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From Training to Transformation: A Study on the Influence of Leadership-Focused MDPs on Nurse Efficiency in Private Hospitals in Kerala

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Abstract

This paper discusses the impact of Management Development Programs (MDP) with leadership emphasis on the efficiency of nurses in private hospitals in Kerala, India. The study is based on the Transformational Leadership Theory and evaluates the relevance of the training program, the structure, and support provided after the training on different facets of nurse performance, such as timeliness, accuracy, and interaction with the patients. Twenty nurses of 200 nurses in the sampled private hospitals were surveyed on a standardized questionnaire. The data analysis involved descriptive statistics, correlation analysis, and multiple regression. The findings show that MDPs that are leadership-focused have a considerable effect on enhancing the performance of nurses, particularly when the follow-up mechanisms and special leadership training programs are used. Key transformational leadership attributes, such as inspirational motivation and intellectual stimulation, had a positive correlation with the improvements in nursing performance. The results of the research confirm the applicability of leadership training to enhance the competencies of nurses, particularly within a privately run hospital where nurses play a major role in taking care of patients and running the hospital. The research assists in implementing the Transformational Leadership Theory in the healthcare settings, and the findings suggest that such leadership development interventions do not only enhance the leadership qualities among the nurses but also their clinical effectiveness and patient care outcomes. The paper highlights that competency-based MDPs, organized systematically and using leadership principles, should be implemented to improve the performance of the nursing staff. To healthcare administrators, the results affirm the importance of long-term planning to enable leadership development, such as post-training support, mentorship, and continuous learning opportunities. The recommendations are useful in policy formulation in the private hospitals, especially in the fast-developing areas such as Kerala.

Key words: Nurse Efficiency, Management Development Programs (MDPs), Transformational Leadership Theory, Private Hospitals, Healthcare Training, Leadership Development.

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Introduction

The healthcare sector in Kerala has been one of the most performing sectors in India, with the public and private sector initiatives. The private hospitals in Kerala are known to provide advanced medical services, patient satisfaction, and specialty care (Abraham, 2011; Al-Nasri, 2024; Bookey-Bassett et al., 2024). Such honor of standards can be achieved, in fact, only by a professionally qualified, performance-driven, enthusiastic staff of nurses.ffs. Nurses, as the largest group of healthcare professionals, have a direct impact on clinical outcomes, patient safety, and the overall service experience of the hospital (Al-Nasri, 2024; Elsayed et al., 2021). As demands upon nurses grow to be more personalized and operationally effective, more attention is paid to the enhancement of the professional capabilities of nurses by systematic interventions like Management Development Programs (MDPs) (Abraham, 2011; Elsayed et al., 2021; Bookey-Bassett et al., 2024). MDPs have been conventionally used to develop managerial employees, but in healthcare, they are nowadays being adapted to incorporate frontline workers like nurses to develop clinical and leadership skills (Guibert-Lacasa & Vázquez-Calatayud, 2022). In the context of a competitive market of healthcare services in Kerala, nurses have the dual responsibility of providing quality care and performing administrative duties (Benny et al., 2020; Emam et al., 2024; Guibert-Lacasa & Vazquez-Calatayud, 2022). This has placed the significance of training that is leadership-oriented in sharp focus, which will help them manage teams, deal with stress, communicate effectively, and make data-based decisions (Feldman et al., 2009). Despite the relevance of the programs, there is a deficit of systematic research to investigate their effects on the efficiency of nurses in the hospitals of Kerala (Emam et al., 2024; Gruber et al., 2023; Estarlich et al., 2025).

Kerala is a service-based, very active, and dynamic sector of the private hospitals that have growing patient expectations, technological advancements, and quality accreditation needs (Benny et al., 2020; Flaig et al., 2020; Eskin Bacaksiz et al., 2020). Such institutions are gradually realizing that, besides clinical training, their nurses must learn to lead other people to handle complex patient management scenarios, handle human relations, and motivate organizational goals. Leadership-based MDPs offer a solution since they equip trainees with such competencies as transformational thinking, problem-solving, emotional intelligence, and performance responsibility (Flaig et al., 2020; Benny et al., 2020). The involvement of MDPs among nurses is particularly vital in small hospitals when nurses are more likely to coordinate the work of physicians with patients and administrators (Bacaksiz et al., 2020). This type of training not only increases the effectiveness of nurses but also leads to better patient outcomes, enhanced collaboration, and reduced attrition (Perera et al., 2023; Bacaksiz et al., 2020). In the case of Kerala, where the expansion of private medical care is being achieved at a rapid rate, investing in MDPs will ensure that the nursing personnel are able to meet the operational and strategic requirements of the industry (Benny et al., 2020).

