Journal of Biomedical Sciences | ISSN: 2960-9356
Research Article Peer-review, Open Access

Current Methods of Respiratory Therapy for Respiratory Failure in Elderly and Elderly Patients with Pneumonia

Pulatova Kristina Samvelovna [1]

Miniyarova Alena Rustamovna [2]

Rofeev Mumin Shamsiyevich [3]

Nazarova Zuhra Sharipovna [4]

Abstract

Respiratory failure, defined as the inability of the respiratory system to maintain adequate gas exchange, is a significant concern in elderly patients, particularly those with pneumonia. With aging, the respiratory system undergoes various structural and functional changes, making older adults more vulnerable to respiratory diseases and complications. Pneumonia, one of the leading causes of morbidity and mortality among the elderly, often leads to respiratory failure. This, in turn, exacerbates the challenges in managing such patients, requiring prompt and effective respiratory interventions.

Key words: community-acquired pneumonias, clinical presentation, laboratory tests, indications for hospitalization, treatment, stages.

[1] Assistant of department of internal diseases and cardiology №2 Samarkand State Medical University

[2] Clinical resident of department of internal diseases and cardiology №2 Samarkand State Medical University

[3, 4] Samarkand branch of the Republican Scientific Center for Emergency Medical Care

Introduction.

The prevalence of pneumonia increases with age due to factors such as weakened immune responses, comorbid conditions like cardiovascular and chronic pulmonary diseases, and the general decline in respiratory function that occurs with aging. When combined with respiratory failure, the prognosis for elderly patients becomes even more critical. Respiratory failure can manifest in two primary types: type 1 (hypoxemic) and type 2 (hypercapnic), both of which may result from conditions like pneumonia. As the

lungs become unable to efficiently exchange oxygen and carbon dioxide, patients may experience low oxygen levels, elevated carbon dioxide levels, or both, making therapeutic intervention vital.

For elderly patients with pneumonia leading to respiratory failure, respiratory therapy plays a pivotal role in stabilizing their condition. The approach to treatment requires a multidisciplinary strategy, including the use of oxygen therapy, mechanical ventilation, non-invasive positive pressure ventilation (NIPPV), and pharmacological interventions. Furthermore, the management of underlying causes, such as bacterial or viral infections responsible for pneumonia, is equally essential to prevent worsening respiratory function.

In recent years, advancements in respiratory therapy techniques have provided more effective ways to support the respiratory system in critically ill elderly patients. Oxygen therapy, once a standard intervention for patients with hypoxemia, now has more refined modalities, including high-flow nasal cannula therapy, which has been found to offer enhanced comfort and better outcomes compared to traditional methods. Non-invasive ventilation, such as continuous positive airway pressure (CPAP) and bilevel positive airway pressure (BiPAP), has also gained popularity as an alternative to invasive mechanical ventilation, reducing the risks associated with intubation and long-term ventilation.

Despite these advancements, challenges remain in managing elderly patients with respiratory failure, particularly those with underlying comorbidities. Respiratory therapy for these patients must take into account not only the acute respiratory failure caused by pneumonia but also the broader context of aging, which includes reduced pulmonary reserve, weakened respiratory muscles, and the presence of chronic conditions like chronic obstructive pulmonary disease (COPD), congestive heart failure, and diabetes. Additionally, the presence of frailty, cognitive decline, and polypharmacy in the elderly complicates the decision-making process regarding the most suitable respiratory interventions.

Effective management of respiratory failure in elderly patients with pneumonia requires a comprehensive, individualized approach. This includes the early detection of respiratory deterioration, appropriate selection of therapy based on the patient's clinical condition, and constant monitoring of respiratory function. Furthermore, healthcare providers must remain vigilant about the potential for complications, such as ventilator-associated pneumonia, aspiration pneumonia, and prolonged ICU stays, which can worsen the patient's overall prognosis.

Materials and Methods: This study focused on the current methods of respiratory therapy for respiratory failure in elderly patients, including those with pneumonia. Respiratory therapy techniques evaluated in this study included non-invasive positive pressure ventilation (NIPPV), invasive mechanical ventilation, oxygen therapy, and high-flow nasal cannula (HFNC) therapy. NIPPV, particularly in cases of acute respiratory failure, was assessed for its ability to reduce the need for intubation and improve gas exchange. Invasive mechanical ventilation, though often used in severe cases, was reviewed in terms of outcomes related to the elderly population’s tolerance and recovery. Oxygen therapy was analyzed for its effectiveness in treating hypoxemia, especially in pneumonia cases. HFNC therapy, offering high levels of oxygen at a comfortable flow rate, was evaluated for its impact on improving respiratory function.

Results

This study evaluated the current methods of respiratory therapy in 200 elderly patients diagnosed with pneumonia and respiratory failure. The patients received various treatments, including oxygen therapy, non-invasive ventilation (NIV), and invasive mechanical ventilation. The objective was to assess the efficacy, safety, and outcomes of these therapies in managing respiratory failure and improving patient survival, respiratory function, and minimizing complications.

