

# The Role of Interdisciplinary Collaboration between Respiratory Therapists, Pharmacists, and Laboratory Specialists in Managing Respiratory Infections in ICU Patients: Improving Outcomes in Severe Pneumonia Cases

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## Abstract

**Background:** Severe respiratory infections, particularly pneumonia, are a major cause of morbidity and mortality in intensive care units (ICUs). Effective management of these infections requires a multidisciplinary approach involving respiratory therapists (RTs), pharmacists, and laboratory specialists (LS). This study investigates how interdisciplinary collaboration among these professionals improves patient outcomes in ICU settings.

**Methods:** A retrospective cohort study was conducted at a tertiary hospital ICU, analyzing 300 patients diagnosed with severe respiratory infections. Outcomes were compared between patients managed by an interdisciplinary team and those receiving traditional care. Primary outcomes included ICU length of stay, duration of mechanical ventilation, mortality rate, and ventilator-associated pneumonia (VAP) incidence. Secondary outcomes focused on antibiotic stewardship, timeliness of diagnostic testing, and medication adjustments.

**Results:** Patients managed by the interdisciplinary team had significantly shorter ICU stays (12.4 vs. 16.2 days,  $p < 0.001$ ), reduced mechanical ventilation duration (8.1 vs. 11.5 days,  $p < 0.001$ ), lower mortality rates (16% vs. 28%,  $p = 0.008$ ), and decreased VAP incidence (9% vs. 18%,  $p = 0.012$ ). The interdisciplinary group also showed improved antibiotic stewardship, with 93% receiving appropriate therapy based on culture results (vs. 78%,  $p = 0.002$ ).

**Conclusion:** Interdisciplinary collaboration between RTs, pharmacists, and LS significantly improves outcomes for ICU patients with severe respiratory infections. This approach reduces ICU stays, ventilator days, mortality, and VAP incidence, highlighting the value of multidisciplinary care in critical settings.

**Keywords:** Interdisciplinary collaboration, respiratory infections, intensive care unit, pneumonia, respiratory therapists, pharmacists, laboratory specialists, ventilator-associated pneumonia, antibiotic stewardship.

## Introduction

Severe respiratory infections, particularly pneumonia, are a leading cause of morbidity and mortality among patients admitted to intensive care units (ICUs) globally. Patients with pneumonia who require ICU care often face complications such as acute respiratory failure, sepsis, and multi-organ dysfunction, necessitating complex, multi-faceted treatment approaches (Dey et al., 1997). Managing such cases effectively requires the coordinated efforts of a multidisciplinary healthcare team, including respiratory therapists (RTs), pharmacists, and laboratory specialists (LS). Each of these professionals brings unique expertise to the treatment process, addressing the respiratory, pharmacological, and diagnostic needs of critically ill patients (Adhikari et al., 2010).

Respiratory therapists play a central role in the ICU by managing mechanical ventilation, non-invasive ventilation, and oxygen therapy, all of which are critical for patients suffering from respiratory infections like pneumonia. Their expertise ensures that patients receive appropriate ventilation settings and that any signs of respiratory deterioration are promptly addressed, which is essential for reducing mortality and preventing complications (Rotstein et al., 2008). Pharmacists, meanwhile, are pivotal in the antimicrobial management of pneumonia, contributing through medication selection, dosing adjustments, and ensuring the appropriate use of antibiotics. Pharmacists also manage the pharmacokinetics and pharmacodynamics of drugs in critically ill patients, optimizing medication therapy for the best possible outcomes (Bond and Raehl, 2007). Laboratory specialists provide the crucial diagnostic data needed to guide treatment decisions, including blood gas analysis, bacterial cultures, and monitoring inflammatory markers such as procalcitonin and C-reactive protein (Sridharan and Chamberlain, 2013; Dey et al., 1997). These biomarkers help assess infection severity and monitor treatment response, ensuring that therapy is timely and effective.

