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Health Information Quality and Patient Safety Performance: A Study at Awet Muda Narmada Regional Hospital

Syamsuriansyah[1*], Hizriansyah[2]

[1] Department of Health Information Management, Politeknik Medica Farma Husada Mataram, Mataram, Indonesia
[2] Department of Occupational Safety and Health, Politeknik Medica Farma Husada Mataram, Mataram, Indonesia

Corresponding Author Email: sam_bptk@yahoo.com

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ABSTRACT

This study examined the relationship between health information quality management and patient safety performance, identifying significant factors influencing safety outcomes. A quantitative approach was used, with the Hospital Survey on Patient Safety Culture (HSPSC) translated, culturally tailored, and validated for the local setting. The intervention consisted of comprehensive training in information quality, workflow alignment, and the implementation of standardized documentation procedures over 6 weeks. The study was conducted at Awet Muda Narmada Regional General Hospital in West Lombok, West Nusa Tenggara, Indonesia, with a sample size of 92 healthcare professionals, including physicians, nurses, and health information managers. The results demonstrated a 46-point improvement (from 52 to 98 on a 100-point Likert-type scale) in the dimension of "Management Support for Patient Safety," with an average gain of 46 points after the intervention. A paired t-test found a significant difference between pre- and post-intervention scores ($p = 0.001$), and linear regression confirmed a strong positive relationship between information quality and patient safety ($y = 0.86x + 24.15$), with a coefficient of determination (R^2) of 0.496. The study demonstrates that improving health information quality is associated with better patient safety outcomes. Practical implications include the need to incorporate information technology training, create non-punitive incident reporting systems, and optimize Electronic Health Records (EHR) to foster a stronger patient safety culture in hospital settings.

Key Messages:

- Improved health information management significantly enhances management support for patient safety (46 points, $p < 0.001$).
- A systematic and integrated approach to health information management, tailored to local needs, has proven effective in fostering a culture of patient safety within the hospital setting.
- Trust, transparency, and a reporting culture are essential to effective health information management and improved patient safety.

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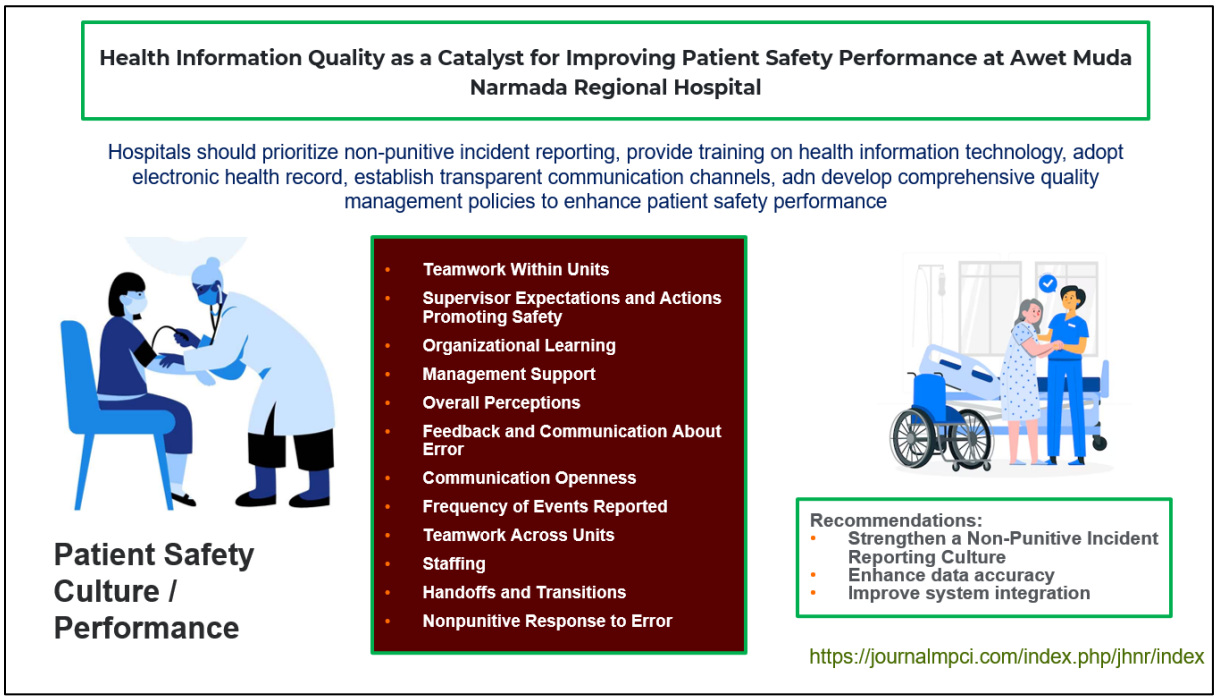
GRAPHICAL ABSTRACT



