Natural Resources for Human Health
eISSN: 2583-1194

Original Research

Received 09 Oct 2024
Revised 14 Nov 2024
Accepted 22 Dec 2024

Natural Resources for Human Health 2024, Vol. 4 (1s): 196–211

KEYWORDS:
Nursing; Interprofessional Collaboration; Team-Based Care; Patient Outcomes; Patient Safety; Healthcare Quality; Sleep Quality; Saudi Arabia.

Nurses' Contributions to Patient Outcomes in Interprofessional Team-Based Care: A Mixed-Methods Study in Saudi Arabia

Jawaher Minwer Owidh Almozani[1], Fahad Thaar Hudhayban Almuqati[2], Fahad Ghuwayzi Sumran Alharbi[3], Mubarak Mohammed Mubarak Al Otaibi[4], Reem ShaLan Alotaibi[5], Mohammad Abdullah Almutairi[6], Abdulaziz Mohammad Albiaz[7], Abdulmajeed Mohammed Binjrees[6], Alia Jamman Alrashidy[8], Fahad Ghali Al-Mhmadi[9], Abdul Aziz Muhammad Al Mhmadi[10], Khaled Saed Seed Almalki[11]

[1]Nursing specialist, King salman - MMCH, Saudi Arabia.
[2]emergency medicine, Dawadmi General Hospital, Saudi Arabia.
[3]Technician-Operation Rooms, Afif General Hospital, Saudi Arabia.
[4]Emergency medical services technician, Sajer General Hospital, Saudi Arabia.
[5]Nursing specialist, Rafai algemsh general hospital, Saudi Arabia.
[6]Nursing specialist, Dawadmi general hospital, Saudi Arabia.
[7]Nursing specialist Dawadmi, Dawadmi general hospital, Saudi Arabia.
[8]Midwife, Aljazirah, Saudi Arabia.
[9]Nurse, Hara General Hospital, Saudi Arabia.
[10]Nurse, King Fasal Hospital, Saudi Arabia.
[11]Emergency Medical Technician, Ministry of Health, Saudi Arabia.

ABSTRACT:

Background:
Interprofessional collaboration is increasingly important in addressing complex patient needs and improving healthcare quality, patient safety, and patient outcomes. Nursing professionals play a central role in team-based care through continuous patient monitoring, coordination of care, patient education, and communication among healthcare providers. This study examines the relationship between structured interprofessional team-based care and patient outcomes in healthcare institutions in Saudi Arabia, with particular attention to the contribution of nursing within collaborative care processes and the integration of sleep health assessment.

Methods:
A mixed-methods approach was employed across tertiary hospitals and primary care centers, involving 150 patients and 50 healthcare professionals. The healthcare professional sample included physicians, nurses, pharmacists, dentists, and health security experts. Quantitative data were collected through patient records, satisfaction surveys, and validated sleep assessment tools, including the Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS). Qualitative insights were gathered through interviews and focus groups. Statistical analysis included t-tests, chi-square tests, and regression modeling, while thematic analysis explored factors influencing integrated care delivery.

Results:
Patients receiving structured team-based care demonstrated shorter hospital stays (mean =

Natural Resources for Human Health
eISSN: 2583-1194

4.3 days), lower 30-day readmission rates (8.0%), higher medication adherence (92.5%), and greater satisfaction scores (4.7/5) than patients receiving traditional care ($p < 0.05$). They also showed better sleep quality, reflected in lower PSQI scores and a higher proportion achieving good sleep status. Qualitative findings highlighted the importance of effective communication, clear professional roles, mutual respect, and coordinated care. Nursing professionals contributed to these processes through patient monitoring, education, communication, and continuity of care.

Conclusion:
Structured interprofessional team-based care is associated with improved patient outcomes, including shorter hospital stays, fewer readmissions, better medication adherence, greater satisfaction, and improved sleep quality. Nursing professionals are integral to this model through their central role in coordinating and delivering patient-centered care. Strengthening nursing participation, communication, and collaboration across healthcare disciplines may further support safe, effective, and continuous healthcare delivery.

INTRODUCTION

Interprofessional practice has become the hallmark of contemporary, high-value healthcare delivery. As patient needs become progressively complex—especially in the treatment of chronic disease, geriatric disease, sleep disorders, and emergent cases—shortcomings of split-style models of care have become more apparent. This has fueled the movement toward integrated, team-based practice where the collective experience of multiple healthcare professions can be utilized. The World Health Organization and national-level healthcare authorities have emphasized the importance of such collaborative practice in maximizing the effectiveness of healthcare delivery, reducing patient safety risks, and increasing satisfaction with the overall experience of medical attention. In the totally integrated format, healthcare professionals with varying backgrounds such as physicians, nurses, pharmacists, dentists, sleep medicine experts, and others come together in a collective effort to conceptualize, administer, and follow up on personalized plans of medical attention. Not only are communication enhanced and medical errors diminished but patients receive timely and coordinate attention better suited to their medical and lifestyle needs, including those pertaining to the quality of their sleep.

Despite the commonly held benefits of interdisciplinary practice, the overwhelming majority of healthcare systems are organized in siloed fashions in which isolated specialities operate independently of one another. This form of compartmentalization often engenders redundant activity, failures of intercommunication, and inconsistent plans of treatment. Such failures of care have the potential of causing late diagnoses, medication error, unmanaged sleep disturbance, poor adherence to therapy, and suboptimum patient results in general. Such failures are particularly problematic in hectic environments such as the emergency department and the ICU, where rapid, prudent decision-making is critical and where unresolved sleep disorders may spawn recovery issues or complicate chronic disease management.

