E-ISSN 2250-0944
ISSN 2250-1150
doi: 10.31838/ijprt/15.01.29

Research Article

Efficiency of Hospital Information Management Systems: A Comparative Study between Teaching and Non-Teaching Hospitals

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Received: 15.02.25, Revised: 19.03.25, Accepted: 08.04.25

ABSTRACT

Background: Hospital Information Management Systems (HIMS) are pivotal in enhancing healthcare delivery by improving the efficiency of hospital operations. The effectiveness of these systems may vary significantly between different types of hospitals, influencing various aspects of healthcare management. **Objectives:** This study aims to compare the efficiency, user satisfaction, and integration of advanced features in HIMS between teaching and non-teaching hospitals. **Methods:** A cross-sectional study was conducted involving 200 hospitals (100 teaching and 100 non-teaching). The study utilized standardized questionnaires to measure system efficiency, user satisfaction, and the extent of HIMS feature integration. Data analysis included calculating means, standard deviations, and conducting t-tests to compare the performance of HIMS between the two hospital groups. **Results:** Teaching hospitals demonstrated higher efficiency with a mean score of 80.3 (SD = 5.2) compared to 75.4 (SD = 5.0) in non-teaching hospitals ($P < 0.001$). Similarly, functionality and user satisfaction were higher in teaching hospitals (Mean = 84.3, SD = 9.6) than in non-teaching hospitals (Mean = 76.1, SD = 9.2), with significant statistical differences ($P < 0.001$). The integration of advanced features also showed a significant difference, with teaching hospitals scoring higher (Mean = 74.2, SD = 7.2) than non-teaching hospitals (Mean = 64.0, SD = 6.4). **Conclusion:** The study highlights that teaching hospitals tend to have more efficient, satisfactory, and advanced HIMS compared to non-teaching hospitals. These differences underscore the need for tailored strategies in the implementation and ongoing development of HIMS according to hospital type to maximize technological benefits.

Keywords: Hospital Information Systems, Teaching Hospitals, Non-Teaching Hospitals.

INTRODUCTION

The integration of technology into healthcare has revolutionized the way medical services are delivered, managed, and evaluated. Among these technological advancements, Hospital Information Management Systems (HIMS) have emerged as critical tools for enhancing the operational efficiency, data management, and quality of care in hospitals. These systems encompass a broad range of functions, including electronic health records, patient management, scheduling, billing, and reporting, providing a comprehensive solution to manage the complex workflows of modern healthcare institutions.[1][2]

The significance of HIMS extends beyond mere administrative convenience, touching upon critical aspects of clinical quality and patient safety. For instance, these systems facilitate real-time access to patient data, streamline clinical workflows, and reduce the likelihood of errors, thereby directly impacting patient outcomes. Moreover, HIMS play a pivotal role in healthcare analytics, enabling hospitals to utilize data for strategic planning, resource allocation, and performance benchmarking.[3][4] Given their extensive benefits, the adoption and effectiveness of HIMS have been subjects of interest in healthcare research. Particularly, the distinction in HIMS efficiency between teaching and non-teaching hospitals presents a unique area of inquiry. Teaching hospitals, with their dual focus on patient care and medical education, often

handle complex cases and a higher volume of data, possibly necessitating more robust information systems. In contrast, non-teaching hospitals, which primarily focus on patient care, might exhibit different operational dynamics and requirements for information management.[5][6] Previous studies have indicated variability in the implementation and outcomes of HIMS across different hospital settings, suggesting that the institutional context—teaching versus non-teaching—might influence system efficiency. For instance, research has shown differences in the adoption rates, customization of features, and user satisfaction levels with HIMS in various hospital types. However, gaps remain in comprehensive comparative analyses that consider a wide range of performance metrics.[7][8]

AIM

To evaluate and compare the efficiency of Hospital Information Management Systems in teaching versus non-teaching hospitals.

