

# Integrative Multidisciplinary Care Model: Enhancing Patient Outcomes Through the Collaboration of Nursing, Radiology, Laboratory Diagnostics, and Physical Therapy in Tertiary Hospitals

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## Abstract

**Background:** Multidisciplinary care models are increasingly recognized for their potential to improve patient outcomes and operational efficiency in tertiary hospitals. This study evaluated the impact of integrating nursing, radiology, laboratory diagnostics, and physical therapy services in a tertiary care setting.

**Methods:** A mixed-methods study was conducted over six months at a Tertiary Care Hospital. Quantitative data on patient outcomes (e.g., length of stay, time-to-treatment, recovery milestones) and operational efficiency were collected, while qualitative data from interviews and observations explored team dynamics and challenges.

**Results:** The multidisciplinary approach significantly reduced hospital stays (20.5%) and time-to-treatment initiation (32.4%), with improvements in recovery milestones (26.2%) and patient satisfaction scores (23.6%). Communication efficiency improved by 53.3%, and role clarity enhanced collaboration. However, challenges included technological limitations and workload imbalances.

**Conclusions:** Multidisciplinary care models enhance healthcare delivery by integrating expertise from diverse disciplines. Addressing barriers such as staffing and technological support can further optimize their effectiveness.

**Keywords:** Multidisciplinary care, Tertiary hospital, Patient outcomes, Interdisciplinary collaboration, Healthcare efficiency, Nursing, Radiology, Laboratory diagnostics, Physical therapy

## Introduction:

The complexity of patient care in tertiary hospitals necessitates a collaborative, interdisciplinary approach to ensure optimal outcomes. Multidisciplinary teams—comprising nursing staff, radiologists, laboratory specialists, and physical therapists—play a critical role in delivering comprehensive and patient-centered healthcare. Each profession brings a unique perspective and expertise, collectively addressing the diverse needs of patients and bridging gaps in traditional healthcare delivery models.

Healthcare today faces increasing demands for efficiency, accuracy, and personalized care. Tertiary hospitals, as centers for specialized and critical care, are particularly challenged to integrate services across disciplines. The interaction of diagnostic imaging by radiologists, laboratory data analysis, therapeutic interventions by

physical therapists, and the continuous care and coordination provided by nurses forms the backbone of this collaborative model (Kim et al., 2013). Such teamwork ensures that diagnostic and therapeutic decisions are informed by a holistic understanding of the patient's condition, resulting in improved clinical outcomes and reduced healthcare costs (Kim et al., 2016).

Studies emphasize the importance of seamless communication within multidisciplinary teams. For instance, the integration of laboratory and imaging diagnostics has been shown to expedite treatment in patients with acute conditions, such as stroke, where timely intervention is crucial (Asplund et al., 2015). Moreover, the involvement of physical therapists in early rehabilitation programs, guided by imaging and lab findings, significantly enhances recovery and functional independence (Kim et al., 2016).

Despite its potential, implementing multidisciplinary care in tertiary hospitals is not without challenges. Effective collaboration requires structured protocols, robust communication channels, and adequate resource allocation (Ojeagae et al., 2019). Addressing these challenges through innovative practices and technology integration, such as electronic health records and AI-assisted diagnostics, can further streamline workflows and enhance the quality of care (Voong et al., 2019).

This paper explores the synergistic roles of nurses, radiologists, laboratory specialists, and physical therapists in multidisciplinary care settings. By examining the dynamics of this collaboration, we aim to identify strategies to optimize patient outcomes, highlight existing barriers, and propose solutions for fostering an integrated approach to healthcare.

## **Literature Review:**

The multidisciplinary approach to healthcare has garnered significant attention as an effective strategy to enhance patient care in tertiary hospitals. This section reviews existing literature on the roles of nursing, radiology, laboratory diagnostics, and physical therapy within multidisciplinary teams, their contributions to patient outcomes, and the challenges associated with such collaborations.

### *1. Importance of Multidisciplinary Teams in Healthcare*

Multidisciplinary teams in tertiary hospitals leverage the specialized skills of diverse healthcare professionals to address complex patient needs. Studies indicate that collaboration among disciplines such as nursing, radiology, laboratory diagnostics, and physical therapy improves diagnostic accuracy, reduces treatment delays, and enhances recovery (Kim et al., 2016). These teams ensure holistic care by integrating perspectives from different specialties into the decision-making process (Ojeagae et al., 2019).

Nurses often serve as the coordinators within these teams, providing critical bedside assessments and ensuring continuity of care. They bridge gaps between diagnostic inputs from radiologists and laboratory specialists and therapeutic interventions provided by physical therapists (Kim et al., 2013). Such collaboration facilitates timely and informed decisions, especially in acute and critical care scenarios.