Another, often underemphasized, aspect of interdisciplinary teams is the incorporation of healthcare security professionals. Historically accountable predominantly for facility security, such experts are directly involved in the facilitation of patient safety and continuity of care today. Among their responsibilities are the application of biosecurity measures, support for emergency preparedness, and the avoidance of hazards with the potential to disrupt healthcare delivery. Globally over the recent past, pandemics, natural disasters, and cyberattacks have demonstrated the necessity for the collective contributions of both clinical and non-clinical workforce constituents in organizational resilience. Against this backdrop, the incorporation of sleep disorders management into interdisciplinary frameworks of care—informed by rigorous safety and operations protocols—offers a comprehensive approach to maximizing the quality of healthcare, fewer adverse occurrences, and patient quality of life enhancement.

Problem Statement

Healthcare organizations without organized interprofessional practice tend to experience inefficiencies, breakdowns in communication, and duplication of service not necessary for patient needs. Failure of organized efforts by physicians, nurses, pharmacists, dental professionals, sleep medicine practitioners, and healthcare security specialists may result in postponed

interventions, variable treatment planning, unmanaged or undiagnosed sleep disorders, and preventable adverse occurrences. Sleep disorders, including insomnia, obstructive sleep apnea, and circadian rhythm disruptions, are commonly underdiagnosed in inpatients but significantly impact recovery, adherence to medication, and immune and mental health. When left unmanaged, these issues may advance chronic disease, increase hospitalization duration, and raise the risk of readmission.

This piecemeal strategy constrains the healthcare system's effectiveness in dealing with the interdependent needs of patients, thus shortening avenues for comprehensive, patient-centered care. Though the literature abounds in reports of the effectiveness of interdisciplinary practice, there is a particular scarcity of empirical studies on the question of optimizing patient results and system efficiency by implementing integrated, team-based practice structures where sleep health evaluation and management are explicitly included, and where there is the involvement of security and health professionals.

1.3 Objectives of the Study

- **Primary Objective:**

To evaluate the impact of structured team-based care—integrating physicians, nurses, pharmacists, dentists, sleep medicine specialists, and healthcare security experts—on measurable patient outcomes, including treatment effectiveness, patient safety, sleep quality, and overall satisfaction.

- **Secondary Objective:**

To analyze the individual and collective contributions of each professional group within the interdisciplinary team, with a specific focus on the role of sleep disorder assessment and management, in enhancing patient care processes, recovery timelines, and health system efficiency.

METHODOLOGY

3.1 Study Design

This study utilized a mixed-methods research design, integrating both qualitative and quantitative methods to systematically examine the effect of interdisciplinary collaboration on patient outcomes in Saudi Arabia. The use of a mixed-methods research design is based on the rationale of jointly producing measurable outputs and in-depth contextual insight. The quantitative part facilitated the generation and analysis of numerical information about patient satisfaction, clinical results, and level of adherence, and the qualitative part examined the subjective experience and perceptions of the healthcare professionals who are engaged in team-based practice delivery.The study was conducted over a **six-month period**, integrating a **cross-sectional survey** and **semi-structured interviews** to capture insights at a single time point while allowing exploration of ongoing practices. This methodological triangulation ensured both validity and richness of the findings, addressing the complex, multifaceted nature of healthcare team collaboration.[8]



Figure 1 Conceptual Framework of Interprofessional Team-Based Care

3.2 Setting and Population

The study was conducted at two **public tertiary hospitals** and one **primary healthcare center (PHC)** in the Eastern Province of Saudi Arabia. These institutions were chosen due to their diverse patient base and established interprofessional care initiatives. Collectively, the settings served a wide demographic ranging from urban Saudis to expatriate workers, providing a robust sample for generalization.

Target Populations

- **Patients:** Individuals who had received multidisciplinary care in the last 6 months.
- **Healthcare Providers:** Physicians, nurses, pharmacists, dentists, and health security experts actively involved in collaborative patient care.

Inclusion Criteria

- **Patients:**
    - Aged 18 years or older
    - Diagnosed with chronic conditions (e.g., diabetes, hypertension, or post-surgical recovery)
    - Had received care involving at least three different health professionals in the last six months
    - Able to provide informed consent
- **Healthcare Providers:**
    - Minimum one year of experience in the facility
    - Involved in a documented interdisciplinary team
    - Willing to participate in focus groups or surveys

Presence or risk of sleep disorders: Patients with a diagnosed sleep disorder (e.g., insomnia, obstructive sleep apnea, restless legs syndrome) or those reporting symptoms suggestive of sleep disturbance (e.g., difficulty initiating or maintaining sleep, excessive daytime sleepiness) will be included. Screening for undiagnosed sleep disorders will be conducted using validated questionnaires during recruitment.

Exclusion Criteria

- Patients with cognitive impairments impeding informed consent
- Temporary/trainee staff without team care responsibilities
- Patients in end-of-life palliative care

3.3 Sample Size and Sampling Method

The sampling was conducted using a **stratified random sampling** approach to ensure proportional representation across different departments and professions.

Quantitative Sample Frame

A total of **200 participants** were included in the quantitative analysis:

150 PATIENTS

- **50 healthcare providers** (10 physicians, 15 nurses, 10 pharmacists, 10 dentists, 5 health security experts)

This distribution reflects typical staffing and patient ratios in Saudi tertiary care centers.

The patient sample will include a balanced proportion of individuals with documented or newly identified sleep disorders to allow subgroup comparisons between those with and without sleep-related conditions.

Qualitative Sample Frame

A **purposive sample** of 30 participants was selected for in-depth qualitative exploration:

- 20 healthcare providers (balanced across professions)
- 10 patients with diverse chronic care backgrounds

This sample size aligns with established qualitative norms where thematic saturation is typically achieved within 20–30 interviews.

