Enhancing Patient Care Quality through Technological Integration: The Mediating Role of Healthcare Team Effectiveness among employees in Oman Government Hospital

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KEYWORDS

Quality of Health Care; Health Care Technology; Interprofessional Relations; Health Care Teams; Health Policy

ABSTRACT

Objectives: One of the components of 'Health Vision 2050,' the Omani government's initiative, is to improve the standards of quality in the healthcare system. To achieve this, sound technological integration and effective teams need to be deployed. This study aimed to assess the effect of technological integration on patient care quality through the mediating role of healthcare team effectiveness among employees in Oman government hospital.

Methods: A total of 700 questionnaires were distributed to healthcare workers, including administration staff, physicians, nurses, technical staff, and paramedical staff in Omani hospitals. Out of these, 402 valid questionnaires were used for Smart PLS 4.0 structural equation modelling analysis to test the effect of independent and mediating variables.

Results: The results of structural equation modelling analysis show that technological integration has positive significant effects on patient care quality. Moreover, healthcare team effectiveness has been found to have a partial mediating effect on the relationship between technological integration and patient care quality among healthcare workers in Omani hospitals. This finding suggests that, in addition to the benefits provided by healthcare team effectiveness, further advantages can be achieved through technological integration.

Conclusions: Technological integration is one of the important factors for increasing patient care quality as well as spurring healthcare team effectiveness. Integrating recent technology solutions can enhance patient service delivery and improve the effectiveness of healthcare teams as well as enhance operational efficiency.

I. Introduction

Policymakers and the public recognise rising medical costs worldwide. Due to chronic disease prevalence and treatment complexity. Health spending in 38 industrialised countries rose 9.3% to 9.9% of GDP in 2020, according to the OECD. In 2018, Oman became a WHO Collaborating Centre for Quality of Care and Patient Safety. The nation's improved healthcare quality earned recognition. Demand will drive Oman's healthcare spending up 9.1% to almost $5 billion by 2022. Prevention and non-communicable diseases boost spending. Due to high demand, Jaiswal, Elbadawi [1] recommend 1,144 new hospital beds to reach 7,937 in 2022. Rising medical costs in Oman cannot be reduced while improving healthcare quality [2]. Medical inflation will hurt patient care. A recent patient care and safety (RQPS) report found low patient safety culture and quality among Oman's healthcare professionals. Hospitals want to improve quality despite rising costs and patient numbers. New approaches can improve healthcare quality. National healthcare is complicated by complex care needs, demographic and economic changes, and financial pressures. Insufficient resources and rising patient expectations limit government health care spending. Oman's healthcare cannot be improved or medical costs lowered [2]. Quality care reduces costs, says Barclay, Lalor [3]. Management of waste improves hospital efficiency and care. A good quality management system improves healthcare efficiency, effectiveness, quality, and cost. Economic factors, organisational structures, and relationships affect health care system operations. Facility efficiency is also affected by clinical procedure design and implementation [4]. Quality management, Six Sigma, TQM, and Lean Thinking have been tested in hospitals to address these. Technology integration improves hospital patient care, according to Chakraborty, Kaynak [5]. Teamwork and operational certainty improve in healthcare. Leaders improve service quality by building subordinate relationships [6]. Effective communication and teamwork help hospitals succeed where it reduces medical errors, improves efficiency, and lowers costs in hospitals.

Ethics-oriented employees view their leaders as competent and capable [7]. Businesses that provide services can improve customer service. Many activities are out of the public hospital administration's control, and professional and organisational hierarchy conflicts. Stress, job satisfaction, and performance caused by hospital ethical climate issues can be managed to reduce costs and improve care [8]. Technological integration and team effectiveness affect patient care quality in Oman's public hospitals. Managers will gain strategic direction and a complete view of HR practices by aligning healthcare team functions with core business objectives. Using the Quality Management theoretical perspective, Hackman's five-factor model, and path-goal theory, this study examined the relationship between technological integration and patient care quality in Oman Hospital and the mediating role of team effectiveness. This study also evaluated the healthcare team's patient care improvements, which can have reliable theoretical and practical implications. This study uses quantitative research and the Saunders research onion model. This study surveys 16,791 MOH employees in Oman in a cross-sectional survey from 14 hospitals by distributing the questionnaires as the medium of data collection to the medical and administrative staff, executive managers, nursing officers, and quality improvement managers. Krejcie and Morgan [9]’s equation determines the sample size.