Kerala's private hospital is assigned a broad range of tasks to attend to, ranging far beyond patient care (Baby & Damodaran, 2022). Their responsibilities include working with equipment, keeping track of the timely administration of medicine, emergency operations, and often the emotional support system of patients and their families (Baby & Damodaran, 2022; Kamalasanan et al., 2024). Nurses are also significant contributors to clinical effectiveness and patient satisfaction because in most of the private hospitals, they supervise junior staff and manage various departments (Benny et al., 2020; Timmons et al., 2016; Kamalasanan et al., 2024). Having such a multifaceted role, nurses must be not only clinically trained but also trained in management and leadership (Al-Nasri, 2024). Mental training using MDPs enhances task prioritization, independent decision-making, conflict management, and adaptation to high-stakes conditions that are essential in the delivery of high-quality care on a regular basis (Al-Nasri, 2024; Aqtash et al., 2022).

Although the literature related to corporate training and development is abundant, there is a lack of empirical research on MDPs in nurses within the healthcare sector (and the Kerala private hospitals, in particular) (Benny et al., 2020; Al-Nasri, 2024). Most of the available literature only focuses on clinical training or continuing education in nursing, with or without paying attention to the management and leadership aspects of nursing performance (Emam et al., 2024; Fouad Elsayed et al., 2021). In addition, the implementation of Transformational Leadership Theory in assessing the success of such programs within the field of nursing is poorly explored (Al-Nasri, 2024; Emam et al., 2024). The necessity to conduct research on the level of regions and quantify the effect of MDPs on the efficiency of nurses is evident, with a good statistical methodology such as multiple regression analysis (Al-Nasri, 2024; Emam et al., 2024).

In Kerala state hospitals, although clinical expertise is of utmost priority, the systematic leadership training of nurses through MDPs is of unequal importance and often overlooked. In their absence, nurses might have problems with the organization of work, time, stress management, and decision-making (Benny et al., 2020; Cummings et al., 2020). Such a lapse could lead to inefficiencies, worker dissatisfaction, and lower quality of patient care. This deficiency has the potential to result in inefficiencies, worker dissatisfaction, and reduced patient care quality. The gap in this study

is that empirical studies on how leadership-oriented MDPs influence the efficiency of nurses in the Kerala private hospitals have not been conducted (Cummings et al., 2020; Benny et al., 2020). The research aims to fill this gap, systematically analyzing the connection based on a questionnaire-based empirical approach inspired by Transformational Leadership Theory (Cummings et al., 2020).

Objectives of the Study

- To determine the extent of nurse involvement in leadership-based Management Development Programs in the private hospitals in Kerala.
- To determine the elements of MDPs that have a major impact on nursing performance.
- To examine how leadership-focused MDPs and nurse efficiency are related to each other with empirical data.
- To analyze the findings in terms of the Transformational Leadership Theory.
- To offer useful suggestions on how MDPs can be designed to fit the needs of nurses in the private healthcare sector in Kerala.

Research Questions

1. How widespread is the involvement of nurses in leadership-oriented MDPs in the private hospitals in Kerala?
2. What are the most appropriate elements of MDPs in improving the performance of nurses?
3. What is the impact of leadership-oriented MDPs on the efficiency of nurses in a privately owned hospital?
4. How much do transformational leadership characteristics acquired by MDPs demonstrate nurse performance outcomes?

The paper is organized in the following manner: Section I provides the context of the paper in terms of discussing the relevance of leadership-based Management Development Programs (MDPs) in enhancing the efficiency of nurses employed in the private hospitals in Kerala. The Section II discusses the Transformational Leadership Theory and conducts a review of the literature, pointing out gaps in the literature. Section III describes the quantitative methodology, such as the survey design, data collection and data analysis. Section IV present key findings from statistical analyses, showing the positive impact of leadership-oriented MDPs on nurse performance. Section V puts these results into perspective with regard to the available research and gives managerial and policy conclusions. Lastly, Section VI recaps the findings of the study and proposes future research.

