



When Low-Risk Pneumonia Is Not Low Risk: A Case of Multisystem Complications in Community-Acquired Pneumonia

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Abstract.

Background. Community-acquired pneumonia (CAP) is commonly stratified using severity scores such as the Pneumonia Severity Index (PSI), which guides clinical decision-making. However, low-risk classification does not always reflect the true clinical trajectory, particularly in elderly patients with frailty. We report a 70-year-old female initially classified as low-risk CAP (PSI score 80, Class II) who developed significant multisystem complications, including massive pleural effusion, suspected secondary to syndrome of inappropriate antidiuretic hormone secretion (SIADH) related to hyponatremia, and secondary cardiac dysfunction with reduced left ventricular ejection fraction.

Methods. This report uses a descriptive design in the form of a single case study. The patient in this case report was treated at Ibnu Sina Hospital, Makassar, with a diagnosis of CAP, PSI score 80, low risk class II, Coronary artery disease, Hypoglycemia, and Reactive thrombocytosis.

Result. This case highlights the pathophysiological cascade of CAP involving systemic inflammation (elevated cytokines such as IL-6), endothelial dysfunction leading to pleural fluid accumulation, neurohormonal dysregulation causing electrolyte imbalance, and myocardial stress contributing to cardiac impairment.

Conclusion. Low PSI scores should not lead to underestimation of disease severity. Hyponatremia may serve as an early red flag of systemic involvement, and massive pleural effusion should be considered a marker of disease progression.

Implication. Early multidisciplinary management and close monitoring are essential, particularly in elderly and frail patients.

Keywords: Community-acquired pneumonia, Massive pleural effusion, Hyponatremia, SIADH, Multisystem complications



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INTRODUCTION

Community-acquired pneumonia (CAP) is an acute infection of the pulmonary parenchyma acquired outside of healthcare facilities and is still one of the leading causes of

morbidity and mortality worldwide. CAP can occur in all age groups and has a broad clinical spectrum, ranging from mild to severe with systemic complications. (H. Ticona et al., 2020) (Sherlyn & Grace, 2024)

Globally, pneumonia contributes significantly to hospitalization and death rates, especially when accompanied by complications such as pleural effusion, electrolyte disorders, and other organ involvement. Parapneumonic *pleural* effusion is a common complication of pulmonary inflammatory processes that extend into the *pleural* space. The buildup of fluid in the *pleural cavity* can worsen shortness of breath and increase the patient's morbidity. (Alhariri et al., 2022)

In addition, electrolyte disorders such as hyponatremia are often found in CAP patients. Hyponatremia in pneumonia can be caused by *the syndrome of inappropriate antidiuretic hormone secretion* (SIADH) due to a systemic inflammatory response. This condition is associated with an increased risk of complications and longer treatment times (Yasir & Mechanic, 2023) .

Although patients are classified as low-risk based on stable hemodynamic conditions, CAP still has the potential to develop into a condition with significant complications. Therefore, this case report aims to describe the clinical manifestations, supporting examinations, management, and clinical course of CAP patients with complications, including massive pleural effusion and electrolyte disorders. (Israelsen et al., 2024)

Current evidence indicates that community-acquired pneumonia (CAP) is a significant cause of morbidity and mortality worldwide, with disease severity commonly stratified using clinical scoring systems such as the Pneumonia Severity Index (PSI). CAP is increasingly recognized as a systemic inflammatory condition capable of causing complications beyond the respiratory system, including pleural effusion, electrolyte disturbances, and cardiovascular dysfunction. Hyponatremia, frequently associated with syndrome of inappropriate antidiuretic hormone secretion (SIADH), has been reported as a common electrolyte abnormality in pneumonia patients and is linked to increased disease severity. Additionally, frailty has emerged as an important determinant of clinical outcomes in elderly populations with infectious diseases. However, emerging evidence suggests that low-risk classification based on conventional scoring systems may not fully capture the risk of disease progression and systemic complications.

Despite the widespread use of severity scoring systems such as the Pneumonia Severity Index (PSI) in clinical practice, these tools may not fully capture the complexity of disease progression in elderly patients, particularly those with frailty. Current literature predominantly

focuses on complications in moderate to severe CAP, while limited attention has been given to the occurrence of multisystem complications in patients initially classified as low-risk. Furthermore, the prognostic role of early indicators such as hyponatremia and pleural effusion in low-risk CAP populations remains insufficiently explored. Therefore, there is a need for clinical evidence to reevaluate risk-stratification approaches and identify early warning signs of systemic involvement in low-risk CAP patients.

This study provides novel clinical evidence demonstrating that low-risk community-acquired pneumonia, as defined by conventional severity scoring systems, can progress into significant multisystem complications, including massive pleural effusion, hyponatremia, and secondary cardiac dysfunction. The study further highlights the critical role of frailty as a modifier of clinical risk and identifies hyponatremia as an early warning sign of systemic inflammatory involvement. These findings contribute to the refinement of clinical risk assessment and support the need for more comprehensive monitoring strategies in elderly patients with low-risk CAP.

METHODS

This report uses a descriptive design in the form of a single case study. The patient in this case report was treated at Ibnu Sina Hospital, Makassar, with a diagnosis of CAP, PSI score 80, low risk class II, Coronary artery disease, Hypoglycemia, and Reactive thrombocytosis. Data were obtained through a direct anamnesis of the patient, a thorough physical examination, and evaluation of the results of laboratory examinations, radiology, electrocardiography, and echocardiography recorded in medical records during the treatment period. The data were then analyzed narratively to describe the course of the disease from hospital admission through discharge planning.