The collaboration between these professionals is critical for improving outcomes in ICU patients. Studies have shown that an interdisciplinary approach, where RTs, pharmacists, and LS work together, leads to better patient outcomes, including reduced ICU stays, fewer ventilator days, and lower mortality rates (Blot et al., 2014). Despite this, research specifically examining the impact of such collaboration on the management of respiratory infections like pneumonia remains limited.

The aim of this study is to investigate the collaborative roles of respiratory therapists, pharmacists, and laboratory specialists in managing severe respiratory infections, with a focus on pneumonia in ICU patients. By exploring how these healthcare professionals work together to improve patient outcomes, this research seeks to emphasize the importance of interdisciplinary care in reducing mortality, shortening ICU stays, and preventing complications.

## Literature Review

### 1. Overview of Respiratory Infections in ICU Patients

Respiratory infections, particularly pneumonia, are significant contributors to ICU admissions and are associated with high morbidity and mortality rates. Severe cases of pneumonia, such as community-acquired pneumonia (CAP) and ventilator-associated pneumonia (VAP), often require intensive care, including mechanical ventilation and complex pharmacological management (Dey et al., 1997). In ICUs, pneumonia is a frequent cause of sepsis and acute respiratory distress syndrome (ARDS), leading to longer ICU stays and increased mortality risk (Adhikari et al., 2010). The complexity of managing these patients underscores the necessity for a multidisciplinary approach, where respiratory therapists, pharmacists, and laboratory specialists collaborate to deliver comprehensive care.

## 2. Role of Respiratory Therapists in Managing Respiratory Infections

Respiratory therapists (RTs) play a critical role in the management of respiratory infections in ICU patients by ensuring proper respiratory support and ventilation strategies. For patients with pneumonia, RTs are responsible for administering and monitoring oxygen therapy, managing invasive and non-invasive ventilation, and implementing airway clearance techniques (Rotstein et al., 2008). In patients requiring mechanical ventilation, RTs adjust ventilator settings to optimize gas exchange while minimizing lung injury, a vital component in reducing ventilator-associated complications. Research highlights the impact of RTs in reducing ventilator-associated pneumonia (VAP) through strict adherence to ventilation protocols, including the use of spontaneous breathing trials and regular assessment of sedation levels (Villar et al., 2007).

Beyond mechanical ventilation, RTs also play a key role in assessing and managing respiratory function, adjusting interventions based on blood gas analysis and clinical observation. This dynamic role requires close collaboration with other ICU professionals to ensure coordinated patient care and timely adjustments to treatment (Rotstein et al., 2008). RTs are integral to implementing evidence-based practices, such as lung-protective ventilation strategies, which have been shown to reduce mortality and improve outcomes in patients with ARDS secondary to pneumonia (Petrucci and Iacovelli, 2007).

## 3. Role of Pharmacists in Managing Respiratory Infections

Pharmacists are essential in the multidisciplinary management of severe respiratory infections, particularly through their role in antimicrobial stewardship and medication management. Pneumonia, whether bacterial or viral, requires careful selection of antimicrobials, and pharmacists ensure the appropriate use of antibiotics based on culture results and susceptibility patterns. This helps in reducing the development of antibiotic resistance, which is a growing concern in ICU settings (Bond and Raehl, 2007). Pharmacists also monitor drug-drug interactions, adjust dosing based on renal and hepatic function, and optimize the pharmacokinetics and pharmacodynamics of medications in critically ill patients, particularly those receiving mechanical ventilation (Dunn et al., 2011).

In addition to antimicrobial therapy, pharmacists play a vital role in managing adjunctive therapies for pneumonia patients, such as corticosteroids, anticoagulants, and vasopressors. Studies have shown that pharmacist involvement in antimicrobial stewardship programs in ICU settings significantly reduces inappropriate antibiotic use, shortens the duration of treatment, and lowers mortality rates in patients with severe infections (Bond and Raehl, 2007). Furthermore, collaboration between pharmacists and other ICU professionals, such as RTs and laboratory specialists, is essential in managing the overall pharmacological care of ICU patients with respiratory infections, improving both efficacy and safety outcomes.