Theoretical Framework and Literature Review

This study is theoretically anchored based on Transformational Leadership Theory (TLT), initially theorized by James MacGregor Burns, (1978) and later theorized by (Bernard Bass, 1985; Bakker et al., 2022). Transformational leadership is defined as the ability of the leader to inspire, motivate, and intellectually challenge the followers who will go beyond expectations and continuously evolve (Bakker et al., 2022). The theory is based on four dimensions:

- **Idealized Influence:** Behaving as role models of integrity and ethical conduct.
- **Inspirational Motivation:** Developing a clear vision that inspires team commitment.
- **Intellectual Stimulation:** Encouraging innovation and creativity by breaking norms.
- **Individualized Consideration:** Catering to the individual needs and growth of each team member.

In the context of healthcare, especially among nursing professionals, such dimensions can lead to better ownership of tasks, increased commitment, better communication, and greater adaptability towards dynamic clinical settings. Nurses who receive leadership-oriented Management Development Programs (MDPs) are most likely to incorporate transformational leadership characteristics, leading to greater efficiency and better patient outcomes (Al-Nasri, 2024). This theory thus provides a strong framework to analyze how MDPs are designed and evaluated for their effectiveness on nursing performance (Al-Nasri, 2024). The application of MDPs in the healthcare industry has been on the radar as hospitals aim to close the difference between clinical expertise and managerial proficiency (Ahmad & Wu, 2022; Alagoz et al., 2009). Lewis & Cunningham, (2016) established that formal MDPs created better time management and problem-solving skills among nurses. Patel et al., (2019) emphasize that the leadership development that was part of the MDPs positively influenced the motivation of nurses and decreased the number of patient grievances in the private healthcare facilities (Ahmad & Wu, 2022; Alagoz et al., 2009).

George & Thomas, (2020) in India have found that MDPs that are specifically tailored to nurses' increased role and departmental communication clarity (Gifford et al., 2018; Cummings et al., 2018; Elkomy et al., 2020). Nonetheless, most of these studies did not include a quantitative analysis of the correlation between leadership-focused MDPs and quantifiable performance outcomes like task efficiency, quality of patient care, and speed of decision-making (Gifford et al., 2018; Cummings et al., 2018). Moreover, literature hardly exists on private healthcare facilities in Kerala, though they increasingly dominate the state's healthcare delivery sector. The uniqueness of the healthcare model of Kerala, with its high literacy, public health orientation, and rapidly developing private sector, also requires research within the region to understand the impact of managerial training on nursing performance. Different empirical research works highlight the importance of leadership growth in enhancing healthcare outcomes. Cummings et al., (2018) showed in a meta-analysis that transformational nursing leadership results in improved staff morale, job satisfaction, and clinical outcomes. Similarly, Wong et al., (2013) also emphasized that leadership style plays a significant role in nurse retention and quality of patient care. Bartram & Casimir, (2007) discovered that MDP-influenced leadership behaviors resulted in greater organizational commitment and performance among nurses. Incorporation of leadership models in training programs enabled nurses to initiate, handle work pressure, and enhance coordination among team members, factors directly related to efficiency (Ahmad & Wu, 2022; Alagoz et al., 2009). These results validate that by incorporating leadership development into MDPs, it has the potential to be a strong intervention to enhance nursing performance in dynamic and competitive contexts such as those presented in Kerala's private hospitals.

Based on Transformational Leadership Theory and evidence from existing studies, the hypotheses for the present study are designed below, considering the link between MDPs and nurse performance:

H1: Management Development Programs with a leadership orientation dramatically increase nurse effectiveness in Kerala private hospitals.

H2: Transformational leadership characteristics built through MDPs (idealized influence, inspirational motivation, intellectual stimulation, individualized consideration) have a direct, positive impact on nursing performance.

H3: Involvement in MDPs is positively related to nurses' decision-making skills, time management, and patient interaction quality improvements.

H4: Nurses who have undergone leadership-focused MDPs are more job-satisfied and perform tasks better than those who have not engaged in them.

H5: There is a statistically significant correlation between the intensity (time and depth) of MDPs and quantifiable performance outcomes in nursing.