1. Conceptual Review

Successful healthcare teamwork requires hospital administration leadership. This improves care and the likelihood of errors. Our limited understanding of care quality factors has made applying those studies to Oman's hospitals difficult. This issue prompted this study to create process models that examine hospital administration and technological adoption. The model can better assess personal, environmental, managerial, and technical quality. The literature

review examines hospital quality leadership and team effectiveness and their effects on operational outcomes. Quality Management Theory and Hackman's five-factor model are explored. Leaders must provide information for subordinates to perform well. Information processing theory also addresses organisational information creation and use. The 1999 Oxford English Dictionary defines quality as "the value and degree of excellence". A high-quality product or service meets consumer expectations and ensures satisfaction [10]. A service or product's quality is its ability to satisfy customers. Hospital quality leadership is a major factor in healthcare service quality, according to Rönnbäck and Witell [11]. Quality-focused management is a quality management approach. It has norms and procedures that reinforce each other [12]. Healthcare must provide high-quality, patient-satisfied service to survive in a world with decreasing funding and rising demand. To meet patient needs, various healthcare system components must improve. Quality management in healthcare is crucial because hospital patients are people and reducing errors and improving efficiency saves money and lives. Good health care quality management is accessible, suitable, effective, efficient, affordable, integrated, patient-related, and safe.

1.1 Hackman's five-factor model

In 2002, Hackman published "Leading Teams: Setting the Stage for Great Performances" to achieve optimal team performance by creating the right conditions. Those teams perform best when leaders enable self-management. Leaders should set norms that encourage team members to perform at their best [13]. As shown in Figure 1, five requirements for successful collaboration. A good team has a comfortable, safe space to work together. This involves setting goals and assigning tasks. Credible direction depends on team members' clear goals. Organisational support is also essential for teamwork. Here, resources, incentives, and assistance are available. An empowering team structure includes a well-organized management structure and workflow. Fifth, professional coaching: guiding every team member to exceptional education.

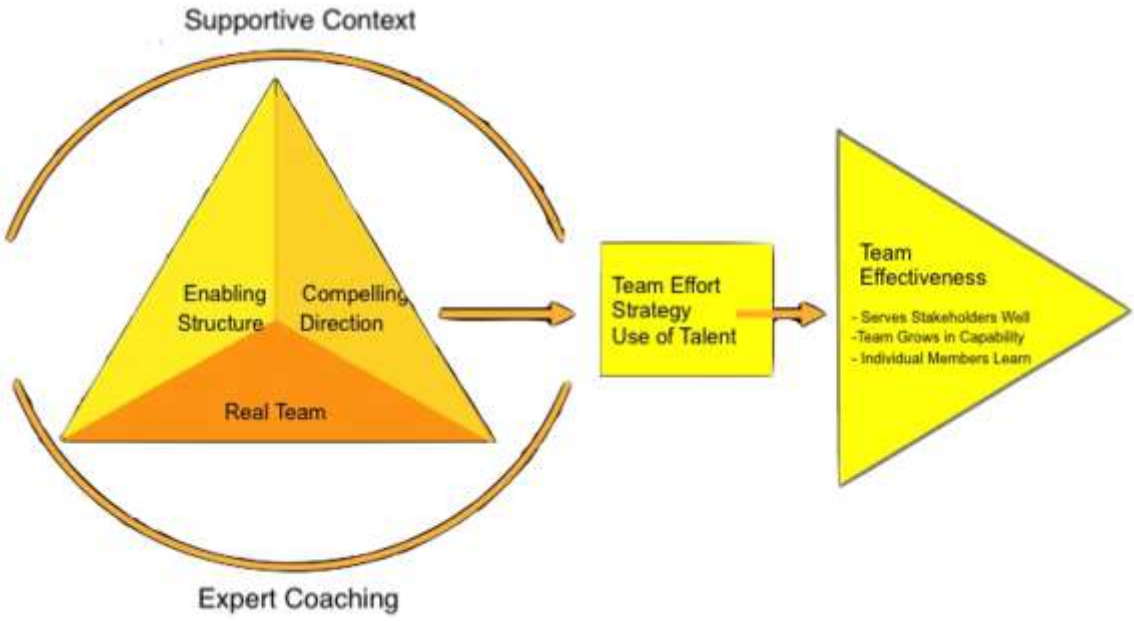

Figure 1: The model for the team's diagnostic survey, as described by Wageman, Hackman [13].