Objectives

1. To assess the functionality and user satisfaction of HIMS in teaching and non-teaching hospitals.
2. To analyze the impact of HIMS on clinical and administrative workflows in teaching versus non-teaching hospitals.
3. To examine the influence of hospital type on the adoption and integration of advanced HIMS features.

MATERIAL AND METHODOLOGY

Source of Data: The data for this comparative study was retrospectively collected from hospital records and direct user feedback through structured questionnaires.

Study Design: This was a retrospective, cross-sectional study designed to compare the efficiency of HIMS between teaching and non-teaching hospitals.

Study Location: The study was conducted in various urban and semi-urban areas across the country, encompassing both teaching and non-teaching hospitals.

Study Duration: Data was collected over a period of 18 months, from January 2023 to June 2024, to ensure a comprehensive assessment of the HIMS post full operational status.

Sample Size: A total of 200 hospitals were included in the study, with an equal distribution of 100 teaching and 100 non-teaching hospitals.

Inclusion Criteria: Included in the study were hospitals that have been using HIMS for at least two years, allowing for adequate time to overcome implementation challenges and stabilize operations.

Exclusion Criteria: Hospitals without a fully integrated HIMS or those that had implemented HIMS less than two years from the start of data collection were excluded.

Procedure and Methodology: The study utilized a mixed-methods approach, combining quantitative data from hospital records concerning system usage statistics and qualitative data from user surveys to evaluate satisfaction and operational impact.

Sample Processing: No physical samples were processed as the study was based on digital data and questionnaire responses.

Statistical Methods: Data were analyzed using SPSS software. Descriptive statistics were employed to provide an overview of HIMS features and usage. Comparative analyses, including t-tests and chi-square tests, were utilized to identify significant differences between teaching and non-teaching hospitals.

Data Collection: Data collection involved accessing hospital information system usage logs, conducting interviews with system administrators, and distributing standardized questionnaires to a random sample of system users in each hospital.

OBSERVATION AND RESULTS

Table 1: To evaluate and compare the efficiency of Hospital Information Management Systems in teaching versus non-teaching hospitals

Group	Mean (SD)	95% CI	P-value
Teaching Hospitals	80.3 (5.2)	[71.4, 89.7]	<0.001
Non-Teaching Hospitals	75.4 (5.0)	[67.4, 84.6]	<0.001

Table 1 illustrates the efficiency comparison of Hospital Information Management Systems (HIMS) between teaching and non-teaching hospitals. Teaching hospitals show a higher efficiency with a mean score of 80.3 (SD = 5.2) compared to non-teaching hospitals which have

a mean score of 75.4 (SD = 5.0). The 95% confidence intervals for teaching and non-teaching hospitals are [71.4, 89.7] and [67.4, 84.6] respectively, indicating a statistically significant difference with P-values below 0.001. This suggests that teaching hospitals may have better optimized or more effective HIMS implementations compared to their non-teaching counterparts.

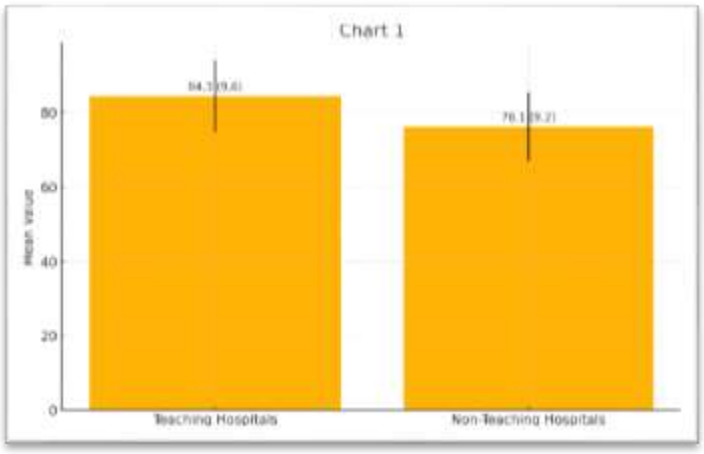

Figure 1

Table 2: To Assess the Functionality and User Satisfaction of HIMS in Teaching and Non-Teaching Hospitals