INTRODUCTION

Effective healthcare delivery relies heavily on accurate and timely health information, especially when making critical clinical decisions. Inaccurate or insufficient information can lead to misdiagnosis and incorrect treatment, thus compromising patient safety. Research indicates that better health information management leads to fewer patient safety occurrences (1) . According to academic studies, around 10% of patients in healthcare institutions worldwide experience safety accidents that might have been averted with improved information management methods (2)(3). International quality standards, such as ISO 9001:2015, have shown substantial benefit in improving healthcare outcomes. The standard encompasses principles of risk management, health and safety requirements, ethical considerations, and consistency in service delivery (4)(5). Implementing ISO 9001:2015 improves process performance and customer satisfaction, which is crucial for providing high-quality healthcare services (6)(7). Although ISO 9001:2015 is not the central framework applied in this study's intervention, its concepts inform the design of systematic approaches to quality improvement. The paradigm stresses continual improvement and resource management, enabling healthcare professionals to adapt to changing needs while maintaining high service standards (8)(9).

The situation in Indonesian hospitals is particularly worrying, since electronic health record systems suffer from difficulties such as lack of standards, insufficient training, and fragmented practices (10)(11)(12). This is especially true in rural hospitals, where many healthcare personnel lack adequate managerial training. Individuals without formal management education, for example, are frequently placed in leadership positions, echoing issues seen in other nations and cultures. (13)(14)(15)(16). This situation is mirrored, where a lack of proper training leads to ineffective management of hospital resources (17)(18). Furthermore, the integration of computer systems in health information management is seen as critical, with a sizable proportion of healthcare workers recognizing the value of such systems in enhancing medical care quality (19)(20)(21).

Technology-based approaches for managing health information quality have emerged as a global priority. The creation of integrated systems employing cloud technologies resulted in enhanced interoperability across hospital departments, less data fragmentation, and increased access to health information in real time (22)(23)(24). Similarly, study indicated that using electronic health records (EHR) coupled with AI-driven data processing algorithms has shortened data retrieval times by up to 50% and

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decreased administrative errors by 30% (25)(26). Furthermore, a regional review found that the use of unified Health Information Management (HIM) frameworks in numerous Indonesian hospitals considerably enhanced business operations and patient satisfaction. In other words, it requires educating healthcare personnel how to deal with data, frequent quality monitoring, and the adoption of comprehensive information security regulations (27)(28)(29)(30)(31).

At RSUD Awet Muda Narmada, the core challenge is low documentation quality and misaligned information flows that fall short of patient safety standards. To address this, a structured intervention was developed, including staff training, information technology updates, and localized policy adjustments. This intervention drew on national regulations and local organizational needs.

Despite the creation and implementation of several health information management quality frameworks, considerable issues significant challenges remain. According to studies, many Indonesian hospitals struggle to adopt technology developments due to inadequate funds, poor staff training, and a general unwillingness to accept change. Furthermore, the frameworks in use fail to meet the specific needs of regional hospitals, resulting in unsatisfactory outcomes (32)(33)(34). Furthermore, a review revealed a dearth of empirical research aimed at measuring the influence of information quality management on patient safety performance in regional hospitals (35)(36). The similarities and contrasts between big urban hospitals and Awet Muda Narmada rural hospitals reflect a multifaceted approach to the latter's operation. This emphasizes the importance of performing more extensive studies in this area in order to build adequate models.