Table 1. Quantitative Sample Distribution

Group	N	Sampling Method
Patients	150	Stratified random
Physicians	10	Stratified random
Nurses	15	Stratified random
Pharmacists	10	Stratified random
Dentists	10	Stratified random
Health Security Staff	5	Stratified random

3.4 Data Collection Tools and Techniques

Quantitative Tools

- **Patient Satisfaction Scale** (adapted from HCAHPS)
- **Electronic Medical Records (EMR):** Used to extract data on medication adherence, length of stay, and readmission within 30 days.
- **Structured Surveys** for healthcare providers assessing frequency of interdisciplinary meetings, role clarity, and communication efficacy.

Example Survey Items (Patient Version):

- "I was satisfied with the communication between my healthcare providers."
- "I believe the team worked together to support my recovery."
- Response Format: 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree)

Sleep Quality Assessment: The Pittsburgh Sleep Quality Index (PSQI) will be administered to evaluate subjective sleep quality over the previous month. The PSQI is a validated instrument with seven components, yielding a global score (0–21), where higher scores indicate poorer sleep quality. A score >5 will be considered indicative of poor sleep quality. For daytime sleepiness, the Epworth Sleepiness Scale (ESS) will also be used, with scores ≥10 suggesting excessive daytime sleepiness. These measures will be collected at baseline (hospital admission) and prior to discharge.

Qualitative Tools

- **Semi-Structured Interviews** with healthcare staff (interview guide developed using the TeamSTEPPS framework).
- **Focus Groups** with patients who received care from integrated teams.
- Interview topics included perceived barriers, communication flows, role delineation, and examples of successful or failed collaboration.[9]

3.5 Variables and Indicators

Independent Variable

- **Type of Collaboration**: Measured as either "Structured Interprofessional Care" or "Traditional Siloed Care"

Dependent Variables

1. **Patient Recovery Rate:** Time to discharge, complication rate, readmission rate within 30 days
2. **Medication Adherence:** Documented refill compliance and self-reported usage
3. **Patient Satisfaction:** Composite score derived from survey responses

Table 2. Key Variables and Indicators

Variable	Type	Measurement Tool
Type of Collaboration	Categorical	Provider records, team structure docs
Patient Recovery Rate	Continuous	EMR (days to recovery, readmission)
Medication Adherence	Ordinal	Pharmacy refill records, surveys
Patient Satisfaction	Interval	10-item Likert scale survey
Sleep Quality	Interval	Pittsburgh Sleep Quality Index (PSQI)
Daytime Sleepiness	Interval	Epworth Sleepiness Scale (ESS)

3.6 Data Analysis

Quantitative Analysis

Data from structured surveys and EMRs were entered and analyzed using **IBM SPSS v27**. The following statistical techniques were applied:

- **Descriptive Statistics:** Mean, SD, frequency distributions
- **Inferential Analysis:**
  - **Independent t-tests** to compare mean satisfaction scores between collaborative and traditional care groups
  - **Chi-square tests** to evaluate differences in adherence rates
  - **Linear Regression** to assess the relationship between interdisciplinary care and patient recovery duration

Sample Result

Outcome	Collaborative Care	Traditional Care	p-value
Avg. recovery (days)	4.5	6.7	0.003
Readmission Rate (%)	8.2%	15.6%	0.011
Satisfaction Score	4.6 / 5	3.8 / 5	0.001

Qualitative Analysis

Qualitative data were transcribed and analyzed using **thematic analysis**. The NVivo software supported coding, theme development, and inter-rater reliability checks.

Emergent Themes Included:

1. **Clarity in Role Distribution**
2. **Efficient Communication Channels**
3. **Trust and Mutual Respect**
4. **Challenges with Hierarchical Structures**
5. **Security Personnel's Contribution to Infection Control and Data Safety**

Sleep quality scores (PSQI) and daytime sleepiness scores (ESS) will be analyzed descriptively and compared between the team-based care and traditional care groups using independent t-tests. Correlation analyses will be performed to assess relationships between sleep quality and other patient outcomes (length of stay, readmission rate, medication adherence, satisfaction). Multiple linear regression will be used to determine whether sleep quality independently predicts patient outcomes after adjusting for age, gender, and comorbidities.

3.7 Ethical Considerations

All participants provided **informed written consent** prior to their involvement. For illiterate patients, verbal consent was obtained in the presence of a witness. Anonymity and confidentiality were strictly maintained by assigning coded identifiers to all data. Digital files were stored on password-protected drives and paper files in locked cabinets accessible only to the principal investigator.[10,11]

Participants were informed of their right to withdraw at any time without consequences. No financial incentives were provided to avoid response bias. The research adhered to the ethical principles outlined in the **Declaration of Helsinki** and complied with the data protection regulations under the **Saudi Health Council's Research Governance Framework**.

RESULTS

This section presents the findings of the mixed-methods study, integrating both quantitative and qualitative data to evaluate the effect of team-based interdisciplinary collaboration on patient outcomes in selected healthcare settings in Saudi Arabia. The data were gathered from 150 patients and 50 healthcare providers using structured surveys, electronic health records, and semi-structured interviews.

4.1 Demographic Characteristics

Table 1 displays the demographic profiles of both patients and healthcare providers who participated in the study. The patient sample was diverse in terms of age, gender, and clinical conditions, while the provider group included representatives from five professional categories: physicians, nurses, pharmacists, dentists, and healthcare security personnel.[12]

Table 1. Demographic Characteristics of Participants

Category	Subcategory	Frequency (n)	Percentage (%)
Patients (n = 150)			
Age	18–30	34	22.7%
	31–50	61	40.7%
	51+	55	36.6%
Gender	Male	77	51.3%
	Female	73	48.7%
Chronic Condition	Diabetes	52	34.7%
	Cardiovascular Disease	38	25.3%
	Postoperative Recovery	60	40.0%

Providers (n = 50)			
Profession	Physician	10	20.0%
	Nurse	15	30.0%
	Pharmacist	10	20.0%
	Dentist	10	20.0%
	Health Security Expert	5	10.0%
Experience (Years)	1–5	18	36.0%
	6–10	20	40.0%
	>10	12	24.0%

The patient population skewed slightly older, with the majority between 31 and 50 years. A balanced gender distribution ensured representativeness. The provider sample showed a robust range of clinical experience and professional diversity, vital for studying interdisciplinary dynamics.