1.2 Information processing theory

Information processing gathers, analyses, and synthesises operational data. Robert Galbraith pioneered Information Processing Theory in 1973. It emphasises information generation and use in an organisation [14]. Based on this theory, organisations are complex systems that struggle to gather and use information [15]. Information processing theory suggests organisations should be structured to simplify data collection, processing, and dissemination [14]. Different organisational structures process information and reduce uncertainty differently. Meeting information processing needs streamlines an organization's operations. Successful organizations adapt their structures to handling information in dynamic environments [15].

2. Hypothesis Development

2.1 Technological Integration on Patient Care Quality

For better patient care and faster decision-making, information processing theory suggests healthcare professionals should communicate better. Electronic data exchange improves hospital operations by facilitating departmental communication, where hospital can ensure sufficient blood and medicine inventory with effective stock monitoring [16]. Technology unites operating rooms, intensive care units, and laboratories in hospitals. Asgari and Asgari [16] emphasise that logistics and quality improvement must work together to improve. Technological advances allow doctors and nurses to access the most accurate patient data. It improves patient care and reduces errors. Thus, it is proposed:

H1: Technological integration has a significant effect on patient care quality among employees in Oman government hospital.

2.2 Technological Integration on Healthcare Team Effectiveness

According to the information processing theory, an organization's ability to process information should match its needs to have a unified approach [15]. Organisations can meet employee information processing needs in uncertain environments by applying information processing theory. Integration workflows boost efficiency. Technology can also improve hospital staff productivity. This technology allows healthcare providers to create an electronic medical record of a patient's medical history. They can also alert patient monitors of medication-related issues [17]. In addition, patient information systems can provide lab procedure data and patient occupancy rates. The technology also helps healthcare organisations share inventory data with others. Hospitals can order medical supplies online where indirectly boost hospital efficiency and effectiveness [18]. This helps doctors monitor patients and provide the best care. Management and other hospital departments need information to make good decisions [19]. Patient data retrieval is accelerated by hospital technology. Sharing knowledge and communicating with peers through technology could improve healthcare services. Consider the following hypothesis:

H2: Technological integration has a significant effect on healthcare team effectiveness among employees in Oman government hospital.

2.3 The Mediating Role of Healthcare Team Effectiveness on Technological Integration and Patient Care Quality

Quality management theory states that quality improvement produces effective teamwork, a key trait of a successful company. In addition, this practice helps employees build strong relationships with their managers. Healthcare professionals help create efficient, high productivity organisations that provide quality care. Multidisciplinary teams and close-knit

groups improve hospital services. Results, patient safety, adaptability, and workplace engagement are all improved by efficient teams, which improves perception. However, poor teamwork in hospitals leads to employee fatigue. According to Hackman's 1987 five-factor theory, teams are more effective when they achieve their goals [13]. The small surgical team can quickly learn from each other by distributing tasks and providing support, especially in complex procedures. Teamwork involves internal communication and resource use to achieve goals. Hospitalised patients often need specialised care. A skilled, diverse team can improve healthcare. Multiple studies show that actively engaging in patient care improves care. With good communication, they can communicate with patients and their families. Patients' active participation is crucial to healthcare professionals' patient care. Healthcare providers follow hospital protocols and prevent pathogens to provide the best care. They also clean and disinfect all facility components, including beds [17]. Healthcare professionals must ensure their decisions benefit patients. They must monitor and manage all essential equipment and protocols, prevent medical errors, and ensure patients receive the best care. Healthcare teams that work well can improve patient care and eliminate process variability. Health team traits can also affect interactions. Team size, accountability, and composition can affect healthcare team efficacy. Effective teams prioritise accountability. A team member should also be able to monitor their teammates' performance, understand their own responsibilities, and stay positive. Individuals aim to take their personal efforts and improve team productivity by helping new colleagues and making performance recommendations. Teamwork is modelled by employees' citizenship. As healthcare delivery becomes more complex and specialised, a coordinated approach is needed to maximise resource use. Healthcare teams improve patient care. It incorporates quality leaders' and HR's expertise. For better patient care, healthcare teams have grown. Teams are crucial to productivity, and team cohesion and individual ability are increasingly valued. Numerous studies show that technology improves organisational and healthcare team performance [20]. The healthcare team now uses technology to perform real-time patient tasks by integrating technology. Electronic documentation also makes patient history, medications, laboratory tests, and progress notes easy to access during recovery. Technology allows healthcare teams to provide more efficient and tailored care. Healthcare teams can collaborate on learning using technology, improving operations. Technology allows hospital managers and staff to share information and improve decision-making. These improvements develop patient care and hospital efficiency. By integrating technology, the healthcare team can efficiently and continuously perform patient care tasks [20]. Thus, it was hypothesised:

H3: Healthcare team effectiveness significantly mediates the significant effect of technological integration on patient care quality among employees in Oman government hospital.