As a result, the purpose of this study is to investigate the link between health information quality and improved patient safety performance, as well as to identify the major information management components that impact safety results.

METHODS

This study takes a quantitative approach, using the Hospital Survey on Patient Safety Culture (HSPSC) to analyze the current condition and trends of patient safety culture in the hospital context. The study focuses on examining HSPSC scores across multiple domains to find strengths and opportunities for improvement. Descriptive statistics are used to characterize the distribution of responses, while inferential techniques such as paired t-tests and linear regression are used to investigate the significance of score fluctuations and identify which characteristics are related with improved safety culture performance. This approach offers a structured, data-driven assessment to inspire strategic measures for improving patient safety outcomes and establishing a safety culture in the hospital setting (37).

This study was conducted at RSUD Awet Muda Narmada, a state-owned general hospital located in West Lombok Regency, West Nusa Tenggara, Indonesia. Serving a population of over 742,000 people, the hospital offers a wide range of medical services—including general and specialized care, emergency services, and inpatient treatment—with more than 300 available beds. RSUD Awet Muda Narmada was selected as the research site due to its ongoing initiatives to enhance health information management as a foundation for improving patient safety. The intervention implemented at RSUD Awet Muda Narmada included a structured 6-week program aimed at improving the quality of health information through several components: (1) a training module on accurate documentation practices and legal compliance, (2) a realignment of information flow procedures in clinical settings, and (3) the introduction of standardized digital templates for patient records. The hospital's health information unit and quality assurance team collaborated on the design of this intervention.

The quantitative population in this study consists of healthcare personnel at RSUD Awet Muda Narmada, including physicians, nurses, and health information management staff. This group was chosen due to their direct involvement in managing, utilizing, and safeguarding patient information as part of patient safety efforts. A purposive sampling technique was employed with the following inclusion criteria: (1) a minimum of three year of work experience at the hospital, (2) active participation in patient safety-related activities, and (3) sufficient knowledge of health information management. Based on these criteria, a total of 92 respondents were selected to represent the study sample.

The quantitative instrument used in this study is the Hospital Survey on Patient Safety Culture

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(HSPSC), which is designed to measure healthcare staff perceptions across various dimensions of patient safety culture within hospital settings. The HSPSC comprises 12 key dimensions, including: (1) Teamwork Within Units, (2) Supervisor/Manager Expectations and Actions Promoting Safety, (3) Organizational Learning—Continuous Improvement, (4) Management Support for Patient Safety, (5) Overall Perceptions of Patient Safety, (6) Feedback and Communication About Error, (7) Communication Openness, (8) Frequency of Events Reported, (9) Teamwork Across Units, (10) Staffing, (11) Handoffs and Transitions, and (12) Nonpunitive Response to Error.

A 5-point Likert scale is used to capture responses, ranging from “Strongly Disagree” to “Strongly Agree.” For the purpose of this study, the HSPSC has been contextually adapted to reflect the cultural and organizational environment of RSUD Awet Muda Narmada, ensuring its relevance and validity in the local setting. The collected quantitative data will be analyzed using SPSS Statistics to evaluate patterns and relationships across the measured dimensions.

To assure data trustworthiness, the Hospital Survey on Patient Safety Culture (HSPSC) instrument was tested for validity and reliability before being used at RSUD Awet Muda Narmada. It was translated, culturally modified, and assessed by specialists in health information management, patient safety, and hospital quality assurance. Content validity was determined using expert judgment, with each question evaluated for clarity, relevance, and contextual fit, and adjustments made to guarantee alignment with the Indonesian healthcare system. The HSPSC instrument's reliability was tested using Cronbach's Alpha to determine internal consistency, with a pilot test given to 30 healthcare staff at Tripat Gerung hospital who satisfied the inclusion requirements. Cronbach’s Alpha coefficient exceeded 0.87, suggesting acceptable to excellent reliability across all parameters. Combined with expert validation for content correctness, these processes revealed that the instrument is valid and reliable for evaluating views of patient safety culture among healthcare staff at RSUD Awet Muda Narmada.