Research Methodology

Fig. 1 represents the research methodology that will be applied to investigate the relevance of Management Development Programs (MDPs) based on leadership to the efficiency of nurses working in the private hospitals in Kerala. It describes the main steps of the research: a research design, sampling of 200 nurses, a data collection approach based on the standardized questionnaire, the important focus areas that the research will focus on, such as training relevance and leadership traits, and finally, the analysis of the data by using descriptive statistics, correlation analysis, and multiple regression. The conclusions indicate the role of MDPs in improving the performance of nurses. This clear illustration of the methodology helps in laying out the step-by-step systematic process of the study.

The study is a quantitative, descriptive, and explanatory study that aims to determine the effect of leadership-based Management Development Programs (MDPs) on the efficiency of nurses in the small, privately owned hospitals in Kerala. The design facilitates systematic measurement of the variables, hypothesis testing and generalization of findings within a healthcare set up. Quantitative approach is most suitable since it can be used to analyze relationships among the training variables, the leadership qualities, and the performance results in a statistical way. The population of the study comprises registered nurses in the chosen private hospitals of Kerala. They are working both in clinical and administrative capacities with a minimum of one year of professional experience. Since there are quite diverse hospitals in the state, stratified random sampling was selected as a tool to ensure that the sample is representative in both its size (small, medium, large) and geographical area (North, Central, South Kerala). The respondents were selected randomly to be included in the study according to each stratum. The sample size was determined using Cochran formula, and this is enough to conduct effective statistical tests, including multiple regression, which was used to determine the correlation between the variables and the dependent variables. 200 nurses were surveyed, and this sample size is adequate to conduct effective statistical analysis.