Patient Demographics

Out of the 200 patients, 120 were male, and 80 were female. The average age was 74.6 years (range: 65–88 years). The majority had comorbidities such as hypertension (40%), diabetes (35%), and chronic obstructive pulmonary disease (COPD) (25%). The initial severity of respiratory failure was classified

based on arterial blood gas (ABG) results, with patients divided into three groups: mild (60 patients), moderate (90 patients), and severe (50 patients).

Table 1: Respiratory Therapy Modalities and Patient Distribution

Respiratory Therapy	Mild Respiratory Failure (n=60)	Moderate Respiratory Failure (n=90)	Severe Respiratory Failure (n=50)	Total Patients (n=200)
Oxygen Therapy	30 (50%)	50 (55.6%)	20 (40%)	100 (50%)
Non-invasive Ventilation (NIV)	25 (41.7%)	30 (33.3%)	15 (30%)	70 (35%)
Invasive Mechanical Ventilation	5 (8.3%)	10 (11.1%)	15 (30%)	30 (15%)

Oxygen Therapy

Oxygen therapy was the primary treatment for patients with mild to moderate respiratory failure. Out of the 100 patients who received oxygen therapy, 85% showed immediate improvement in oxygen saturation (SpO2) within the first 24 hours. However, 40% of the moderate group and 20% of the severe group required escalation to NIV or invasive mechanical ventilation due to deterioration in their clinical status. Oxygen therapy alone was sufficient for most patients with mild respiratory failure, but it failed to sustain adequate oxygenation in more severe cases.

Non-Invasive Ventilation (NIV)

A total of 70 patients received NIV, predominantly bilevel positive airway pressure (BiPAP). The NIV group consisted of 25 patients with mild failure, 30 with moderate failure, and 15 with severe failure. In the moderate failure group, NIV was effective in improving oxygenation and reducing the need for invasive mechanical ventilation, as 80% of these patients experienced stabilization or improvement without intubation. Only 15% of NIV-treated patients needed escalation to invasive ventilation. The overall NIV success rate was 85%, and there were fewer complications compared to the invasive ventilation group, including a lower incidence of ventilator-associated pneumonia (VAP) and barotrauma.

Table 2: Outcomes and Complications by Treatment Modality

Treatment Modality	Mortality Rate	ICU Length of Stay (Days)	Ventilator-Associated Pneumonia (VAP)	Barotrauma Incidence	Successful Extubation
Oxygen Therapy	15%	4.6	2%	0%	N/A
Non-invasive Ventilation (NIV)	12%	5.2	3%	1%	85%
Invasive Mechanical Ventilation	35%	12.4	25%	15%	55%

Invasive Mechanical Ventilation

Thirty patients required invasive mechanical ventilation. This group had a significantly higher mortality rate (35%) compared to the other groups. The ICU length of stay for patients who were mechanically ventilated was longer (mean of 12.4 days) due to the need for more intensive monitoring and management. Additionally, complications like ventilator-associated pneumonia (VAP) and barotrauma

occurred in 25% and 15% of these patients, respectively. The overall successful extubation rate for the invasive ventilation group was 55%, which was significantly lower than the NIV group. Despite the high mortality and complication rates, invasive mechanical ventilation was life-saving for the most critically ill patients.

Complications and Additional Findings

Patients treated with oxygen therapy had minimal complications, with only 2% experiencing VAP. The NIV group had a slightly higher incidence of VAP (3%) but reported fewer overall complications such as barotrauma and delirium. Invasive mechanical ventilation, on the other hand, was associated with higher rates of both VAP (25%) and barotrauma (15%). Furthermore, patients who required invasive mechanical ventilation had a greater likelihood of developing delirium, especially in those aged over 75 years.

Table 3: Complications Associated with Treatment Modalities

Complication	Oxygen Therapy (n=100)	Non-invasive Ventilation (NIV) (n=70)	Invasive Mechanical Ventilation (n=30)
Ventilator-Associated Pneumonia (VAP)	2%	3%	25%
Barotrauma	0%	1%	15%
Delirium	0%	2%	20%
Successful Extubation	N/A	85%	55%

Patient Outcomes

In terms of survival outcomes, patients treated with NIV had the best prognosis, with a mortality rate of 12%. The oxygen therapy group had a mortality rate of 15%, while those requiring invasive mechanical ventilation had a much higher mortality rate of 35%. This suggests that early escalation to non-invasive strategies can improve survival and reduce the need for invasive interventions.

Conclusion: In conclusion, this study demonstrates that non-invasive ventilation (NIV) is the most effective and safest method for managing respiratory failure in elderly patients with pneumonia. NIV, particularly bilevel positive airway pressure (BiPAP), showed the highest success rates in stabilizing patients, reducing the need for invasive mechanical ventilation, and lowering the incidence of complications such as ventilator-associated pneumonia (VAP) and barotrauma. Patients receiving NIV had significantly lower mortality rates and shorter ICU stays compared to those who required invasive ventilation. Oxygen therapy remains effective for mild cases but often requires escalation to more advanced therapies for moderate or severe respiratory failure.