The quantitative data from the Hospital Survey on Patient Safety Culture (HSPSC) data were analyzed using SPSS Statistics version 25. Composite scores for each dimension were calculated and analyzed using paired t-tests to identify significant changes over time, while linear regression was used to identify key predictors influencing variations in patient safety performance.

Ethical Clearance

This study received ethical approval from the institutional ethics committee at Medica Farma Husada Polytechnic, Mataram with the ethical clearance reference number 065/PMFHM.4/PN.01.00/2024. All procedures adhered to institutional ethical guidelines. Prior to data collection, informed consent was obtained from all participants, ensuring they fully understood the purpose of the research, their voluntary participation, and their right to withdraw at any time without consequence. Participants’ identities and responses were treated with the strictest confidentiality, and all data were anonymized prior to analysis. The study adhered to the ethical principles outlined in the Declaration of Helsinki, ensuring respect, autonomy, and justice for all involved respondents.

RESULTS

Figure 1 compares patient safety scores before and after the intervention, with the greatest improvement shown in the "Management Support for Patient Safety" dimension (from 52 to 98). Figure 2 depicts the results of the regression analysis. Tables 1 and 2 describe respondent characteristics and t-test results and are properly cited in order.

Based on the respondent characteristics data (Table 1), A total of 92 respondents in this study. The majority were female (58.70%) and aged between 20–30 years (51.09%), followed by those aged 31–40 years (33.70%) and over 40 years (15.22%). Regarding educational background, most respondents held a bachelor's degree (S1) (58.70%), followed by diploma holders (D3) at 38.04%, while only 3.26% had a master’s degree (S2). Professionally, the sample consisted mainly of nurses (65.22%), with doctors accounting for 19.57%, and health information management (HIM) staff making up 15.22%. Most respondents worked in inpatient units (39.13%), with the remainder distributed across emergencies

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(13.04%), outpatient (10.87%), ICU/operating theater (15.22%), supporting units such as labs and radiology (10.87%), and HIM departments (10.87%).

Table 1. Respondent Characteristics

Respondent Characteristics	n	%
Sex		
Female	54	58.70
Male	38	41.30
Age		
20 - 30 years	47	51.09
31 – 40 years	31	33.70
>40 years	14	15.22
Last education		
D3	35	38.04
S1	54	58.70
S2	3	3.26
Profession		
Doctor	18	19.57
Nurse	60	65.22
Health Information Management Staff	14	15.22
Work unit		
Hospitalization	36	39.13
IGD	12	13.04
Outpatient	10	10.87
ICU/OK	14	15.22
Support (Lab, Radiology, etc.)	10	10.87
Health Information Management	10	10.87
Total	92	100.0

Figure 1 shows that the Comparison of Patient Safety Scores Before and After the Intervention Graph shows an increase in scores on all patient safety dimensions after the intervention, with the highest increase trend occurring in the Management Support for Patient Safety dimension, which increased significantly from 52 to 98 (an increase of 46 points), indicating a strengthening of managerial commitment to safety culture. The Teamwork Across the Unit dimension also showed a significant rise, rising by 21 points. Nonpunitive Responses to Errors increased by only 2 points (from 43 to 45), while Frequency of Reported Incidents increased by 3 points (from 73 to 76). These findings show that, while the intervention was generally effective, there are still challenges in creating a culture of safe reporting without fear of punishment and ensuring the handover process runs smoothly—two critical aspects that necessitate a more comprehensive structural and cultural approach.

Figure 1 compares patient safety scores before and after the intervention, with the greatest improvement shown in the "Management Support for Patient Safety" dimension (from 52 to 98). between the pre- and post-test averages, with a mean difference of -16.000 ($t = 4.253$, $p = 0.001$), where the p-value < 0.05. This gives substantial evidence for rejecting the null hypothesis and concluding that the two situations differ significantly.