II. Methods

1. Participants

Oman Hospital's diverse managerial staff received the questionnaires and it was crosssectional. The study included 14 Oman hospital managers. The final 402 valid questionnaires were ready for analysis. Ethics questions like identity confidentiality and research consent were included in the questionnaires. According to Hair, Black [21], a sample size should be at least 10 times the highest number of endogenous variable arrowheads. Using this criterion, the research sample size was suitable for performance factor analysis and other tests. Most respondent characteristics were male (57.1%), had over 16 years of health industry experience (39.2%), were nurses (32.5%), had a bachelor's degree (40.9%), and were from Al-Buraimi governorate (26.6%). Table 1 shows complete demographic profiles.

Table 1. Respondents' Demographic Profile.

Group	Frequency	Percentage (%)
Gender:		
Male	230	57.1%
Female	173	42.9%
Working Experience:		
1-5 Years	44	10.9%
6-10 Years	62	15.4%
11-15 Years	139	34.5%
More Than 16 Years	158	39.2%
Designation:		
Admin	127	31.5%
Physician	87	21.6%
Nurse	131	32.5%
Technician / Paramedical	58	14.4%
Educational Level		
High School / Lower	22	5.5%
Diploma	103	25.6%
Bachelor Degree	165	40.9%
Master Degree	90	22.3%
Ph.D. Degree	23	5.7%
Governorate		
Muscat	62	15.4%
North Batina	20	5%
South Batina	16	4%
Dakhilia	31	7.7%
Dahira	35	8.7%
North - Sharqiya	29	7.2%
South-Sharqiya	29	7.2%
Dhofar	41	10.2%
AL Buraimi	107	26.6%

Table by authors

2. Measures

The research uses Technological Integration, Healthcare Team Effectiveness, and Patient Care Quality as independent, mediating, and dependent variables. This study quantifies Technological Integration using four indicators [5]. Paré and Sicotte [22] defined Healthcare Team Effectiveness by four items. Next, the Patient Care Quality (PCQ) evaluated fourdimensional constructs: Interpersonal Quality [23], Technical Quality, Environmental Quality, and Administrative Quality [24], each with four items and 12 total. All measurement items are scored on a 5-point Likert scale from "strongly disagree" to "strongly agree".

3. Statistical Analyses

The study used SmartPLS 4 to analyse Partial Least Squares – Structural Equation Modelling (PLS-SEM). PLS-SEM, a variance-based statistical method, evaluates the measurement and structural models simultaneously [25]. This study used regression analysis to evaluate mediation Hair, Black [21]. PLS-SEM also fits easily into current research, which validates theoretical models and seeks managerial advice [26]. In this study, the measurement and structural models are evaluated [26]. Measurement model assessment includes reporting indicator loadings, internal consistency reliability (Cronbach's alpha and composite reliability), convergent validity (AVE), and discriminant validity. The assessment of the structural model yielded the coefficient of determination (R2), the blindfolding-based cross-validated redundancy measure (Q2), the effect size ($f2$), and path coefficient significance measurements. For the structural model test, 10,000 subsamples were bootstrapped one-tail. This method was used to adjust and provide a more reliable method for robust results while aligning with the model's proposed relationship direction.

4. Ethics

All data from respondents was anonymized. Approval for participation was obtained online.

III. Results

1. Measurement Model Assessment

Table 2 shows that the measurement model met indicators' loadings, internal consistency reliability, convergent validity, and discriminant validity. Technical integration, patient care quality, and healthcare team effectiveness all have loadings indicators above 0.4, indicating they should be kept [25]. The model's construct is satisfactory, as Cronbach's alpha and composite reliability values exceed 0.7 [25]. According to convergent validity, each construct explains more than half of the variance in its indicators (AVE = 0.583–0.929) [25]. According to Table 3, the Heterotrait-Monotrait (HTMT) ratio is below 0.9, indicating its suitability for further analysis [27]. The results also suggest that each construct is unique and encompasses phenomena not covered by other constructs [25].

Table 2: Measurement models.