### *2. Contributions of Radiology and Laboratory Diagnostics*

Radiological imaging and laboratory diagnostics are central to multidisciplinary care, providing essential data for accurate diagnosis and treatment planning. For instance, radiologists' contributions in identifying stroke patterns through imaging enable early interventions by physical therapists and nurses in rehabilitation (Asplund et al., 2015). Laboratory tests further complement these efforts by revealing biomarkers that guide therapeutic strategies (Voong et al., 2019).

The integration of these diagnostic tools into team workflows has been shown to significantly reduce hospital stays and improve patient outcomes. Beckett et al. (2012) highlighted the role of multidisciplinary trauma

teams in utilizing imaging and lab results to prioritize interventions, especially in resource-constrained settings. However, the reliance on advanced technology requires effective communication among team members to interpret and act on findings.

### *3. Role of Physical Therapy in Multidisciplinary Care*

Physical therapists play a vital role in the recovery and rehabilitation phases of patient care, particularly in tertiary settings. Their interventions are often guided by inputs from radiology and laboratory diagnostics, ensuring tailored therapies. Research by Kim et al. (2016) demonstrates that early physical therapy interventions informed by imaging data can significantly enhance mobility and reduce long-term complications in patients with musculoskeletal injuries.

Furthermore, physical therapy has been instrumental in multidisciplinary programs aimed at chronic disease management and post-operative care. Collaborative approaches where physical therapists work closely with nurses and diagnostic teams have been linked to higher patient satisfaction and functional outcomes (Ojeagae et al., 2019).

### *4. Challenges in Multidisciplinary Collaboration*

Despite its benefits, the implementation of multidisciplinary care faces several challenges. Effective communication among team members, alignment of goals, and managing interprofessional dynamics are common obstacles (Voong et al., 2019). For example, misinterpretation of diagnostic findings or delays in information sharing can undermine the efficiency of care delivery.

Resource constraints, such as limited access to advanced imaging technologies or skilled personnel, further complicate the execution of multidisciplinary models in some tertiary hospitals (Asplund et al., 2015). Moreover, the lack of standardized protocols for interdisciplinary collaboration can lead to inconsistencies in patient care.

### *5. Technology and Innovation in Multidisciplinary Care*

Recent advancements in healthcare technology, including AI-assisted diagnostics and integrated electronic health records (EHRs), have facilitated better coordination among multidisciplinary teams. Such tools enable real-time sharing of diagnostic results, streamlining workflows and reducing errors. For instance, Ojeagae et al. (2019) reported a 20% reduction in treatment delays following the adoption of EHR systems in a tertiary care setting.

Additionally, telemedicine and virtual multidisciplinary rounds have emerged as innovative solutions to improve accessibility and communication, particularly during the COVID-19 pandemic. These platforms have expanded the scope of collaboration, allowing teams to engage in cross-disciplinary discussions regardless of geographical constraints (Voong et al., 2019).

## **Conclusion**

The literature underscores the significant impact of multidisciplinary teams in improving patient outcomes in tertiary hospitals. By integrating the expertise of nurses, radiologists, laboratory specialists, and physical therapists, these teams address the complexities of modern healthcare. However, challenges such as communication barriers, resource limitations, and lack of standardization must be addressed to fully realize the potential of multidisciplinary care. Future research should focus on developing structured frameworks and leveraging technology to enhance collaboration and efficiency.

## Methodology

This study employed a mixed-methods approach to evaluate the effectiveness and challenges of multidisciplinary collaboration among nurses, radiologists, laboratory specialists, and physical therapists in a tertiary hospital. The study was conducted over a six-month period at a Tertiary Care Hospital, a 500-bed facility providing advanced healthcare services. The methodology combined quantitative data collection through patient outcome metrics and qualitative insights from team interviews and observations.

### 1. Study Design

The research followed a prospective observational study design, complemented by a qualitative component. Multidisciplinary teams involved in managing patients across various departments, including intensive care, orthopedics, and neurology, were observed. The study focused on examining the impact of collaboration on patient outcomes, workflow efficiency, and team dynamics.

### 2. Participants

The study included the following participants:

- **Nurses:** 25 registered nurses responsible for patient monitoring, education, and coordination of care.
- **Radiologists:** 10 radiologists involved in diagnostic imaging and interpretation for clinical decision-making.
- **Laboratory Specialists:** 8 professionals conducting and reporting diagnostic tests.
- **Physical Therapists:** 12 therapists providing rehabilitative care tailored to patient needs.

Participants were recruited from departments handling high patient volumes requiring interdisciplinary care, such as stroke units, post-operative recovery wards, and trauma care.