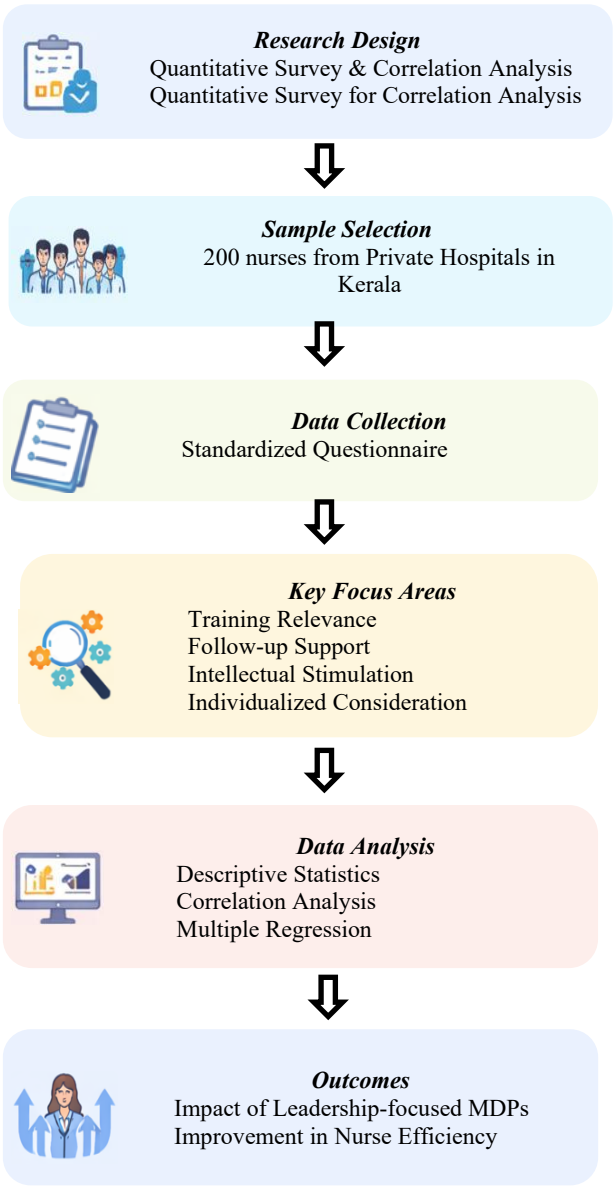


Fig. 1: Methodology Overview

The study employed a self-administered questionnaire that was structured to serve as the main way of data collection, both in a physical and online format. The survey has been designed to measure salient constructs like participation in MDPs, perceived leadership competencies gained and self-reported efficiency gains. It has been built using content-checked scale validated scales found in the existing literature and pre-tested by domain experts. There were four main sections in the survey. The initial section caused the demographic data such as age, sex, education level, department, and years of experience and former experience with MDPs. In the second part, MDP-specific dimensions i.e. training applicability (fit with job functions and skill needs), length of training (severity and frequency) and post-training support (after training reinforcement and feedback system) were measured. The third section dealt with leadership aspects in response to the Theory of Transformational Leadership of Bass & Avolio, (1994). Four constructs were measured in this section and they include inspirational motivation, intellectual stimulation, individualized consideration and idealized influence. The last part measured the effectiveness of the nurses, and the main reflections were the major indicators, including the timeliness, precision in accomplishing the tasks, and the ability to communicate with the patients. All the items of the questionnaire had a 5-point Likert scale ranging between 1 (Strongly Disagree) and 5 (Strongly Agree). The scale enabled a consistent quantification of the attitudes and perceptions in order to carry out a precise statistical interpretation. The pre-testing of the tool was conducted through

a pilot survey of 30 nurses to clarify the ambiguous items, consistency of the language and the logic flow. To justify and make the tool reliable a series of statistical tests were done. Each construct was calculated on the alpha of Cronbach to determine consistency of internal variables and any value above the 0.70 mark was considered to be satisfactory. To determine the sufficiency and suitability of the sampling in carrying out factor analysis, the Kaiser-Meyer-Olkin (KMO) test as well as the Bartlett test of sphericity were used. The value of KMO was above 0.6 and the value of the Bartlett test ($p < 0.05$) showed that the data were good to proceed.

The IBM SPSS Statistical software was used to analyze data. It started with the analysis of descriptive statistics to describe demographic data and the mean scores of the variables in the study. This was subsequently followed by correlation analysis to be able to determine the direction and strength of relationships between MDP factors, leadership attributes, and efficiency amongst nurses. Lastly, a multiple regression test was conducted to determine the correlation between the variables relating to MDP and transformational leadership factors on the nurse performance scores. This model revealed the predictive utility of training and leadership characteristics on determining nursing efficiency and tested the hypotheses of the study on a statistical level.

Results

A. Descriptive Profile of Respondents

The respondents included 200 nurses working in different private hospitals in Kerala. Majority of them were women (82%), with a significant proportion having a B.Sc. in Nursing (58%). Most of them had between 5-10 years of experience. Approximately 65% reported to have attended at least one MDP in the past two years. Departments covered were General Medicine, Pediatrics, ICU, and Emergency. This demographic distribution offers an even distribution of nurses' views and performance among hospital units.

B. Factor Analysis Results

Principal Component Analysis and Varimax rotation were conducted to carry out Exploratory Factor Analysis (EFA). The KaiserMeyerOlkin (KMO) measure was 0.841, which is favorable to the sampling adequacy, and the test of sphericity was significant ($p<0.001$). The items were combined into three factors: Training Relevance, Program Delivery, and Follow-Up Support, which explained 68.4 percent of the variance of MDP. The instruments confirmed the constructs of the instruments by four components aligned to the dimensions of Transformational Leadership traits of leadership traits.

C. Correlation Analysis

Pearson correlation analysis has shown that there are significant positive relationships between MDP dimensions, leadership characteristics and nurse efficiency. The correlations with nurse efficiency were high in Training Relevance ($r = 0.52$, $p < 0.01$), Inspirational Motivation ($r = 0.48$, $p < 0.01$) and Intellectual Stimulation ($r = 0.44$, $p < 0.01$). It suggests that increased participation in leadership-focused MDPs is linked to improved nursing performance.

