

# Successful Use of Non-Invasive Ventilation in Acute Cardiogenic Pulmonary Edema: A Case Report

Eqab Al Mutairi<sup>5</sup>

## ABSTRACT

*Non-invasive ventilation (NIV) is a well-established intervention for acute cardiogenic pulmonary edema (ACPE), improving oxygenation and reducing the need for intubation. We present a case of an elderly patient with hypertensive emergency complicated by ACPE, managed successfully with continuous positive airway pressure (CPAP) without progression to invasive ventilation. This case highlights the importance of early recognition, appropriate mode selection, and integration of guideline-directed medical therapy in the acute phase.*

**Journal:** Boston Research Journal of Social Sciences & Humanities

**Keywords:** NA

**Accepted:** 19 July 2025

**Published:** 15 September 2025

**ISSN:** Online ISSN: 2834-4863 | Print ISSN: 2834-4855

**Language:** English

**Research ID:** 24d883f0-28a3-4dca-875b-906f8ead130e

**Type:** Peer-Reviewed Research Article (Open Access)



The authors declare that no competing interests exist. The authors contributed equally to this work. This article is distributed under the terms of the Creative Commons Attribution License as an open access article. CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

**Read Online:** <https://rebrand.ly/vw7zf0m>

**Author(s):** 5 – MutairiE@mngha.med.sa

## I. INTRODUCTION

Acute cardiogenic pulmonary edema (ACPE) is a life-threatening emergency characterized by rapid accumulation of fluid in the alveolar spaces, leading to hypoxemia and respiratory distress. Non-invasive ventilation (NIV), including continuous positive airway pressure (CPAP) and bilevel positive airway pressure (BiPAP), is widely used to reduce preload, afterload, and improve gas exchange.

Clinical trials and meta-analyses demonstrate that NIV reduces intubation rates and may improve survival in selected patients.

## II. CASE PRESENTATION

A 72-year-old female with a history of long-standing hypertension, type 2 diabetes, and ischemic cardiomyopathy (left ventricular ejection fraction: 35%) presented to the emergency

department with acute onset dyspnea at rest, orthopnea, and pink frothy sputum.

- **Vital signs on admission:** BP 210/110 mmHg, HR 128 bpm, RR 36/min, SpO<sub>2</sub> 78% on 10 L/min face mask oxygen, temperature 36.8 °C.

- **Physical examination:** Diffuse bilateral crackles, elevated jugular venous pressure, cold extremities, no focal neurological deficits.

- **Investigations:** Chest radiograph revealed bilateral alveolar infiltrates consistent with pulmonary edema. Arterial blood gas showed pH 7.28, PaCO<sub>2</sub> 58 mmHg, PaO<sub>2</sub> 50 mmHg on 10 L/min oxygen. NT-proBNP was elevated; troponin I was mildly increased.

### III. MANAGEMENT

The patient was positioned upright and started immediately on CPAP at 10 cmH<sub>2</sub>O with FiO<sub>2</sub> 0.8 via full face mask. Within 20 minutes, SpO<sub>2</sub> improved to 94% and respiratory rate decreased to 26/min. Arterial blood gas after one hour showed pH 7.35, PaCO<sub>2</sub> 46 mmHg, PaO<sub>2</sub> 85 mmHg.

Adjunctive therapy included IV nitroglycerin infusion (titrated for blood pressure control), IV furosemide (40 mg), and continuation of chronic beta-blocker and ACE inhibitor therapy after stabilization. Over the next 12 hours, CPAP was gradually weaned to 5 cmH<sub>2</sub>O, then discontinued.

The patient avoided intubation, was transferred to a step-down unit after 24 hours, and discharged on hospital day 5 with optimized heart failure medications.

### IV. DISCUSSION

This case demonstrates the effectiveness of early CPAP in the management of ACPE. NIV improves oxygenation, reduces the work of breathing, and decreases cardiac preload and afterload. Compared to conventional oxygen therapy, multiple studies and meta-analyses confirm that NIV decreases intubation rates and shortens hospital stay.

The choice between CPAP and BiPAP depends on the clinical profile. CPAP primarily improves oxygenation, whereas BiPAP provides additional ventilatory support in hypercapnic patients. In this case, the patient improved significantly with CPAP alone, likely due to effective

hemodynamic unloading in the context of hypertensive crisis.

Current guidelines (ESC 2021, AHA/ACC 2022, ERS/ATS 2017) endorse the use of NIV in ACPE with significant respiratory distress and hypoxemia, provided there are no contraindications such as altered consciousness, hemodynamic instability, or inability to protect the airway.

### V. CONCLUSION

Early initiation of NIV, particularly CPAP, can rapidly stabilize patients with ACPE, reducing the need for invasive ventilation and improving outcomes. This case underscores the value of timely recognition, appropriate ventilatory mode selection, and integration of NIV with guideline-directed medical therapy in acute heart failure management.

### VI. REFERENCES

1. Gray A, et al. Noninvasive ventilation in acute cardiogenic pulmonary edema (3CPO trial). *N Engl J Med*. 2008.
2. Berbenetz N, et al. Non-invasive positive pressure ventilation (CPAP or bilevel) for acute cardiogenic pulmonary edema. *Cochrane Database Syst Rev*. 2019.
3. Masip J, et al. Non-invasive ventilation in acute heart failure. *Eur Heart J*. 2018.
4. Ponikowski P, et al. 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. *Eur Heart J*. 2021.
4. Rochwerg B, et al. ERS/ATS clinical practice guidelines: noninvasive ventilation for acute respiratory failure. *Eur Respir J*. 2017.
5. Heidenreich PA, et al. 2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure. *Circulation*. 2022.