Construct	Indicator	Mean	Loadings	Cronbach's Alpha	Composite Reliability	AVE
Technology Integration	TI_1	3.289	0.873	0.942	0.947	0.852
	TI_2	3.172	0.947			
	TI_3	3.308	0.943			
	TI_4	3.323	0.927			
Patient Care Quality	PCQ_AQ1	3.784	0.806	0.952	0.958	0.583
	PCQ_AQ2	3.729	0.717			
	PCQ_AQ3	3.734	0.786			

Note: HTE = Healthcare Team Effectiveness; PCQ = patient care quality; and TI = Technological Integration. *Table by authors*

Table 3: Discriminant Validity

Heterotrait-Monotrait ratio (HTMT)				**Fornell-Larcker criterion**			
	HTE	**PCQ**	**TI**		**HTE**	**PCQ**	**TI**
HTE				HTE	0.8760		
PCQ	0.848			PCQ	0.8000	0.7630	
TI	0.515	0.716		TI	0.4760	0.6590	0.9230

Note: HTE = Healthcare Team Effectiveness; PCQ = patient care quality; and TI = Technological Integration. *Table by authors*

2. Structural Model Assessment

The structural model was assessed by measuring predicted variance (R2), effect size ($f2$), and predictive power (Q2) of the two dependent variables. Table 4 displays results. These metrics demonstrate how well external variables explain and predict internal variables (patient care quality) [25] supporting this study's findings. R2 has the lowest acceptance rates in human behaviour fields due to its inherent unpredictability, unlike natural sciences. Social sciences accept R2 values of 0.1, indicating sufficient explained variance. A 0.20 value is high [28]. The patient care quality (R2 = 0.640, Q2 = 0.352) and healthcare team effectiveness (R2 = 0.226, Q2 = 0.218) exhibit moderate and high levels of explained variance and medium and high levels of predictive power [25]. The explained variance and predictive power of patient care quality (R2 = 0.640, Q2 = 0.352) and healthcare team effectiveness (R2 = 0.226, Q2 = 0.218) are moderate and high [25]. Furthermore, the effect size ($f2$) results show medium to large effects for the two direct effects in the model [25]. Integration of technology and healthcare team effectiveness have a moderate correlation (effect size 0.15–0.34). Effective healthcare teams improve patient care by more than 0.35.

Table 4. Structural model testing.

Dependent Variable	**R2**	**F2**		**Q2**
		HTE	**TI**	
HTE	0.226		0.293	0.218
PCQ	0.640	1.779		0.352

Note: HTE = Healthcare Team Effectiveness; PCQ = patient care quality; and TI = Technological Integration. *Table by authors*

Analysis of path coefficient significance followed. The hypotheses proposed were statistically significant and correlated positively (Table 5 and Figure 2). Research shows that technological integration positively impacts patient care quality (H1) ($\beta = 0.800$, $t = 32.631$, $p<0.01$). Moreover, technological integration positively impacts healthcare team effectiveness (H2) ($\beta = 0.476$, $t = 10.643$, $p<0.01$). Technology integration affects patient care through healthcare team effectiveness, according to the indirect influence test (H3). A significant relationship ($\beta =0.381$, $t = 8.986$, $p<0.01$) exists, indicating complete mediation. Increasing healthcare team effectiveness through technological integration improves patient care quality.

Table 5: Direct and indirect effect testing.

Path	Original Sample (Beta)	Sample Mean	Standard Deviation	T Statistic	P Values	Hypothesis
TI->PCQ	0.800	0.801	0.025	32.631	0.000	H1 Supported
TI->HTE	0.476	0.476	0.045	10.643	0.000	H2 Supported
TI->HTE->PCQ	0.381	0.382	0.042	8.986	0.000	H3 Supported

Note: HTE = Healthcare Team Effectiveness; PCQ = patient care quality; and TI = Technological Integration. *Table by authors*