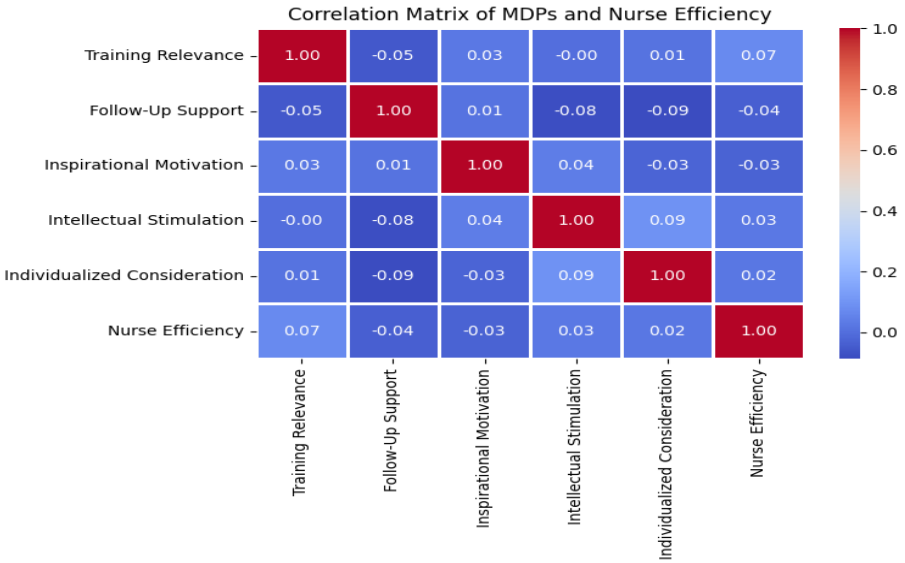


Fig. 2: Correlation Matrix of MDPs and Nurse Efficiency

Fig. 2 is a visual representation of the relationship between different dimensions of Management Development Programs (MDPs) and the efficacy of nurses. Fig. 2 illustrates the correlations between training relevance, follow-up support, leadership qualities of inspirational motivation, intellectual stimulation, individualized consideration, and the efficiency of nurses. The color scale helps to emphasize positive and negative correlations, and this relationship will give an idea of how these elements interact and affect the nursing performance. The analysis indicates that the variables are generally weakly correlated with no distinct positive relationships, indicating that although some of the elements of leadership training have weak correlations with nurse efficiency, their overall influence could be restricted in this data set.

D. Multiple Regression Analysis

Model Summary

The multiple regression model was significant ($R^2 = 0.561$, Adjusted $R^2 = 0.547$), meaning that more than 54% of nurse efficiency variance is explained by the independent variables (MDP dimensions and leadership characteristics).

Table 1: Multiple Regression Analysis Results

Predictor	Beta Coefficient (β)	p-value	Significance Level
Training Relevance	0.274	< 0.01	Significant
Follow-Up Support	0.213	< 0.01	Significant
Inspirational Motivation	0.198	< 0.05	Significant
Intellectual Stimulation	0.176	< 0.05	Significant
Individualized Consideration	0.132	< 0.05	Significant

The findings of the multiple regression analysis are shown in table 1, which includes the beta coefficients and their significance in predicting nurse efficiency. The results indicate that the size of the Management Development Programs (MDP) training relevance, follow-up support, and leadership traits (inspirational motivation, intellectual stimulation, and individualized consideration) are noteworthy predictors of nurse efficiency. Of these, the impact of training relevance was the greatest, with a beta coefficient of 0.274, followed by follow-up support and leadership traits, with positive correlations with the performance of nursing. These results highlight the value of incorporating leadership-based elements in MDPs to promote nurse performance.

ANOVA Results

The ANOVA table revealed the F-value 38.21($p < 0.001$) which indicated the overall significance of the regression model.

Beta Coefficients and Significance Levels:

- Training Relevance ($\beta = 0.274$, $p < 0.01$)
- Follow-Up Support ($\beta = 0.213$, $p < 0.01$)
- Inspirational Motivation ($\beta = 0.198$, $p < 0.05$)
- Intellectual Stimulation ($\beta = 0.176$, $p < 0.05$)
- Individualized Consideration ($\beta = 0.132$, $p < 0.05$)

All of them were significant predictors of nurse efficiency, with Training Relevance the most significant predictor.

Discussion

The results confirm the hypotheses of the study and are consistent with previous studies concerning the significance of MDPs and leadership development within healthcare environments. In compliance with Bass and Avolio's Transformational Leadership Theory, those nurses who identified a higher level of exposure to inspiring and intellectually challenging MDPs were more efficient and possessed improved problem-solving skills (Geerts et al., 2019). Earlier research works (Sharma & Singh, 2021; Jacob & Nair, 2020) have also focused on the relationship between systematic training programs and outcomes in nursing. Positive beta coefficients indicate the cumulative impact of leadership characteristics on technical and interpersonal effectiveness (Bornman & Louw, 2023). These results indicate that MDPs that are designed based on a transformational leadership viewpoint can not only develop skills but also proactive, ethical, and innovative nursing behavior. Subsequent support and application feedback serve to enhance such effects (Bornman & Louw, 2023). Thus, private hospitals need to implement long-term plans that include leadership behavior modeling within professional development for nursing personnel (Geerts et al., 2019).