## 4. Role of Laboratory Specialists in Managing Respiratory Infections

Laboratory specialists (LS) play a pivotal role in diagnosing and monitoring the progression of respiratory infections in ICU patients. Accurate and timely diagnostic tests, such as blood cultures, sputum analysis, and polymerase chain reaction (PCR) tests, are critical for identifying the causative organisms of pneumonia and determining the appropriate antimicrobial treatment (Sridharan and Chamberlain, 2013). Laboratory tests, including complete blood counts (CBC), procalcitonin levels, and C-reactive protein (CRP), are also used to assess the severity of infection and guide the duration of antibiotic therapy. Elevated procalcitonin levels, for example, have been shown to correlate with bacterial infections and help clinicians tailor antibiotic regimens more effectively (Sridharan and Chamberlain, 2013).

Moreover, laboratory specialists work closely with RTs and pharmacists by providing essential data from blood gas analyses and monitoring key biomarkers that reflect a patient's respiratory and metabolic status. For patients receiving mechanical ventilation, regular blood gas analysis is critical in evaluating the effectiveness of ventilation strategies and guiding adjustments. Laboratory specialists also contribute to monitoring the patient's response to treatment by tracking changes in inflammatory markers, ensuring that clinical decisions are based on objective data (Dey et al., 1997).

### 5. Benefits of Interdisciplinary Collaboration

The complexity of managing respiratory infections in ICU patients necessitates a team-based approach that leverages the unique expertise of each healthcare professional involved. Studies have demonstrated that interdisciplinary collaboration between RTs, pharmacists, and laboratory specialists significantly improves patient outcomes in ICU settings. For example, Blot et al. (2014) found that interdisciplinary teams in the ICU contributed to a reduction in ICU length of stay, fewer ventilator days, and lower mortality rates among patients with pneumonia. The collaboration between RTs, who focus on respiratory support, pharmacists, who optimize antimicrobial therapy, and LS, who provide diagnostic data, ensures that treatment plans are both comprehensive and patient-specific.

Furthermore, interdisciplinary communication is essential for the timely adjustment of treatment protocols. When laboratory data indicates an infection is not responding to a chosen antibiotic, pharmacists can quickly recommend alternatives, while RTs adjust ventilation strategies based on the patient's respiratory status. This level of coordination prevents delays in care, reduces the risk of complications, and improves the overall quality of care for ICU patients with respiratory infections (Blot et al., 2014).

The literature underscores the critical roles of respiratory therapists, pharmacists, and laboratory specialists in managing respiratory infections in ICU patients. By working together, these professionals contribute to improved patient outcomes, including reduced mortality, shorter ICU stays, and fewer complications. The integration of their skills highlights the importance of interdisciplinary collaboration in the effective management of severe respiratory infections such as pneumonia. However, further research is needed to explore specific collaboration models and their impact on clinical outcomes in greater detail.

## Methodology

### Study Design

This study was conducted as a retrospective cohort study in the intensive care unit (ICU) of a tertiary hospital. The primary objective was to assess how the interdisciplinary collaboration between respiratory therapists (RTs), pharmacists, and laboratory specialists (LS) impacts patient outcomes in cases of severe respiratory infections, particularly pneumonia. The study focused on reviewing patient records and clinical outcomes associated with collaborative care models during ICU admissions.

### Study Setting and Population

The study was carried out in the 30-bed ICU of a tertiary hospital over a 12-month period. The patient population consisted of adults (aged 18 years and above) admitted to the ICU with a confirmed diagnosis of severe respiratory infection, including community-acquired pneumonia (CAP), ventilator-associated pneumonia (VAP), or hospital-acquired pneumonia (HAP). The inclusion criteria required that patients receive care from a multidisciplinary team consisting of RTs, pharmacists, and LS during their ICU stay. Exclusion criteria included patients with incomplete records, those transferred from other hospitals, and

those with pre-existing conditions that severely confounded the outcomes, such as advanced malignancy or terminal illness.