### 3. Data Collection

Quantitative Data:

1. **Patient Outcome Metrics:**
  - Length of hospital stay.
  - Time-to-treatment initiation from diagnosis.
  - Recovery milestones (e.g., regaining mobility post-stroke, wound healing rates).
  - Patient satisfaction scores measured through validated surveys (HCAHPS).
2. **Efficiency Metrics:**
  - Time taken to complete multidisciplinary rounds.
  - Delays in communication of lab and imaging results.

Qualitative Data:

1. **Semi-structured Interviews:**
  - Conducted with 30 participants (7 nurses, 5 radiologists, 6 laboratory specialists, and 12 physical therapists).
  - Questions focused on perceptions of collaboration, communication barriers, and role clarity.
2. **Observational Analysis:**
  - Multidisciplinary team meetings and bedside rounds were observed by researchers to identify patterns in communication and workflow.
3. **Case Study Documentation:**
  - Five complex patient cases requiring intensive interdisciplinary coordination were documented to assess the real-world application of team-based care.

#### 4. Data Analysis

##### Quantitative Analysis:

Data from patient records and outcome metrics were analyzed using statistical software (e.g., SPSS). Descriptive statistics summarized demographic and clinical variables. Comparisons were made using:

- **t-tests:** For pre- and post-intervention metrics (e.g., length of stay).
- **ANOVA:** To compare performance across different departments.

##### Qualitative Analysis:

- Transcripts from interviews and observation notes were coded and thematically analyzed using NVivo software.
- Themes such as “communication efficiency,” “role clarity,” and “workflow barriers” were identified and triangulated with observational findings.

#### 5. Ethical Considerations

Ethical approval was obtained from the hospital’s ethics committee. Informed consent was secured from all participants. Patient data were anonymized, and confidentiality was maintained throughout the study. Observational analysis was conducted with prior permission from team members.

#### 6. Implementation of Multidisciplinary Model

To ensure uniformity in collaboration, the following interventions were introduced before data collection:

1. **Weekly Multidisciplinary Rounds:**
  - Structured rounds including nurses, radiologists, laboratory specialists, and physical therapists to discuss patient cases.
2. **Centralized Electronic Health Records (EHR):**
  - EHR facilitated real-time sharing of diagnostic results and care plans among team members.
3. **Team Communication Training:**
  - Workshops on effective interprofessional communication to address potential barriers.

#### 7. Limitations

The study acknowledges limitations, including:

- Restriction to a single tertiary hospital, limiting generalizability.
- Potential bias in self-reported data from interviews.
- Variation in team structures across departments that may influence findings.

### Quantitative Findings

#### 1. Patient Outcome Metrics

The quantitative data collected demonstrated improvements in patient outcomes and healthcare delivery efficiency. The key metrics analyzed are summarized in the table below:

Metric	Pre-Intervention Mean (±SD)	Post-Intervention Mean (±SD)	% Improvement	p-value
Length of Hospital Stay (days)	7.8 ± 2.1	6.2 ± 1.8	20.5%	<0.001
Time-to-Treatment Initiation (hours)	10.5 ± 3.4	7.1 ± 2.5	32.4%	<0.001
Recovery Milestones Achieved (%)	65%	82%	26.2%	0.002
Patient Satisfaction Scores (0-10)	7.2 ± 1.5	8.9 ± 1.1	23.6%	<0.001

## 2. Efficiency Metrics

Efficiency metrics were analyzed to evaluate the operational impact of the multidisciplinary approach. Results are presented below:

Metric	Pre-Intervention Mean (±SD)	Post-Intervention Mean (±SD)	% Improvement	p-value
Time for Multidisciplinary Rounds (minutes)	45 ± 12	30 ± 8	33.3%	<0.001
Communication Delays (hours)	4.5 ± 1.8	2.1 ± 1.0	53.3%	<0.001

These findings suggest that the multidisciplinary care model led to significant improvements in both patient outcomes and operational efficiency.

## Qualitative Findings

### Themes and Sub-Themes

The qualitative analysis identified four primary themes with associated sub-themes based on participant interviews and observational data.

Themes	Sub-Themes
<b>1. Enhanced Communication</b>	Real-time updates via EHR, improved clarity in team meetings
<b>2. Role Clarity</b>	Defined responsibilities, reduced overlap
<b>3. Collaborative Problem Solving</b>	Joint decision-making, mutual respect among disciplines
<b>4. Barriers to Implementation</b>	Technological limitations, workload imbalance, need for more training

### Participant Replies

The following responses illustrate insights under each theme:

#### Theme 1: Enhanced Communication

- “The EHR system has made it so much easier to access lab results and imaging reports instantly. It’s a game-changer for timely decision-making.” (Nurse)
- “Our weekly meetings now feel more productive because everyone has the same information upfront.” (Radiologist)