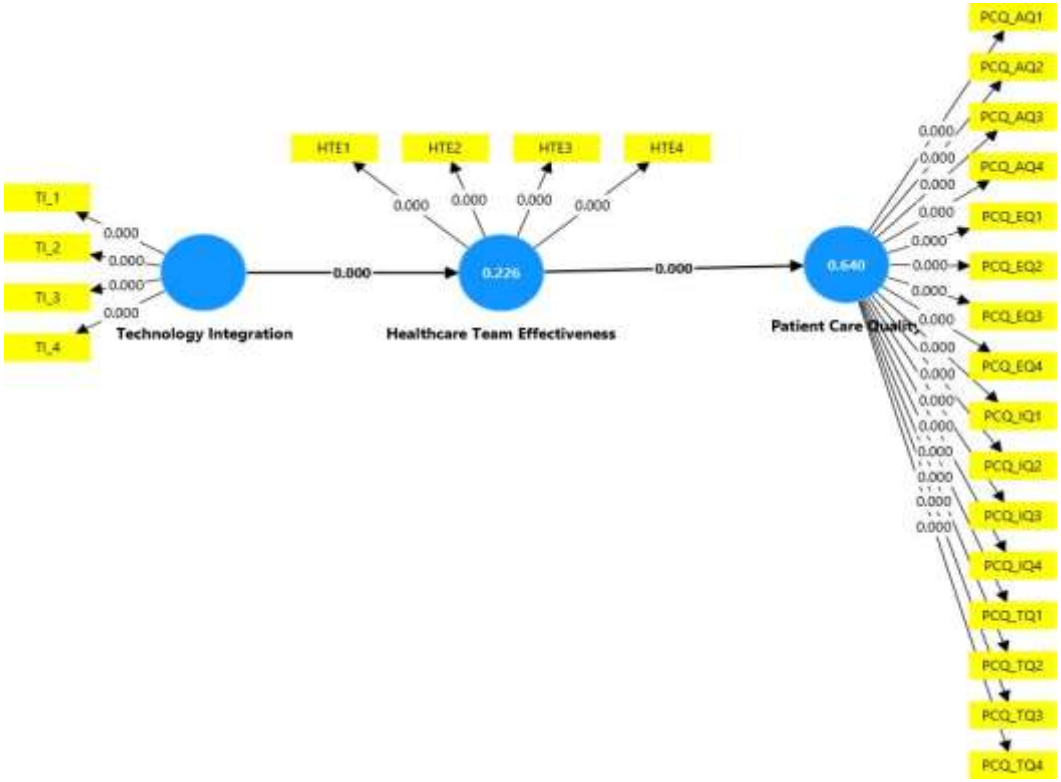

Figure 2: Structural model test results. *Figure by authors*

Note: HTE = Healthcare Team Effectiveness; PCQ = patient care quality; and TI = Technological Integration.

IV. Discussion

This study found that technology integration improves patient care, supporting previous research [16]. The study found that technology integration may affect healthcare team performance [17, 18]. Healthcare professionals collaborate and improve operations with technology. Sharing knowledge and information helps hospital managers and staff make better decisions. Healthcare teams can perform patient tasks in real time with technology integration [20]. Technology also improves employee administrative, communication, and patient care, according to this study. Recent studies [29, 30] support these. technology improves healthcare teams, patient care, and employee performance in Oman's government hospitals. Oman government hospital employees must consider irrational and rational factors in patient care

quality. This study found that Oman's government hospitals' healthcare teams can heavily mitigate technological integration's effects on patient care. Patients need professional healthcare teams [29, 30]. The proposed model's healthcare team must be effective as a complete mediator. This study affects healthcare professionals, policymakers, and technology developers. Advanced technology to improve healthcare teams requires ethical consideration. This study has several limitations. Sample size and data collection time limited this study's generalizability. This study showed that new technologies will shape healthcare management. Immersion improves education, decision-making, and lifelike experiences, revolutionizing healthcare management. Patient care, operational efficiency, and healthcare outcomes should improve with new healthcare management technologies. Researchers can solve the complex problems of integrating emerging technologies into healthcare administration by working together.

The study advances several theories despite its limitations. Technology integration, healthcare team effectiveness, and patient care in an Oman government hospital are examined. Many nations have studied the topic, but research is scarce [5]. Operations management connections in Oman's hospitals, including human resources (HR) and organisational behaviour (OB) are studied to improve healthcare quality. Leadership at hospitals must also create and implement integration plans. Motivated employees and workplace structure affect integration strategy success. With real-time patient data, doctors can reduce test and procedure duplication. Service quality affects patient outcomes and economic benefits. A comprehensive patient care quality plan improves healthcare workers' conditions. Training improves care quality, teamwork, and hospital technology integration [29]. Research findings matter to administrators, policymakers, healthcare professionals, and technology developers. It promotes patient care and educates them about Oman's healthcare system. Promotes patient care and educates about Oman's healthcare system. Reuniting healthcare teams and technology will improve patient care in government hospitals. Oman's healthcare and Ministry of Health services will benefit from this study.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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