#### Intervention: Interdisciplinary Collaboration

The core intervention in this study was the interdisciplinary collaboration between RTs, pharmacists, and LS in managing ICU patients with severe respiratory infections. Each profession contributed to different aspects of care:

- Respiratory Therapists: RTs were responsible for managing mechanical ventilation, non-invasive ventilation, and oxygen therapy. Their role included adjusting ventilator settings based on blood gas results, optimizing oxygenation, and ensuring adherence to lung-protective strategies such as low-tidal volume ventilation.
- Pharmacists: Pharmacists worked closely with ICU physicians and RTs to ensure the correct selection and dosing of antibiotics, antivirals, corticosteroids, and other medications. Pharmacists were also responsible for monitoring for potential drug interactions, adjusting dosages based on renal and hepatic function, and managing antimicrobial stewardship protocols to prevent antibiotic resistance.
- Laboratory Specialists: LS contributed to patient management by providing timely diagnostic results, including blood gas analysis, cultures, and biomarker monitoring (e.g., procalcitonin, C-reactive protein). LS ensured the accuracy of results, which were critical for guiding treatment adjustments.

#### Data Collection

Data were collected retrospectively from the hospital's electronic health record (EHR) system. A total of 300 patient records were reviewed, focusing on patients admitted to the ICU with a diagnosis of severe respiratory infection. Data collection included demographic information (age, gender), comorbidities, type of respiratory infection, length of ICU stay, duration of mechanical ventilation, and mortality rates.

Additionally, data were extracted on specific interventions provided by RTs, pharmacists, and LS, such as ventilator settings, antibiotic prescriptions, and laboratory results. Outcomes related to interdisciplinary collaboration, such as timeliness of treatment adjustments, frequency of multidisciplinary team meetings, and adherence to care protocols, were also recorded.

#### Outcome Measures

The primary outcome measures were:

1. Length of ICU Stay: The total duration of ICU stay from admission to discharge or transfer.
2. Duration of Mechanical Ventilation: The total number of days a patient was on mechanical ventilation.
3. Mortality Rate: ICU mortality, defined as the proportion of patients who died during their ICU stay.
4. Ventilator-Associated Pneumonia (VAP) Incidence: The rate of VAP in patients who were on mechanical ventilation for more than 48 hours.
5. Antibiotic Stewardship Outcomes: These included the appropriateness of antibiotic therapy (based on culture results), the duration of antibiotic use, and the incidence of antibiotic resistance.

Secondary outcomes included the number of interventions made by pharmacists to optimize drug therapy, the frequency of diagnostic tests ordered by LS, and the impact of timely adjustments to ventilator settings by RTs based on blood gas results.

### Data Analysis

Data were analyzed using SPSS software version. Descriptive statistics, including means, medians, standard deviations, and frequencies, were used to summarize patient demographics, infection characteristics, and clinical outcomes.

- **Comparative Analysis:** A subgroup analysis compared patients managed by interdisciplinary teams to those managed by traditional care models (where less collaboration between RTs, pharmacists, and LS occurred). Independent t-tests and chi-square tests were used to compare continuous and categorical variables, respectively.

- **Multivariate Analysis:** To adjust for potential confounders, a multivariate regression analysis was conducted. This analysis controlled for factors such as age, comorbidities, and baseline severity of illness, allowing for a more accurate assessment of the impact of interdisciplinary collaboration on patient outcomes.

- **Kaplan-Meier Survival Analysis:** Kaplan-Meier curves were generated to compare survival rates between patients managed by the interdisciplinary team and those receiving traditional care. The log-rank test was used to assess statistical significance between survival curves.

### Ethical Considerations

This study was approved by the ethics committee. Patient confidentiality was maintained by anonymizing all data during the collection and analysis phases.

### Limitations

While this study provides valuable insights into the impact of interdisciplinary collaboration on ICU outcomes, it is limited by its retrospective nature and the reliance on data from a single institution. Additionally, potential confounding variables, such as differences in physician decision-making and variations in patient care outside of the core disciplines, may affect the generalizability of the findings. Future prospective studies are needed to validate these results and explore how similar models of care can be implemented in other healthcare settings.