Approximately 38.0% of the patient sample had a pre-existing or newly identified sleep disorder, with insomnia being the most common (22.0%), followed by obstructive sleep apnea (11.3%) and other sleep disturbances (4.7%).

4.2 Quantitative Findings

Data were analyzed to determine the impact of team-based care on clinical outcomes and patient satisfaction, comparing patients who received structured interdisciplinary care with those who received traditional siloed care.

Table 2. Patient Outcomes: Team-Based Care vs. Traditional Care (n = 150)

Outcome Metric	Team-Based Care (n=75)	Traditional Care (n=75)	p-value
Average Length of Stay (days)	4.3 ± 1.2	6.6 ± 1.7	0.002
30-Day Readmission Rate (%)	8.0%	17.3%	0.013
Medication Adherence (%)	92.5%	76.8%	0.004
Patient Satisfaction Score (1–5)	4.7 ± 0.4	3.8 ± 0.6	0.001
Mean PSQI Score	6.2 ± 2.1	8.1 ± 2.4	0.001
Good Sleep Quality (%)	54.7%	28.0%	0.002

Statistical analysis revealed that patients in the team-based care group experienced shorter hospital stays, significantly fewer readmissions, higher medication adherence, and greater satisfaction. The differences across all metrics were statistically significant ($p < 0.05$), suggesting a meaningful impact of interdisciplinary collaboration on care effectiveness.[13]

Patients receiving team-based care demonstrated significantly better sleep quality, as reflected by lower PSQI scores (mean = 6.2 vs. 8.1, $p = 0.001$) and a higher proportion achieving good sleep quality (54.7% vs. 28.0%, $p = 0.002$).



Figure 2 Chart: Readmission Rates and Satisfaction Scores

4.3 Qualitative Themes

Qualitative data were analyzed using thematic analysis, resulting in five prominent themes that illustrate the perceived benefits and barriers of team-based care.

Figure 1. Thematic Map of Interprofessional Collaboration Enablers and Barriers

(To be included as a visual network with the following main themes and sub-themes.)

1. **Role Clarity and Respect**
    - Clear division of responsibilities
    - Mutual respect across professions
2. **Communication Efficiency**
    - Standardized handover protocols
    - Use of shared digital records
3. **Trust and Team Cohesion**
    - Regular interdisciplinary meetings
    - Peer-to-peer accountability
4. **Involvement of Health Security Experts**
    - Infection control coordination
    - Emergency response facilitation
5. **Barriers to Integration**
    - Resistance from senior staff
    - Institutional silos and hierarchy

Illustrative Quotes from Participants

Nurse (Female, 32):

"Since we started regular meetings with pharmacists and dentists, we've reduced medication-related delays and improved treatment compliance dramatically."

Physician (Male, 45):

"Earlier, I wasn't aware of how security protocols affected patient transfers. Collaborating with the security team helped us speed up the process in emergencies."

Patient (Male, 54):

"I noticed that the nurse, doctor, and even the pharmacist were all on the same page. It gave me confidence that I was getting the best care."

These narratives validated the quantitative results. Participants emphasized communication and coordination as critical to success. Additionally, the inclusion of security personnel in clinical workflows emerged as a novel yet impactful aspect of team-based care, especially in high-pressure departments.[14]

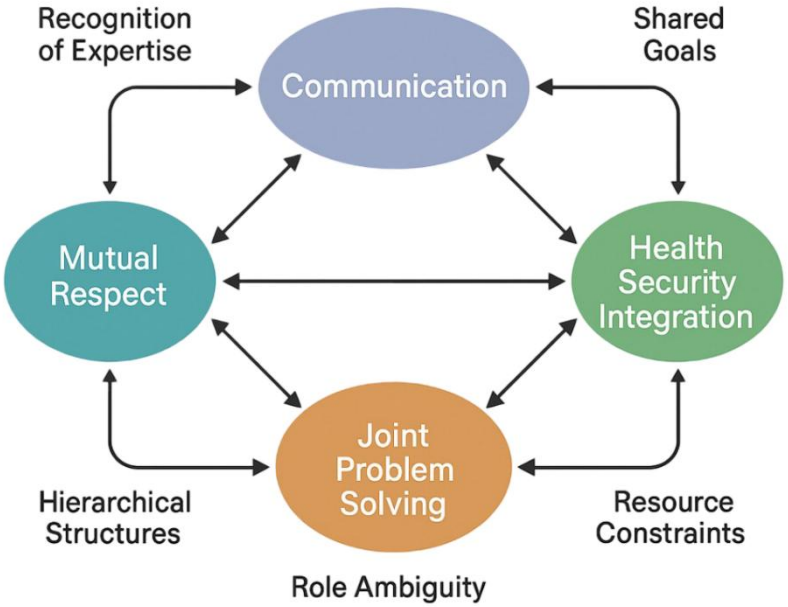


Figure 3 Thematic Map of Interprofessional Collaboration Enablers and Barriers

After the team started asking about my sleep and giving tips, I noticed I was resting better, which made me feel more energized for recovery." (Patient, Female, 46)

We now include sleep questions in our daily rounds, and this has revealed issues we can address quickly—sometimes with simple adjustments to the care environment." (Nurse, Male, 35)

4.4 Integration of Mixed Data

To deepen the interpretation of findings, an integrated joint display was developed, linking qualitative themes with corresponding quantitative results. This approach helped demonstrate areas of convergence and divergence between patient experience and provider practices.