## Theme 2: Role Clarity

- *“I now know exactly when to intervene as a physical therapist because the radiologists and nurses provide clear diagnostic data.”* (Physical Therapist)
- *“Defining our roles has reduced confusion and overlapping tasks.”* (Laboratory Specialist)

## Theme 3: Collaborative Problem Solving

- *“Joint discussions have led to solutions that we might not have considered individually. For example, combining lab markers with imaging results helped pinpoint an unusual diagnosis.”* (Radiologist)
- *“The team’s input during rounds often gives me new perspectives on patient care.”* (Nurse)

## Theme 4: Barriers to Implementation

- *“Sometimes the EHR system lags, and it disrupts our workflow.”* (Laboratory Specialist)
- *“The workload can be overwhelming, especially when we’re short-staffed.”* (Nurse)

## Discussion

The findings from this study demonstrate the significant benefits of a multidisciplinary care model in a tertiary hospital setting. By integrating the expertise of nurses, radiologists, laboratory specialists, and physical therapists, patient outcomes and operational efficiency were notably improved. This discussion evaluates these results in the context of existing literature, explores the implications for practice, and addresses the challenges identified.

### 1. Improvements in Patient Outcomes

The study revealed a significant reduction in the length of hospital stays (20.5%) and time-to-treatment initiation (32.4%), alongside a marked increase in recovery milestones (26.2%) and patient satisfaction scores (23.6%). These findings align with previous research that highlights the role of multidisciplinary teams in expediting care and improving outcomes (Kim et al., 2016; Ojeagae et al., 2019). By fostering collaboration, the model ensures that diagnostic inputs from radiologists and laboratory specialists are seamlessly integrated into therapeutic plans by physical therapists and nurses, thereby enhancing the timeliness and precision of care delivery.

Furthermore, the increase in patient satisfaction underscores the importance of holistic, coordinated care. Patients benefited from comprehensive treatment plans informed by diverse professional perspectives, which likely contributed to their confidence in the healthcare system.

### 2. Enhanced Operational Efficiency

Operational metrics showed a 33.3% reduction in the time required for multidisciplinary rounds and a 53.3% decrease in communication delays. These improvements are significant, as communication inefficiencies are a common barrier to effective interdisciplinary collaboration (Asplund et al., 2015). The introduction of centralized electronic health records (EHRs) played a pivotal role in these improvements, providing real-time access to diagnostic results and facilitating seamless communication. These findings support prior studies advocating for technology integration to streamline workflows in healthcare (Voong et al., 2019).

### 3. Role Clarity and Collaborative Problem-Solving

Qualitative findings highlighted enhanced role clarity as a key benefit of the multidisciplinary model. Clear delineation of responsibilities reduced overlaps, leading to more efficient use of resources. Participants reported that collaborative problem-solving during rounds enabled the team to address complex cases more effectively, a finding consistent with existing literature emphasizing the value of shared decision-making in healthcare (Beckett et al., 2012).

For example, radiologists and laboratory specialists provided critical diagnostic insights that guided physical therapy interventions, while nurses ensured the continuity of care. This interplay underscores the necessity of a structured approach to multidisciplinary teamwork.

### 4. Challenges and Barriers

Despite these improvements, challenges were evident. Technological limitations, such as occasional EHR lags, were cited as barriers to seamless communication. Additionally, workload imbalances and staffing shortages were noted, echoing concerns from previous studies about the sustainability of multidisciplinary care in resource-constrained environments (Kim et al., 2016).

These barriers highlight the need for investment in both technology and human resources to fully realize the potential of multidisciplinary care models. Training programs to enhance interprofessional communication and workflow standardization may also mitigate some of these challenges.

### 5. Implications for Practice

The findings of this study provide valuable insights for healthcare administrators and policymakers:

1. **Adopting Technology:** EHR systems and other digital tools are critical enablers of efficient multidisciplinary care. Hospitals must ensure these technologies are adequately supported and maintained.
2. **Investing in Team Training:** Regular workshops and simulations can enhance interprofessional communication and collaboration skills.
3. **Resource Allocation:** Addressing staffing shortages and workload imbalances is essential for sustainable multidisciplinary care delivery.

### 6. Limitations

The study's limitations must be acknowledged. Conducted in a single tertiary hospital, the findings may not be generalizable to other settings. Additionally, while the study identified qualitative insights, self-reported data may be subject to bias. Future research should consider expanding the scope to include multiple institutions and longitudinal assessments of patient outcomes.

### Conclusion

This study demonstrates that multidisciplinary care models improve both patient outcomes and operational efficiency in tertiary hospital settings. While challenges such as technological limitations and workload imbalances persist, the benefits of integrating nursing, radiology, laboratory, and physical therapy services are undeniable. Moving forward, hospitals should focus on addressing these barriers and investing in systems and training that support multidisciplinary collaboration.



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