## Findings

### Demographic Characteristics

The study reviewed the records of 300 ICU patients diagnosed with severe respiratory infections, particularly pneumonia, during the study period. The mean age of the patients was 62.5 years (SD = 14.2), and 58% were male. The most common comorbidities were diabetes (30%) and chronic obstructive pulmonary disease (COPD) (25%). Table 1 provides a summary of the demographic characteristics.

**Table 1. Demographic Characteristics of the Study Population**

Characteristic	Total (n = 300)
Mean Age (years)	62.5 ±14.2
Male (%)	58%
Comorbidities	
- Diabetes (%)	30%
- COPD (%)	25%
- Hypertension (%)	22%
- Heart Disease (%)	18%

## Clinical Outcomes

## 1. Length of ICU Stay

The average length of stay in the ICU was significantly shorter for patients managed by the interdisciplinary team (mean = 12.4 days, SD = 3.8) compared to those receiving traditional care (mean = 16.2 days, SD = 4.5) ( $p < 0.001$ ). This difference is presented in Table 2.

**Table 2. Comparison of Length of ICU Stay Between Interdisciplinary and Traditional Care Groups**

Group	Mean Length of ICU Stay (days)	SD	p-value
Interdisciplinary Team	12.4	3.8	< 0.001
Traditional Care	16.2	4.5	

## 2. Duration of Mechanical Ventilation

Patients managed by the interdisciplinary team also had a significantly shorter duration of mechanical ventilation (mean = 8.1 days, SD = 2.3) compared to those receiving traditional care (mean = 11.5 days, SD = 3.1) ( $p < 0.001$ ), as shown in Table 3.

**Table 3. Comparison of Duration of Mechanical Ventilation Between Interdisciplinary and Traditional Care Groups**

Group	Mean Duration of Ventilation (days)	SD	p-value
Interdisciplinary Team	8.1	2.3	< 0.001
Traditional Care	11.5	3.1	

## 3. Mortality Rate

The overall ICU mortality rate was 22%, but patients receiving care from the interdisciplinary team had a lower mortality rate (16%) compared to those receiving traditional care (28%) ( $p = 0.008$ ). These results are shown in Table 4.

**Table 4. Comparison of ICU Mortality Rate Between Interdisciplinary and Traditional Care Groups**

Group	Mortality Rate (%)	p-value
Interdisciplinary Team	16%	0.008
Traditional Care	28%	

## 4. Ventilator-Associated Pneumonia (VAP) Incidence

The incidence of ventilator-associated pneumonia (VAP) was significantly lower in the interdisciplinary team group (9%) compared to the traditional care group (18%) ( $p = 0.012$ ), as illustrated in Table 5.

**Table 5. Comparison of VAP Incidence Between Interdisciplinary and Traditional Care Groups**

Group	VAP Incidence (%)	p-value
Interdisciplinary Team	9%	0.012
Traditional Care	18%	

### 5. Antibiotic Stewardship Outcomes

Patients managed by the interdisciplinary team were more likely to receive appropriate antibiotic therapy based on culture results (93% versus 78%,  $p = 0.002$ ). The duration of antibiotic use was also shorter in the interdisciplinary care group (mean = 7.8 days,  $SD = 1.9$ ) compared to the traditional care group (mean = 10.2 days,  $SD = 2.1$ ) ( $p < 0.001$ ), as shown in Table 6.

**Table 6. Comparison of Antibiotic Stewardship Outcomes Between Interdisciplinary and Traditional Care Groups**

Outcome	Interdisciplinary Team	Traditional Care	p-value
Appropriate Antibiotic Therapy	93%	78%	0.002
Mean Duration of Antibiotic Use (days)	7.8	10.2	< 0.001

### Secondary Outcomes

In addition to the primary outcomes, several secondary outcomes were examined to assess the impact of interdisciplinary collaboration:

1. **Pharmacist Interventions:** Pharmacists in the interdisciplinary team made an average of 5.3 medication adjustments per patient (e.g., dose adjustments, discontinuation of unnecessary antibiotics), compared to 2.1 in the traditional care group ( $p < 0.001$ ).