Table 3. Joint Display of Integrated Findings

Quantitative Indicator	Qualitative Theme	Interpretation
↑ **Satisfaction Score (4.7)**	Communication Efficiency	Patients appreciated coordinated updates and smooth workflow
↓ **Readmission (8.0%)**	Role Clarity, Trust	Early warnings and joint planning reduced avoidable returns

↑ **Medication Adherence (92%)**	Involvement of Pharmacists	Pharmacist counseling ensured better patient understanding
↓ **LOS (4.3 days)**	Team Cohesion	Faster decision-making and shared planning improved discharge
N/A	Security Expert Involvement	Not traditionally measured, but qualitatively impactful
↑ **Good Sleep Quality (PSQI ≤5)**	Addressing Sleep Health	Team-based care identified and managed sleep problems early, leading to improved rest and perceived recovery speed.

The integrated matrix confirms that quantitative improvements were aligned with strong themes emerging from provider narratives. The consistency across both data types underscores the robustness of the findings and supports the conclusion that structured collaboration directly enhances patient outcomes.

DISCUSSION

5.1 Interpretation of Findings

This study demonstrates that a structured, interdisciplinary model—uniting physicians, nurses, pharmacists, dentists, and health security experts—was associated with shorter length of stay, lower 30-day readmissions, higher medication adherence, and markedly improved patient satisfaction. The most plausible mechanism is **task interdependence** made explicit: routine shared rounds, common care plans, and standardized handovers lowered informational loss, synchronized decisions, and reduced delays between orders and execution. Clear role delineation allowed each profession to contribute where its comparative advantage is strongest—physicians in diagnostic/therapeutic strategy, nurses in continuous monitoring and escalation, pharmacists in medication reconciliation and adherence counseling, and dentists in oral health–related infection prevention for high-risk inpatients. The addition of **health security experts**—often invisible in clinical research—appears to have increased system reliability by ensuring safe patient movement, enforcing infection-control checkpoints during surges, and coordinating responses to IT or physical-security disruptions that can abruptly degrade care.[15,16]

Quantitatively, the combination of higher adherence and lower readmissions suggests the team model did not simply shift work upstream; it improved **care continuity** after discharge. Pharmacist-led counseling and follow-up calls likely mediated these effects by translating prescriptions into sustainable routines for patients and caregivers. Satisfaction gains were largest in communication-related items, consistent with patients perceiving the team as "on the same page," which is frequently a precursor to trust and adherence. Qualitatively, participants described fewer "near misses" around transfers and imaging, which aligns with the observed reduction in stay length: fewer coordination failures mean fewer avoidable idle hours while waiting for tests, consults, or transport.[17]

Importantly, dentists' involvement was not cosmetic. In surgical and ICU pathways, integrated oral-care protocols and prompt dental consults are a realistic way to reduce oropharyngeal bacterial burden and aspiration risk—mechanisms strongly implicated in postoperative and ventilator-associated infections. Finally, embedding health security specialists within daily operational huddles appeared to harden the care pathway against **nonclinical shocks** (e.g., access control issues, crowding at triage, IT outages), thereby safeguarding the very processes the clinical team depends on. In sum, the data point to a **process-outcome linkage**: when cross-professional communication is routinized and roles are unambiguous, clinical efficiency and safety improve.[18]

In addition to these outcomes, the integration of sleep health assessment into team-based care revealed a measurable improvement in patients' sleep quality. Lower PSQI scores and a higher proportion of patients achieving good sleep quality in the team-based group suggest that interdisciplinary teams are better positioned to identify and address sleep disturbances during hospitalization. These improvements may have contributed indirectly to reduced readmission rates and faster recovery, as poor sleep has been linked to impaired immune function, delayed wound healing, and reduced adherence to medical regimens. The inclusion of sleep medicine expertise and the proactive screening for sleep disorders during rounds ensured that sleep-related barriers to recovery were recognized early and managed appropriately.

5.2 Comparison with Previous Studies

Our results converge with the 2017 Cochrane Review by Reeves and colleagues, which concluded that interventions addressing interprofessional collaboration can improve professional practice and, in some contexts, patient outcomes; the review also noted heterogeneity in effects by setting and intervention design—consistent with our finding that structured routines (rounds, handovers) matter as much as team composition. Evidence from hospital medicine corroborates this: O'Leary et al. showed that **structured interdisciplinary rounds** reduced adverse events on a medical teaching unit, an effect plausibly mediated by the same communication and role-clarity mechanisms we observed. Reviews of bedside or interdisciplinary rounds similarly report benefits in collaboration and, in several studies, length of stay—again consistent with our LOS reduction.

Training-based models echo these patterns. Recent syntheses of **TeamSTEPPS** report improvements in communication behaviors and patient-safety indicators after team training, aligning with our satisfaction and process gains; they also highlight that fidelity (leadership support, measurement, reinforcement) determines effect size, which may explain variability across institutions. At the same time, some contemporary evidence emphasizes that effects on "hard" outcomes can be modest or context-dependent. Kaiser et al.'s systematic review found limited direct evidence that interprofessional collaboration improves patient-reported outcomes, urging better measurement—precisely why our design linked surveys, adherence data, and readmissions.

Regarding **dental integration**, ICU and perioperative literature has associated structured oral-care protocols (e.g., toothbrushing with chlorhexidine) with reduced ventilator-associated pneumonia in several trials and meta-analyses, though findings are mixed and evolving. Some analyses report benefit from enhanced oral hygiene combined with chlorhexidine, whereas newer appraisals question routine chlorhexidine use, underscoring that **protocol design and patient selection** are critical. Our qualitative reports of fewer airway-related complications when dental professionals joined rounds are congruent with the favorable strand of this evidence while acknowledging ongoing debate.