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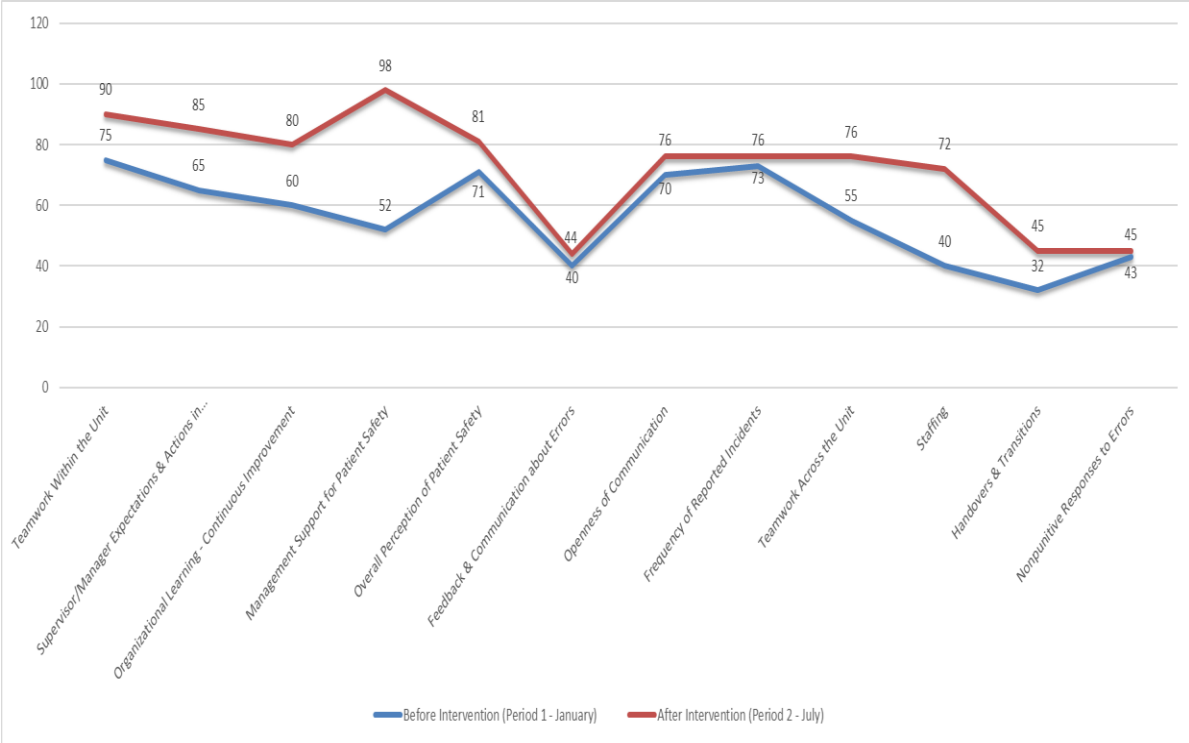

Figure 1. Comparison of Patient Safety Scores Before and After Intervention

Table 2. Paired t-Test Results: Comparison of Before and After Measurements

	Paired Difference							
				95% CI of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1 Before-after	-16.000	13.031	3.762	-24.280	-7.720	-4.253	11	.001

Figure 2. Regression Analysis Results for Patient Safety Performance Improvement

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Awet Muda Narmada Hospital's linear regression study showed a significant positive association between pre- and post-intervention scores (y = 0.86x + 24.15) with a coefficient of determination (R^2) of 0.496. This means that about 49.6% of the variability in post-intervention scores can be explained by pre-intervention scores, with the remainder impacted by factors outside the model. The regression coefficient of 0.86 shows that for every one-unit increase in the pre-intervention score, the average post-intervention score increases by 0.86 units after correcting for the constant. The model indicates a decent correlation, but the low R^2 value implies that other factors should be studied to improve patient safety ratings. The intervention appears to increase patient safety performance, highlighting the need to improve healthcare information management to achieve improved patient safety outcomes.