2. **Timeliness of Diagnostic Testing:** Laboratory specialists in the interdisciplinary group facilitated more timely diagnostic tests, with a mean turnaround time of 3.2 hours for critical tests (e.g., blood gas, cultures) compared to 5.5 hours in the traditional care group ( $p < 0.001$ ).

3. **Ventilator Adjustments:** Respiratory therapists in the interdisciplinary team made significantly more frequent adjustments to ventilator settings based on blood gas results and clinical assessments (mean = 4.7 adjustments per patient vs. 2.6 in the traditional group,  $p < 0.001$ ).

### Summary of Findings

The results indicate that patients managed by an interdisciplinary team of respiratory therapists, pharmacists, and laboratory specialists experienced significantly better outcomes in terms of reduced ICU stay, shorter ventilation duration, lower mortality rates, and reduced incidence of VAP. Furthermore, the interdisciplinary team approach led to more appropriate antibiotic use, fewer antibiotic resistance cases, and more timely adjustments in patient management. These findings suggest that a multidisciplinary approach is essential for improving outcomes in ICU patients with severe respiratory infections.

### Discussion

This study aimed to evaluate the impact of interdisciplinary collaboration between respiratory therapists, pharmacists, and laboratory specialists on the outcomes of ICU patients with severe respiratory infections, particularly pneumonia. The findings demonstrate that such collaboration significantly improved patient outcomes, including reduced length of ICU stay, shorter duration of mechanical ventilation, lower mortality rates, and decreased incidence of ventilator-associated pneumonia (VAP). These results are consistent with



existing literature that highlights the value of multidisciplinary care in complex medical cases, particularly in the ICU setting (Blot et al., 2014).

#### Impact of Interdisciplinary Collaboration

The reduced ICU length of stay and shorter duration of mechanical ventilation in patients managed by an interdisciplinary team highlight the efficiency of a team-based approach. In this study, patients under interdisciplinary care spent an average of 12.4 days in the ICU, compared to 16.2 days for patients receiving traditional care. This reduction can be attributed to the frequent adjustments made by respiratory therapists to ventilator settings based on real-time blood gas analysis, facilitated by laboratory specialists. Additionally, pharmacists contributed to optimizing medication regimens, particularly through antibiotic stewardship, which resulted in faster resolution of infections and earlier discontinuation of antibiotics (Bond and Raehl, 2007). This finding underscores the critical role of interdisciplinary teamwork in enhancing patient outcomes by reducing the duration of intensive care.

The shorter duration of mechanical ventilation in the interdisciplinary group (8.1 days vs. 11.5 days in the traditional group) further supports the hypothesis that coordinated care leads to better respiratory outcomes. Studies have shown that prolonged mechanical ventilation is associated with higher risks of VAP, lung injury, and overall poor outcomes (Rotstein et al., 2008). By adjusting ventilation strategies promptly and appropriately, respiratory therapists can mitigate these risks, as evidenced by the significantly lower VAP incidence in the interdisciplinary group (9% vs. 18%). This finding aligns with previous research, which suggests that well-coordinated care involving respiratory therapists can reduce the incidence of VAP and other ventilator-associated complications (Villar et al., 2007).

#### Mortality and Infection Control

The lower mortality rate in the interdisciplinary care group (16% vs. 28%) is particularly notable. This result likely reflects the cumulative effect of timely interventions, optimized medication management, and appropriate ventilation strategies. Previous studies have shown that the integration of pharmacists in ICU care can lead to better medication management, including more appropriate antibiotic use and fewer drug-related complications (Dunn et al., 2011). This study reinforces the importance of pharmacist-driven antimicrobial stewardship in reducing infection-related mortality. By ensuring the appropriate selection, dosing, and duration of antibiotics, pharmacists help prevent the emergence of antibiotic-resistant pathogens, which is a major concern in ICU settings (Bond and Raehl, 2007).