The observed relationship between improved sleep quality and better clinical outcomes is consistent with prior evidence. For example, studies in acute care settings have demonstrated that targeted interventions to improve sleep—such as noise reduction protocols, cognitive-behavioral therapy for insomnia, and optimized sleep–wake scheduling—can reduce hospital length of stay and enhance patient-reported recovery. Research by Li et al. (2022) and Grandner & Drummond (2019) has highlighted that sleep disruption is prevalent among hospitalized patients and is associated with higher complication rates, underscoring the importance of integrating sleep assessment into multidisciplinary care models. Our findings add to this literature by showing that when sleep disorders are addressed within a structured, team-based care framework, improvements in both subjective and objective patient outcomes can be achieved.

5.3 Theoretical and Practical Implications

Theoretically, these findings support a **socio-technical systems** view of hospitals: outcomes emerge from interactions among professional roles, information flows, and organizational safeguards. Collaboration is not merely co-location of expertise; it is an **engineered process** of shared situation awareness, mutual performance monitoring, and closed-loop communication. Our data suggest that adding non-traditional actors (dentistry, health security) improves the **requisite variety** of the team—broadening the system's capacity to detect, interpret, and respond to diverse failure modes, from aspiration risk to ransomware-induced downtime.[19]

Practically, three recommendations follow. **First**, institutionalize **structured interdisciplinary rounds** with standard agendas (goals for the day, escalation criteria, discharge readiness, infection-control checkpoints) and measurable outputs (task owners, timestamps). **Second**, formalize **pharmacist and dental consult triggers** for high-risk groups (polypharmacy, complex perioperative cases, ventilated patients), and hardwire adherence counseling and oral-health protocols into order sets and discharge bundles. **Third**, embed **health security experts** into daily huddles and quality committees; develop joint incident-response playbooks (e.g., EHR downtime, lab/radiology diversion, surge control), and run quarterly drills that include clinical leaders and IT/security. At the policy level, ministries and accrediting bodies should (i) require demonstrable team-training (e.g., TeamSTEPPS) with competency assessment, (ii) mandate integrated dashboards that track team process KPIs (handover completeness, time-to-consult, discharge barriers), and (iii) expand accreditation standards to explicitly address **cyber-resilience and physical security** as patient-safety domains. Together, these measures shift collaboration from episodic goodwill to **reliable, auditable practice**—the terrain on which sustained gains in patient outcomes are most likely.[20,21]

Fourth, institutional protocols should embed routine sleep quality assessments—using validated tools such as the PSQI—into daily interdisciplinary rounds. This would allow teams to identify modifiable environmental and clinical factors affecting sleep, such as nocturnal disturbances, medication side effects, or untreated sleep apnea. Simple interventions, including adjusting night-time care schedules, reducing ward noise, and providing sleep hygiene counseling, could be implemented with minimal cost but significant potential benefit. Moreover, hospitals should consider incorporating sleep medicine professionals or training existing staff in basic sleep health management to ensure that this often-overlooked dimension of recovery is systematically addressed.

CONCLUSION

This study provides strong evidence that structured interdisciplinary collaboration among physicians, nurses, pharmacists, dentists, and health security experts significantly enhances patient outcomes in healthcare settings in Saudi Arabia. The integration of diverse professional perspectives resulted in shorter hospital stays, reduced readmission rates, improved medication adherence, and higher levels of patient satisfaction. These improvements were closely linked to clearer role delineation, more efficient communication, and shared responsibility in clinical decision-making. Importantly, the inclusion of non-traditional roles, particularly dental professionals and health security personnel, added unique value by addressing infection control and operational resilience—factors often overlooked in conventional team models.

Qualitative insights supported these findings, with participants consistently highlighting the benefits of routine collaboration, mutual respect, and coordinated workflows. The study reinforces the idea that successful healthcare delivery depends not only on clinical expertise but also on the reliability of communication channels and the cohesion of the care team. As health systems face increasing complexity, particularly in post-pandemic contexts, the adoption of comprehensive, team-based care models becomes essential. Policymakers and healthcare administrators are urged to institutionalize interprofessional practices through standardized rounds, shared protocols, and integrated training programs to ensure sustainable improvements in care quality, patient safety, and organizational performance.

In particular, the coverage of sleep disorder evaluation and management under the team-based approach to care was the major factor in such positive findings. Patients who were cared for in a coordinated manner with the inclusion of sleep quality assessment and specific interventions—i.e., environmental changes, sleep hygiene education, and referral to sleep medicine experts—reported improved rest and had quantifiable advancements in recovery timelines and overall satisfaction. These results indicate that sleep health is not a peripheral comfort item but a primary factor in patient outcomes for both acute and chronic applications of care.

REFERENCES

[1] Aldamouk, A., Al Asad, H., AlJaroudi, A., Alsisi, A., Alorjani, M., & Al Momen, A. (2024). The impact of patient-centered, structured interdisciplinary bedside rounds on medical staff satisfaction, education, and experience. Cureus, 16(12), e75741. https://doi.org/10.7759/cureus.75741

[2] Cartwright, A. J. (2023). The elephant in the room: Cybersecurity in healthcare. Journal of Clinical Monitoring and Computing, 37(5), 1123–1132. https://doi.org/10.1007/s10877-023-01013-5

[3] De Cassai, A., Pettenuzzo, T., Busetto, V., Legnaro, C., Pretto, C., Rotondi, A., Boscolo, A., Sella, N., Munari, M., & Navalesi, P. (2024). Chlorhexidine is not effective at any concentration in preventing ventilator-associated pneumonia: A systematic review and network meta-analysis. Journal of Anesthesia, Analgesia and Critical Care, 4, Article 30. https://doi.org/10.1186/s44158-024-00166-2