DISCUSSION

This study focuses on key health information management quality characteristics that substantially influence patient safety measures at the Awet Muda Narmada Regional General Hospital. These findings may be interpreted using quality management principles and patient safety models, both of which advocate for the accuracy, consistency, and timeliness of information management required for optimal decision making in the clinical context (38).

The quantitative data confirms that enhanced health information management efforts positively correlate with improved patient safety performance. Supporting literature such as Titi et al., (2021); Ali et al., (2018); Suganda et al., (2023) similarly highlight the role of information systems in minimizing medical errors and enhancing service quality. The discussion refers to previously published studies and not to original qualitative data collected in this study. No qualitative interviews were conducted. Observations regarding distrust, low transparency, weak follow-up systems, and limited communication are thus grounded in existing literature. Furthermore, qualitative findings from interviews with hospital staff about the barriers to efficiency in health care information systems revealed that distrust and inappropriate transparency, low levels of follow-up, a poor culture of incident reporting, and poor communication between parties were among the major barriers to optimal performance (39)(40)(41). Asan et al., (2021); Platt et al., (2019); Yuan & Lee, (2022); Kızılkaya, (2024) found that optimal performance requires trust, openness, and a reporting culture (42)(43)(44)(45).

The marked improvement in 'Management Support for Patient Safety' indicates that leadership initiatives were well received and likely benefited from top-down enforcement. In contrast, the minimal gain in 'Nonpunitive Response to Error' suggests that deeper cultural and behavioral shifts are more resistant to short-term interventions. These findings are consistent with earlier ones, such as those by Wangkar, (2023); Özturan et al., (2017); D. Lee & Song, (2021); Shahmoradi et al., (2017); Kummer et al., (2018), which state that integrated information systems are critical for resolving difficulties related to data fragmentation, information accessibility, and administrative errors. Problems such as a low reporting culture caused by trust and transparency difficulties, as discovered by this study, require greater attention (46)(47)(48)(49)(50). This is supported by Gao et al., (2019); X. Zhao et al., (2022); Siewert et al., (2018); Falcone et al.,(2022); and Dunbar et al., (2017), who found that fear of retaliation is one of the most significant barriers to event reporting in hospitals with poor internal communication (51)(52)(53)(54)(55).

This study's findings are consistent with HSPSC-based research in rural Indonesian hospitals, which tend to show lower baseline scores and greater post-intervention variability compared to urban counterparts (2)(19). To reduce the risk of self-report bias, the survey was conducted anonymously, and participants received standardized instructions to clarify survey intent and encourage honest responses. In addition, no supervisory personnel were present during completion.

This study contributes to the progress of both quality management in healthcare information and patient safety in hospitals. Theoretically, this study supports the concept that good information management is critical to increasing the quality of health-care services, particularly in terms of patient safety (57). There is additional quantifiable data that supports the system-based performance hypothesis, with significant growth in delivery system performance following the implementation of better health information quality management. This postulate tries to emphasize the need of logic and synchronization

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across various business components, particularly health information systems (58)(59)(60). This study not only reinforces existing theoretical foundations but also provides practical guidance for hospitals in designing policies. Hospitals are expected to optimize resource allocation for information technology development while also paying greater attention to training and raising staff awareness of the importance of accurate and integrated information management.

While this article investigates crucial parts of the dynamics that exist between health information quality management and patient safety, it does have several limitations that should be noted when interpreting its conclusions. To begin with, this study was conducted at a single site, Awet Muda Narmada Regional General Hospital, which may restrict the generalizability of the findings to larger scenarios. Differences in organizational structures and cultures amongst hospitals, particularly in Indonesia and worldwide, may result in varying implementation of health information quality management methods, affecting patient safety performance differently.