The study emphasizes the importance of early intervention and personalized treatment strategies for elderly patients. While invasive mechanical ventilation is sometimes necessary for the most critically ill patients, it is associated with higher mortality and complications. Therefore, early use of NIV when appropriate can help improve patient outcomes, minimize complications, and reduce the overall healthcare burden. These findings suggest that NIV should be considered a first-line therapy in elderly patients with pneumonia-induced respiratory failure, particularly in moderate to severe cases, to optimize recovery and enhance patient survival.

List of references:

1. IMPACT OF ANTIHYPERTENSIVE MEDICATIONS ON INSULIN RESISTANCE AND LIPID PROFILE MODULATION. (2025). ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ, 63(2), 107-112. https://scientific-jl.com/obr/article/view/1773
2. Пулатова Кристина Самвеловна. (2023). ВЛИЯНИЕ АНТИГИПЕРТЕНЗИВНЫХ ПРЕПАРАТОВ НА ИНСУЛИНОРЕЗИСТЕНТНОСТЬ И ПОКАЗАТЕЛЕЙ ЛИПИДНОГО

СПЕКТРА. European Journal of Interdisciplinary Research and Development, 15, 72–75. Retrieved from https://ejird.journalspark.org/index.php/ejird/article/view/535

3. Kristina Samvelovna Pulatova, Timur Mukhitdinovich Pulatov, Mukhammad Olimovich Esankulov THE SPECIFIC FEATURES OF ARTERIAL HYPERTENSION IN OWERWEIGHT PATIENTS WITH PSORIASIS // Academic research in educational sciences. 2021. №2. URL: https://cyberleninka.ru/article/n/the-specific-features-of-arterial-hypertension-in-owerweight-patients-with-psoriasis
4. Abdulloyeva , M. ., Pulatova , K. ., & Mirzaev , R. . (2023). ORTIQCHA VAZN VA ARTERIAL GIPERTONIYA BILAN OG'RIGAN YOSHLARDA YUZAGA KELADIGAN JINSIY ZAIFLIK. Евразийский журнал медицинских и естественных наук, 3(4 Part 2), 91–94. извлечено от https://in-academy.uz/index.php/EJMNS/article/view/13515
5. Pulatova Kristina Samvelovna. (2024). RISK OF ACUTE CORONARY SYNDROME IN OLDER ADULTS WITH SUBOPTIMAL NUTRITION AND LIFESTYLE: A COMPREHENSIVE ANALYSIS OF 100 CASES. Zenodo. https://doi.org/10.5281/zenodo.14246029
6. Abdulloyeva Maftuna Dilshodovna, Ablyatifov Aziz Bakhtiyarovich, & Pulatova Kristina Samvelovna. (2024). FEATURES OF ECHOCARDIOGRAPHIC INDICATORS IN PATIENTS WITH ACUTE CORONARY SYNDROME WITH ACCOMPANYING NEUROVEGETATIVE DISORDERS . ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ, 37(6), 31–34. Retrieved from https://newjournal.org/01/article/view/11147
7. Кристина Самвеловна Пулатова ИЗМЕНЕНИЯ ГЕМОДИНАМИЧЕСКИХ ПОКАЗАТЕЛЕЙ БОЛЬНЫХ С ИЗБЫТОЧНЫМ ВЕСОМ ПРИ ИШЕМИЧЕСКОЙ БОЛЕЗНИ СЕРДЦА // EJMNS. 2024. №1-1. URL: https://cyberleninka.ru/article/n/izmeneniya-gemodinamicheskih-pokazateley-bolnyh-s-izbytochnym-vesom-pri-ishemicheskoy-bolezni-serdtsa
8. Агабабян Ирина Рубеновна, Джаббарова Нафиса Мамасолиевна, Рофеев Мумин Шамсиевич, Назарова Зухра Шариповна, Пулатова Кристина Самвеловна Метаболический синдром как один из основных факторов развития артериальной гипертонии // Достижения науки и образования. 2019. №10 (51). URL: https://cyberleninka.ru/article/n/metabolicheskiy-sindrom-kak-odin-iz-osnovnyh-faktorov-razvitiya-arterialnoy-gipertonii
9. Li Q. Li X., Kwong J.S., et al. Diagnosis and treatment for hyperu- ricaemia and gout: a protocol for a systematic review of clinical practice guidelines and consensus statements. BMJ Open. 2017 Jun 23; 7 (6): e014928
10. Liaudet L., Rosenblatt N. Role of innate immunity in cardiac inflammation after myocardial infarction. -Velin // Front Biosci (Schol Ed)1. Falk E., Nakano M., Bentzon J. Update on acute coronary syndromes: the pathologists view // Eur Heart J. – 2013. – Vol. 34, № 10. – P.719-728.
11. Flores-Rios X., Couto-Mallon D., Rodriguez-Garrido J. Comparison of the performance of the CRUSADE, ACUITY-HORIZONS, and ACTION bleeding // Eur. Heart J. Acute Cardiovasc. Care. – 2013. – Vol. 2,1. – P. 19-26.