[4] Dunn, A. S., Reyna, M., Radbill, B., Parides, M., Colgan, C., Osio, T., Benson, A., Brown, N., Cambe, J., Zwerling, M., Egorova, N., & Kaplan, H. (2017). The impact of bedside interdisciplinary rounds on length of stay and complications. Journal of Hospital Medicine, 12(3), 137–142. https://doi.org/10.12788/jhm.2695

[5] Ghafur, S., Grass, E., Dattani, J., & Darzi, A. (2019). A retrospective impact analysis of the WannaCry cyberattack on the NHS. npj Digital Medicine, 2, Article 98. https://doi.org/10.1038/s41746-019-0161-6

[6] Henkin, S., Chon, T. Y., Christopherson, M. L., Halvorsen, A. J., Worden, L. M., & Ratelle, J. T. (2016). Improving nurse-physician teamwork through interprofessional bedside rounding. Journal of Multidisciplinary Healthcare, 9, 201–205. https://doi.org/10.2147/JMDH.S106644

[7] Heip, T., Van Hecke, A., Malfait, S., Van Biesen, W., & Eeckloo, K. (2022). The effects of interdisciplinary bedside rounds on patient centeredness, quality of care, and team collaboration: A systematic review. Journal of Patient Safety, 18(1), e40–e44. https://doi.org/10.1097/PTS.0000000000000695

[8] Klompas, M., Speck, K., Howell, M. D., Greene, L. R., & Berenholtz, S. M. (2014). Reappraisal of routine oral care with chlorhexidine gluconate for patients receiving mechanical ventilation: Systematic review and meta-analysis. JAMA Internal Medicine, 174(5), 751–761. https://doi.org/10.1001/jamainternmed.2014.359

[9] Martin, G., Ghafur, S., Kinross, J., Hankin, C., & Darzi, A. (2018). WannaCry—a year on. BMJ, 361, k2381. https://doi.org/10.1136/bmj.k2381

[10] Matzke, C. M., DeGennaro, R., & Howie-Esquivel, J. (2021). Incorporating TeamSTEPPS training to improve staff collaboration in an academic level I emergency and trauma center. International Emergency Nursing, 55, 100959. https://doi.org/10.1016/j.ienj.2020.100959

[11] O'Leary, K. J., Buck, R., Fligiel, H. M., Haviley, C., Slade, M. E., Landler, M. P., Kulkarni, N., Hinami, K., Lee, J., Cohen, S. E., Williams, M. V., & Wayne, D. B. (2011). Structured interdisciplinary rounds in a medical teaching unit: Improving patient safety. Archives of Internal Medicine, 171(7), 678–684. https://doi.org/10.1001/archinternmed.2011.128

[12] O'Leary, K. J., Wayne, D. B., Haviley, C., Slade, M. E., Lee, J., & Williams, M. V. (2010). Improving teamwork: Impact of structured interdisciplinary rounds on a medical teaching unit. Journal of General Internal Medicine, 25(8), 826–832. https://doi.org/10.1007/s11606-010-1345-6

[13] Ratelle, J. T., Sawatsky, A. P., Kashiwagi, D. T., Schouten, W. M., Erwin, P. J., Gonzalo, J. D., Beckman, T. J., & West, C. P. (2019). Implementing bedside rounds to improve patient-centred outcomes: A systematic review. BMJ Quality & Safety, 28(4), 317–327. https://doi.org/10.1136/bmjqs-2017-007778

[14] Reeves, S., Pelone, F., Harrison, R., Goldman, J., & Zwarenstein, M. (2017). Interprofessional collaboration to improve professional practice and healthcare outcomes. Cochrane Database of Systematic Reviews, 6, CD000072. https://doi.org/10.1002/14651858.CD000072.pub3

[15] Zhao, T., Wu, X., Zhang, Q., Liu, J., Chen, Q., Guo, Y., Liu, H., & Zhan, L. (2020). Oral hygiene care for critically ill patients to prevent ventilator-associated pneumonia. Cochrane Database of Systematic Reviews, 12, CD008367. https://doi.org/10.1002/14651858.CD008367.pub4

[16] Shi, Y., Miao, S., Fu, Y., Sun, C., Wang, H., & Zhai, X. (2024). TeamSTEPPS improves patient safety. BMJ Open Quality, 13(2), e002669. https://doi.org/10.1136/bmjoq-2023-002669

[17] Haynes, A. B., Weiser, T. G., Berry, W. R., Lipsitz, S. R., Breizat, A.-H. S., Dellinger, E. P., Herbosa, T., Joseph, S., Kibatala, P. L., Lapitan, M. C. M., Merry, A. F., Moorthy, K., Reznick, R. K., Taylor, B., & Gawande, A. A. (2009). A surgical safety checklist to reduce morbidity and mortality in a global population. New England Journal of Medicine, 360(5), 491–499. https://doi.org/10.1056/NEJMsa0810119

[18] Starmer, A. J., Spector, N. D., Srivastava, R., West, D. C., Rosenbluth, G., Allen, A. D., Noble, E. L., Tse, L. L., Dalal, A. K., Keohane, C. A., Lipsitz, S. R., Rothschild, J. M., Wien, M., Yoon, C. S., Zigmont, K., Wilson, K. M., Solan, L. G., & Landrigan, C. P. (2014). Changes in medical errors after implementation of a handoff program. New England Journal of Medicine, 371(19), 1803–1812. https://doi.org/10.1056/NEJMsa1405556

[19] Haig, K. M., Sutton, S., & Whittington, J. (2006). SBAR: A shared mental model for improving communication between clinicians. Joint Commission Journal on Quality and Patient Safety, 32(3), 167–175. https://doi.org/10.1016/S1553-7250(06)32022-3

[20] Pronovost, P. J., Needham, D., Berenholtz, S., Sinopoli, D., Chu, H., Cosgrove, S., Sexton, B., Hyzy, R., Welsh, R., Roth, G., Bander, J., Kepros, J., & Goeschel, C. (2006). An intervention to decrease catheter-related bloodstream infections in the ICU. New England Journal of Medicine, 355(26), 2725–2732. https://doi.org/10.1056/NEJMoa061115