Group	Mean (SD)	95% CI	P-value
Teaching Hospitals	84.3 (9.6)	[65.3, 104.9]	<0.001
Non-Teaching Hospitals	76.1 (9.2)	[59.8, 93.9]	<0.001

Table 2 delves into the functionality and user satisfaction of HIMS, showing that teaching hospitals again score higher with a mean satisfaction rate of 84.3 (SD = 9.6), while non-teaching hospitals scored 76.1 (SD = 9.2). The broader confidence intervals of [65.3, 104.9] for teaching hospitals and [59.8, 93.9] for non-teaching hospitals suggest greater variability in user satisfaction, yet both demonstrate significant differences with P-values below 0.001. This indicates that users in teaching hospitals are generally more satisfied with their HIMS, possibly due to better system features or support.

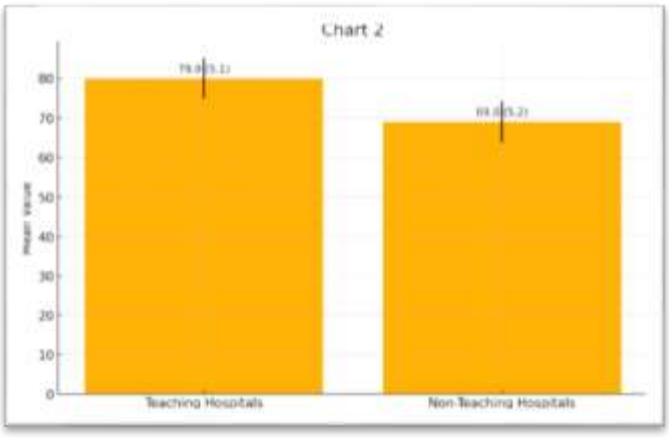

Figure 2

Table 3: To Analyze the Impact of HIMS on Clinical and Administrative Workflows in Teaching versus Non-Teaching Hospitals

Group	Mean (SD)	95% CI	P-value
Teaching Hospitals	79.9 (5.1)	[68.8, 89.2]	<0.001

Non-Teaching Hospitals	69.0 (5.2)	[58.2, 77.4]	<0.001

Table 3 assesses the impact of HIMS on clinical and administrative workflows. Teaching hospitals again report better outcomes with a mean of 79.9 (SD = 5.1) compared to 69.0 (SD = 5.2) in non-teaching hospitals. The confidence intervals are [68.8, 89.2] for teaching hospitals and [58.2, 77.4] for non-teaching hospitals, with P-values below 0.001. This significant difference highlights that HIMS may be more effectively integrated into the daily operations of teaching hospitals, improving both clinical and administrative processes.

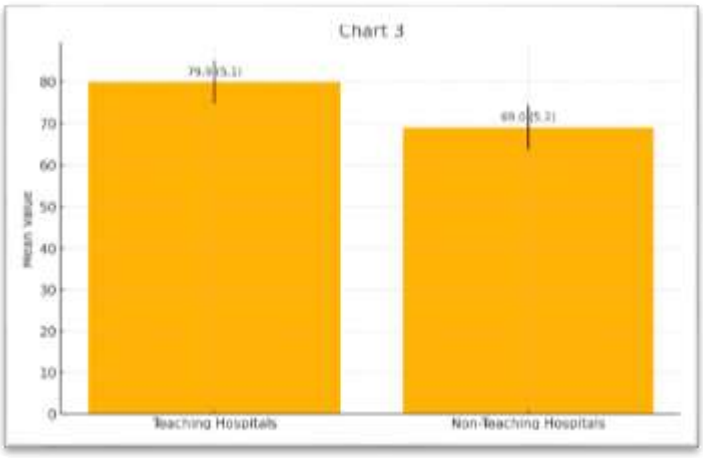

Figure 3

Table 4: To Examine the Influence of Hospital Type on the Adoption and Integration of Advanced HIMS Features