Moreover, the role of laboratory specialists in providing timely and accurate diagnostic information was critical in guiding treatment decisions. The faster turnaround time for critical tests in the interdisciplinary group (3.2 hours vs. 5.5 hours) allowed for more rapid clinical decision-making, which likely contributed to the improved patient outcomes. Laboratory specialists, by providing real-time data on infection markers such as procalcitonin and C-reactive protein, enabled more targeted antibiotic therapy, reducing unnecessary broad-spectrum antibiotic use (Sridharan and Chamberlain, 2013). This collaboration between laboratory specialists and pharmacists is essential for infection control in the ICU, as it ensures that treatments are both timely and appropriate.

#### Antibiotic Stewardship

Antibiotic stewardship was another area where interdisciplinary collaboration proved highly effective. In the interdisciplinary care group, 93% of patients received appropriate antibiotic therapy based on culture results, compared to 78% in the traditional care group. This high level of appropriate antibiotic use, along with the

shorter duration of antibiotic therapy (7.8 days vs. 10.2 days), underscores the critical role pharmacists play in managing infections in ICU patients. Pharmacists, working closely with laboratory specialists, were able to tailor antibiotic regimens more effectively, reducing the risk of resistance while ensuring that patients received the most appropriate therapy. The importance of antimicrobial stewardship in ICU settings cannot be overstated, particularly given the increasing threat of antibiotic resistance in hospital environments (Bond and Raehl, 2007).

#### Timeliness and Responsiveness

The timeliness of care is a recurring theme in this study. The ability of the interdisciplinary team to make frequent adjustments to ventilator settings, prescribe appropriate medications, and respond quickly to diagnostic results translated into better patient outcomes. Respiratory therapists, for example, made more frequent ventilator adjustments based on blood gas results, and these timely interventions helped optimize oxygenation and minimize ventilator-induced lung injury. The rapid response from laboratory specialists in delivering diagnostic results, such as blood cultures and biomarkers, further enhanced the team's ability to adjust treatments in real-time.

These findings suggest that the interdisciplinary model not only improves outcomes but also enhances the overall responsiveness of care. In critical care settings, where time is of the essence, the ability of a well-coordinated team to respond promptly to changing patient conditions is a significant advantage (Dey et al., 1997). This highlights the importance of fostering close communication and collaboration between RTs, pharmacists, and laboratory specialists to maximize the timeliness and effectiveness of interventions.

#### Limitations

Despite the promising findings, this study has some limitations. First, as a retrospective cohort study, it is subject to selection bias and limitations inherent to retrospective data collection. Additionally, this study was conducted in a single tertiary hospital, which may limit the generalizability of the findings to other healthcare settings with different resources or team structures. Further prospective, multicenter studies are needed to validate these findings and explore how different models of interdisciplinary care affect patient outcomes in diverse ICU environments.

#### Implications for Practice

The results of this study suggest that promoting interdisciplinary collaboration in ICU settings can lead to substantial improvements in patient care, particularly for those with severe respiratory infections like pneumonia. Hospitals should consider implementing structured interdisciplinary care protocols that emphasize the coordination of respiratory therapists, pharmacists, and laboratory specialists. Such collaboration not only improves clinical outcomes but also enhances the efficiency of care delivery, potentially reducing healthcare costs associated with prolonged ICU stays and complications such as VAP.

Moreover, this study highlights the importance of continuous professional development and training for healthcare professionals in ICU settings. Encouraging frequent team meetings, case discussions, and shared decision-making can further enhance collaboration and ensure that all members of the interdisciplinary team are working towards common patient care goals.

#### Conclusion

In conclusion, this study demonstrates that interdisciplinary collaboration between respiratory therapists, pharmacists, and laboratory specialists significantly improves outcomes in ICU patients with severe

respiratory infections. By optimizing respiratory support, medication management, and diagnostic accuracy, the interdisciplinary team approach reduces ICU stays, ventilator days, mortality, and infection-related complications. These findings underscore the critical role of teamwork in managing complex ICU cases and highlight the potential for broader implementation of interdisciplinary care models to improve patient outcomes in critical care settings.

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