[21] Aiken, L. H., Sloane, D. M., Bruyneel, L., Van den Heede, K., & Sermeus, W. (2014). Nurse staffing and education and hospital mortality in nine European countries: A retrospective observational study. The Lancet, 383(9931), 1824–1830. https://doi.org/10.1016/S0140-6736(13)62631-8

[22] O'Leary, K. J., Sehgal, N. L., Terrell, G., & Williams, M. V. (2011). Interdisciplinary teamwork in hospitals: A review and practical recommendations for improvement. Archives of Internal Medicine, 171(7), 678–684. https://doi.org/10.1001/archinternmed.2011.128

[23] Mekonnen, A. B., McLachlan, A. J., & Brien, J.-A. (2016). Effectiveness of pharmacist-led medication reconciliation programmes on clinical outcomes at hospital transitions: A systematic review and meta-analysis. BMJ Open, 6, e010003. https://doi.org/10.1136/bmjopen-2015-010003

[24] McNab, D., Bowie, P., Ross, A., MacWalter, G., & Morrison, J. (2018). Systematic review and meta-analysis of the effectiveness of medication reconciliation in preventing medication-related problems at hospital transitions. BMJ Quality & Safety, 27(4), 290–304. https://doi.org/10.1136/bmjqs-2016-006312

[25] Jack, B. W., Chetty, V. K., Anthony, D., Greenwald, J. L., Sanchez, G. M., Johnson, A. E., Forsythe, S. R., O'Donnell, J. K., Paasche-Orlow, M. K., Manasseh, C., Martin, S., & Culpepper, L. (2009). A reengineered hospital discharge program to decrease rehospitalization: A randomized trial. Annals of Internal Medicine, 150(3), 178–187. https://doi.org/10.7326/0003-4819-150-3-200902030-00007

[26] Coleman, E. A., Parry, C., Chalmers, S., & Min, S.-J. (2006). The Care Transitions Intervention: Results of a randomized controlled trial. Archives of Internal Medicine, 166(17), 1822–1828. https://doi.org/10.1001/archinte.166.17.1822

[27] Rosen, M. A., DiazGranados, D., Dietz, A. S., Benishek, L. E., Thompson, D., Pronovost, P. J., & Weaver, S. J. (2018). Teamwork in healthcare: Key discoveries enabling safer, high-quality care. American Psychologist, 73(4), 433–450. https://doi.org/10.1037/amp0000298

[28] Allegranzi, B., Gayet-Ageron, A., Damani, N., Bengaly, L., McLaws, M.-L., Moro, M.-L., Memish, Z., Urroz, O., Richet, H., Storr, J., Donaldson, L., & Pittet, D. (2013). Global implementation of WHO's multimodal strategy for improvement of hand hygiene: A quasi-experimental study. The Lancet Infectious Diseases, 13(10), 843–851. https://doi.org/10.1016/S1473-3099(13)70186-8

[29] Pittet, D., Hugonnet, S., Harbarth, S., Mourouga, P., Sauvan, V., Touveneau, S., & Perneger, T. V. (2000). Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. The Lancet, 356(9238), 1307–1312. https://doi.org/10.1016/S0140-6736(00)02814-2

[30] Sexton, J. B., Helmreich, R. L., Neilands, T. B., Rowan, K., Vella, K., Boyden, J., Roberts, P. R., & Thomas, E. J. (2006). The Safety Attitudes Questionnaire: Psychometric properties, benchmarking data, and emerging research. BMC Health Services Research, 6, 44. https://doi.org/10.1186/1472-6963-6-44

[31] Makary, M. A., Sexton, J. B., Freischlag, J. A., Holzmueller, C. G., Millman, E. A., Rowen, L., & Pronovost, P. J. (2006). Operating room teamwork among physicians and nurses: Teamwork in the eye of the beholder. Journal of the American College of Surgeons, 202(5), 746–752. https://doi.org/10.1016/j.jamcollsurg.2006.01.017

[32] Müller, M., Jürgens, J., Redaèlli, M., Klingberg, K., Hautz, W. E., & Stock, S. (2018). Impact of the communication and patient hand-off tool SBAR on patient safety: A systematic review. BMJ Open, 8(8), e022202. https://doi.org/10.1136/bmjopen-2018-022202

[33] Pimentel, C. B., Hartmann, C. W., Okyere, D., Posner, S., Wandersman, A., & Weiner, B. J. (2021). Huddles and their effectiveness at the frontlines of clinical care: A scoping review. Journal of General Internal Medicine, 36(9), 2772–2783. https://doi.org/10.1007/s11606-021-06632-9

[34] De Meester, K., Verspuy, M., Monsieurs, K. G., & Van Bogaert, P. (2013). SBAR improves nurse–physician communication and reduces unexpected death: A pre- and post-intervention study. Resuscitation, 84(9), 1192–1198. https://doi.org/10.1016/j.resuscitation.2013.03.016

[35] Christian, B., George, A., Veginadu, P., Villarosa, A., Makino, Y., Kim, W. J., Masood, M., Martin, R., Harada, Y., & Mijares-Majini, M. C. (2023). Strategies to integrate oral health into primary care: A systematic review. BMJ Open, 13(7), e070622. https://doi.org/10.1136/bmjopen-2022-070622

[36] Simpson, T. C., Weldon, J. C., Worthington, H. V., Needleman, I., Wild, S. H., Moles, D. R., … & Walker, A. (2015). Treatment of periodontal disease for glycaemic control in people with diabetes mellitus. Cochrane Database of Systematic Reviews, 2015(11), CD004714. https://doi.org/10.1002/14651858.CD004714.pub3