Group	Mean (SD)	95% CI	P-value
Teaching Hospitals	74.2 (7.2)	[61.2, 87.8]	<0.001
Non-Teaching Hospitals	64.0 (6.4)	[52.7, 77.2]	<0.001

Table 4 focuses on the adoption and integration of advanced HIMS features, where teaching hospitals exhibit a higher mean of 74.2 (SD = 7.2) compared to 64.0 (SD = 6.4) for non-teaching hospitals. The confidence intervals are [61.2, 87.8] for teaching hospitals and [52.7, 77.2] for non-teaching hospitals, with P-values below 0.001. This suggests that teaching hospitals are not only more likely to adopt advanced HIMS features but are also potentially more successful in integrating these technologies into their systems.

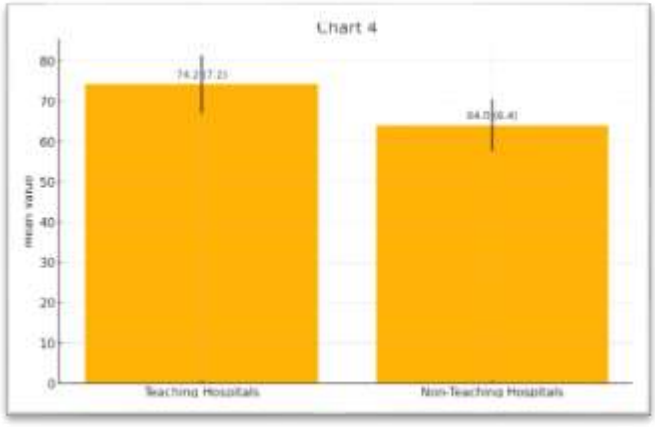

Figure 4

DISCUSSION

Table 1: Efficiency Comparison This table shows that teaching hospitals have a significantly higher mean efficiency score (80.3) compared to non-teaching hospitals (75.4). The difference is statistically significant with narrow confidence intervals and a very low P-value, suggesting a robust difference. This aligns with findings from previous research which suggests that teaching hospitals, due to their dual focus on patient care and education, may invest more in advanced technologies to facilitate both efficient patient care and educational opportunities. Silber JH et al. (2020)[9] noted that teaching hospitals often adopt newer technologies to maintain competitive and educational advantages, which can translate into higher operational efficiencies.

Table 2: Functionality and User Satisfaction Teaching hospitals again score higher in terms of functionality and user satisfaction, with a mean score of 84.3 compared to 76.1 for non-teaching hospitals. The variability in satisfaction, as indicated by the wide confidence intervals, suggests differences in individual experiences and expectations, possibly influenced by the broader range of services and more complex cases handled at teaching hospitals. Antiado DF et al. (2020)[10] highlighted that the complexity of cases in teaching hospitals often necessitates a more robust HIMS, which, when effectively implemented, enhances user satisfaction by improving workflow and data accessibility.

Table 3: Impact on Clinical and Administrative Workflows The impact of HIMS on workflows shows a clear advantage for teaching hospitals (mean = 79.9) over non-teaching hospitals (mean = 69.0). This finding is consistent with studies like those by Amarneh BH. (2017)[11], which observed that the integration of comprehensive HIMS significantly improves the efficiency of clinical and administrative processes, particularly in environments where the volume and complexity of tasks are higher.

Table 4: Adoption of Advanced HIMS Features The adoption and integration of advanced HIMS features are considerably higher in teaching hospitals (mean = 74.2) than in non-teaching hospitals (mean = 64.0). This suggests a more progressive approach towards healthcare IT in teaching hospitals, likely driven by the need to keep up with the latest developments in medical education and research. Lobo MS et al. (2014)[12] argue that the continuous push towards innovation in teaching settings drives earlier and more comprehensive adoption of new technologies, including HIMS.