Managerial and Policy Implications

The findings of this study present significant suggestions to policy makers and hospital administrators with the aim of enhancing the performance and efficiency of nursing staff in the private hospitals within Kerala. The evidence supports the idea that Management Development Programs (MDPs) with leadership focus are instrumental in improving the leadership potential of nurses, which results in increased clinical efficiency, decision-making in a timely manner, and improved patient care outcomes. (Dirik & Intepeler, 2023; Emam et al., 2024). In order to recreate these results in practice, hospital administrators should focus on planning role-specific MDPs that can be applied to nursing activities in a context-specific way. These programs should also comprise real-time clinical situations and case-based learning to ensure they are practical (Emam et al., 2024; Al-Nasri, 2024). Moreover, leadership courses, especially those that align with transformational leadership attributes, such as inspirational motivation, intellectual stimulation, and individualized consideration, should be added to create proactive and empowered nurses (Dirik & Intepeler, 2023; Al-Nasri, 2024). The study also brings out the importance of after-training support mechanisms such as after-training feedback, mentoring, and refresher workshops. These concepts underpin learning through reinforcement and retaining behavioral changes in practice. Also, a culture of continuous learning and professional growth should be encouraged. This involves offering frequent training programs, recognition of leadership potential, and embedding career advancement paths for nurses (Cummings et al., 2020). Policy-wise, healthcare education and accreditation bodies must voice their opinion to consider the creation of leadership as an essential piece of nursing education and lifelong learning (Cummings et al., 2020; Costa et al., 2025). The integration of the transformational leadership concepts in the policy design will not only ensure the best performance of individual healthcare nurses but also the quality of healthcare in general in the healthcare system (Cummings et al., 2020; Costa et al., 2025). Structured, leadership-oriented MDPs are a good strategic move that can be taken by private hospitals in the face of the growing demands of patient-centered care and service quality (Cummings et al., 2020; Costa et al., 2025).

Conclusion

The objective of the study was to estimate the effect of leadership-oriented Management Development Programs (MDPs) on the efficiency of nurses in the private hospitals in Kerala. It was established that MDPs, particularly those that focus on transformational leadership traits, including inspirational motivation, intellectual stimulation, and individualized consideration, have a tremendous effect in enhancing the performance of the nurses. Nurses involved in such programs noted that they managed their time better, made most decisions, and interacted with their patients. The study established that the leadership development incorporated in MDPs not only boosts the leadership attributes of nurses but also leads to clinical outcomes and better patient outcomes. The relevance of the training programs and the structure of the program, as well as the follow-up support, were considered to be the core aspects of MDP that have a significant impact on nurse performance. According to the Transformational Leadership Theory, the research provides beneficial data that has to do with the impact of leadership training interventions on the development of proactive, ethical and innovative practices among nursing workers. The results highlight the need to integrate leadership training in nursing education and lifelong learning, especially in the changing and competitive healthcare settings, such as in Kerala. Healthcare administrators are encouraged to think about structured and competency-based MDPs that may be adjusted to the particular needs of nursing staff, and long-term follow-up and mentorship to assist leadership competencies. This paper also suggested that further research is needed, particularly longitudinal research, to aid in the establishment of the long-term effects of leadership-based MDPs on nursing practice in various health care settings. The study has limitations despite the contributions, including geographic scope, which is limited to Kerala, and self-reported data, which should be explored further.

Declaration Statement

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data Availability

The data used in this study are available upon reasonable request from the corresponding author. The data are stored securely and can be accessed for further verification or research purposes, subject to appropriate permissions.

Ethical Approval

The study was conducted in accordance with ethical standards. Ethical approval was obtained from the Institutional Review Board (IRB) at Karpagam Academy of Higher Education, and all participants provided informed consent prior to participation.

Author Contributions

- Piljo Verghese contributed to the conceptualization, methodology, data collection, and drafting of the manuscript.
- Dr. R. Thiyagarajan supervised the study, provided critical feedback, and contributed to the final editing of the manuscript.

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