Furthermore, the data gathering technique of the two complimentary methodologies of quantitative surveys and in-depth interviews is rich and integrated; but, it is reliant on the interviewed persons' subjective perceptions, which raises the possibility of bias (61)(62)(63). This may result in conclusions that are less reflective of the general perspectives or experiences of all hospital workers (64)(65). The third constraint is the sample size and data collection, which were constrained by the study's time and resources. These restrictions may limit the statistical ability of analyzing connections between variables (66)(67)(68). Despite these limitations, the study's findings provide significant contributions to our understanding of the elements that determine the success of health information quality management in improving patient safety. However, further research with larger and more diversified designs in terms of location, sample size, and methodological methods is required to generalize these findings and enhance the external validity of study results.

Future research should incorporate multicenter designs, include diverse regional hospital settings, and investigate long-term sustainability of interventions using longitudinal methods. Focus should also be placed on enabling organizational culture, transparency, and staff competencies. With broader sampling and extended observation periods, more generalizable and robust recommendations can be produced. Future research could also focus on aspects such as organizational culture, transparency, and two-way communication, as well as staff competencies, to provide more detailed facilitative or inhibitive factors in the effective translation of quality information management.

A longitudinal method to study has been suggested for examining the effects of quality management initiatives on patient safety performance across time. The latter would make it easier to see how a beneficial intervention's effect is maintained during implementation and changes dynamically. With the expanding scope and complexity of investigations, it appears that more complete findings are finally being collected, which will help to build theories, health policies, and hospital quality management techniques. It is also expected that future research would produce meaningful, evidence-based recommendations to guide governmental measures aimed at increasing safety for all patients treated in diverse healthcare settings.

These findings from the study bear wide social and ethical implications for health information quality management and improvement in patient safety. Improvement in health information quality has a number of social benefits: it contributes not only to efficiency in healthcare systems but also strengthens public confidence in the services provided by healthcare organizations. Good health information management thus allows hospitals to offer more accurate, transparent, and evidence-based services, hence enhancing the safety and satisfaction of the general public (38)(69)(70). From an ethical standpoint, this study emphasizes the need of effective medical data management, which is both a legal requirement and a moral responsibility. Patient privacy and confidentiality must be protected by implementing rules and procedures that are consistent with ethical values. This study emphasizes the importance of a systematic strategy to ensuring that medical data management meets rigorous privacy and security requirements, therefore preserving patient rights (71)(72)(73)(74). According to the study's findings, management commitment and organizational culture are the two most important variables in assuring the success of hospital-wide change initiatives. In most cases, improved policy adoption is hampered by hurdles including

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resistance to change. Change management should be created with ethical ideals, openness, and inclusion in mind, as well as the influence on patient welfare and organizational balance (75)(76)(77).

Ultimately, management support and organizational culture are two essential factors for successfully implementing safety strategies. However, challenges such as change resistance and lack of inclusivity must be addressed through transparent, participative approaches. This aligns with the principles of ethical change management and sustained institutional learning (78)(77)(79)(80). Overall, the findings of this study add significant theoretical and empirical contributions while emphasizing the importance of social and ethical obligations in healthcare services. With such broad implications, this study provides a solid platform for establishing more comprehensive policies to enhance health information quality and patient safety.

CONCLUSION

This study confirms a strong correlation between enhanced health information quality and improved patient safety performance at Awet Muda Narmada Regional Hospital. Quantitative analysis using the HSPSC survey shows significant improvements, particularly in the "Management Support for Patient Safety" dimension. Targeted interventions, including AI-enhanced Electronic Health Record (EHR) systems, real-time digital dashboards for safety tracking, and documentation training, proved effective in strengthening safety outcomes and fostering a more proactive safety culture. These strategies reflect best practices in digital transformation aligned with Indonesia's Ministry of Health Regulation No. 24/2022 concerning medical record implementation and electronic documentation. However, the study's single-site scope limits generalizability, and future research must explore broader hospital contexts and the long-term sustainability of interventions. Recommendations include fostering non-punitive incident reporting systems, expanding IT-based training, and encouraging leadership to shape transparent and safe reporting environments actively. Longitudinal study design is encouraged to assess intervention durability and cultural transformation over time.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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