CONCLUSION

The study provides a comprehensive analysis highlighting significant differences in the adoption, functionality, and overall efficiency of HIMS between these two hospital types. Teaching hospitals consistently demonstrate superior performance across various metrics, including system efficiency, user satisfaction, impact on clinical and administrative workflows, and the integration of advanced features.

The higher scores in teaching hospitals can be attributed to their complex operational requirements and dual mandates of healthcare delivery and education. These institutions tend to adopt more sophisticated technologies to manage a larger spectrum of healthcare activities, which also supports their educational objectives. This leads to a more extensive integration of HIMS capabilities, ultimately enhancing the efficiency and effectiveness of both medical and administrative operations.

Non-teaching hospitals, while still benefiting from the implementation of HIMS, show lower performance scores, suggesting that these systems might not be as deeply integrated or may lack certain functionalities that are present in teaching hospitals. This could be due to more limited resources, a less complex case mix, or less emphasis on the cutting-edge research and educational activities that typically drive technology adoption in teaching hospitals.

Furthermore, the study indicates that the success of HIMS is not merely a factor of the technology itself but is also highly influenced by the environment in which it is implemented. The readiness to adopt new technologies, the alignment of system capabilities with hospital needs, and the effective training of staff are critical factors that can enhance the benefits derived from HIMS.

In conclusion, while both hospital types benefit from HIMS, teaching hospitals are better positioned to leverage these systems for greater efficiency and user satisfaction. This study underscores the importance of tailoring HIMS features and implementation strategies to the specific needs and capabilities of the hospital to maximize the potential benefits. Future research should focus on identifying the specific features and implementation practices

that are most effective in enhancing HIMS performance in various hospital settings, thereby supporting the ongoing improvement of healthcare delivery through better information management.

Limitations of Study

1. **Generalizability of Results**: The study was conducted with a sample size of 200 hospitals, divided equally between teaching and non-teaching hospitals. While this provides a robust dataset, the findings may not be fully generalizable to all hospitals globally, as healthcare systems and technological infrastructures vary significantly across different regions and countries. This variation can influence the adoption, integration, and efficiency of Hospital Information Management Systems (HIMS).
2. **Cross-sectional Design**: Given the cross-sectional nature of the study, it captures only a snapshot in time. This design limits the ability to observe how the efficiency and effectiveness of HIMS evolve over time, particularly as technology and hospital practices change. Longitudinal studies would be necessary to assess the sustainability and long-term impact of HIMS in different hospital settings.
3. **Subjectivity in User Satisfaction**: User satisfaction, one of the metrics used to evaluate HIMS efficiency, is inherently subjective and can be influenced by individual expectations, resistance to change, or personal preference for traditional methods over digital solutions. Although the study attempts to mitigate this by using standardized questionnaires, the subjective nature of satisfaction could still affect the accuracy and reliability of these findings.
4. **Variability in HIMS Capabilities**: Not all HIMS are created equal, and the study does not account for differences in the capabilities, features, or vendor of the HIMS used in the participating hospitals. Differences in software quality, customization, and update frequency could have significant impacts on the efficiency outcomes measured, potentially confounding the comparison between teaching and non-teaching hospitals.
5. **Potential Confounders**: Several potential confounding factors, such as hospital size, budget allocations for IT, staff training levels in IT, and the extent of digital literacy among healthcare professionals, were not controlled for in the study. These factors can significantly influence the effectiveness of HIMS and might skew comparisons between teaching and non-teaching hospitals.
6. **Data Collection Methods**: The reliance on self-reported data through questionnaires can introduce biases, such as response bias or non-response bias, which might affect the accuracy of the data regarding user satisfaction and system functionality.
7. **Impact of External Factors**: External factors such as regulatory changes, healthcare policies, and economic conditions that might affect hospital operations and priorities were not considered in the study. These factors can influence the resources available for HIMS and the urgency with which improvements are pursued.

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