DISCUSSION

Case Description

It was reported that a 70-year-old female patient came with the main complaint of shortness of breath, which she had felt for 1 week before entering the hospital, and aggravated during activities and when lying on her back. Cough has been present for the past 10 days without sputum or hemoptysis. Fever is present the day after the first cough complaint, lasts 4 days, and decreases with treatment. The patient then complained of tightness on the 7th day after coughing; the tightness worsened, especially when lying down. The patient was then taken immediately to the emergency room at Ibnu Sina Hospital because he felt the tightness had not

improved. No chest pain or palpitations were found, but the patient continued to experience weakness throughout the body, with tightness. Appetite has decreased, accompanied by significant weight loss over the last three months. The patient had no previous history of chronic diseases such as hypertension, diabetes mellitus, or heart disease. There is no history of long-term treatment.

The results of the patient's anamnesis showed a *frailty* condition based on significant weight loss in 3 months, *generalized weakness*, decreased appetite, and possibly *reduced physiological reserve*. Clinically, the condition is consistent with *frailty syndrome*, which is known to increase susceptibility to excessive inflammatory responses and systemic complications in suspected acute infections of the lower respiratory tract.

On physical examination, tachypnea was noted with a respiratory rate of 30/min, blood pressure of 146/87 mmHg, pulse of 78/min, temperature of 36.9 °C, and oxygen saturation of 97% on room air. Pulmonary auscultation showed decreased breath sounds in the right hemithorax and ronchi in the bilateral basal areas, suggesting a pulmonary infection with possible pleural involvement.

Laboratory examination showed leukocytosis with a predominance of neutrophils, supporting the presence of acute bacterial infection. Platelets increase reactivity against inflammatory processes. Hyponatremia and hypochloremia were found, which may be related to *suspected SIADH-related* hyponatremia. In addition, the patient experienced mild hypoglycemia, which was corrected immediately with fluid administration and education on glucose intake. (Table 1 .)

Table 1. Patient laboratory findings

Test	Results	Normal range	Units
White blood cells	17.7	5.0-10.0	×10 ⁹ per litre (×10 ⁹ /L)
Neutrophil	84.7	40.0-75.0	%
Red blood cells (RBC)	6.42	3.90-5.30	1012/L
Hemoglobin	17.6	12.0-17.4	grams per decilitre (g/dl)
Hematocrit (HCT)	55.8	36.0-52.0	%
Mean corpuscular volume (MCV)	86.9	76.0-96.0	Femtoliters (fL)
Mean corpuscular hemoglobin (MCH)	27.5	28.0-32.0	Picograms (pg)
Mean corpuscular hemoglobin concentration (MCHC)	31.5	31.0-35.0	g/dl
Platelet	659	150-400	109/L
Creatinine serum	0.3	0.5-1.3	mg/dL
serum glutamic pyruvic	11	10-41	U/L

<i>transaminase (SGOT)</i>			
<i>Sodium (Na⁺)</i>	123.2	136 - 145	mmol/L
<i>Potassium (K⁺)</i>	3.68	3.5 - 5.1	mmol/L
<i>Chloride</i>	88.1	94-110	mmol/L
<i>Current blood sugar (GDS)</i>	64	<200	mg/dL
<i>HS Troponin I</i>	0.04	>0.04	ng/mL

An autothoracic examination showed massive pleural dextrusion effusion. These findings are consistent with auscultation results, including decreased breath sounds on the right side, and explain progressive complaints of tightness. Pleural effusion in CAP generally occurs due to increased pleural capillary permeability and migration of inflammatory mediators to the pleural space.

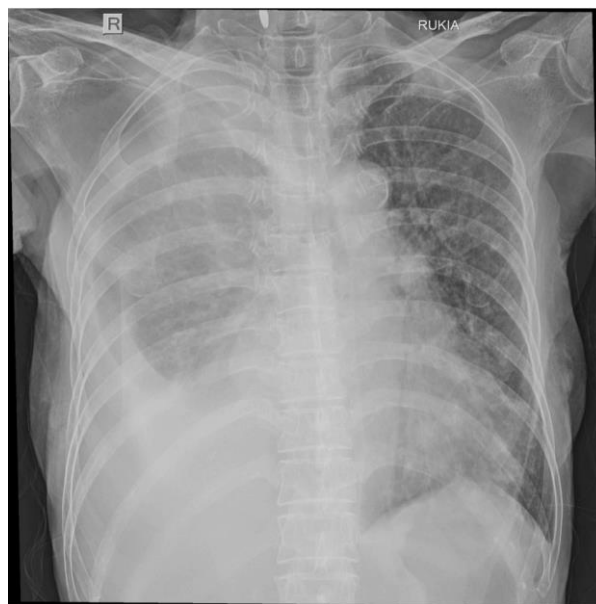


Figure 1. Thorax photos show a massive pleural effusion in the right lung

Cardiovascular evaluation showed changes in electrocardiography in the form of anteroseptal NSTEMI images with *Right Bundle Branch Block* (RBBB) that developed into *Complete RBBB*. Although troponin levels did not increase significantly, echocardiography showed a decrease in the systolic function of the left ventricle with an ejection fraction of 35% as well as hypokinetic globalization and dilation of the heart chamber. This condition is thought to be a secondary response to systemic inflammatory stress and increased hemodynamic load due to massive pleural effusion.

Patient management is comprehensive, including supportive therapy, empirical antibiotics, correction of metabolic disorders, and management of cardiovascular complications. The patient is given oxygen through the nasal cannula at 3–4 L/min to maintain

adequate oxygenation. Intravenous fluid therapy is administered as per clinical needs, initially using dextrose fluid for hypoglycemia correction, then adjusted to crystalloid fluid in order to stabilize hemodynamics and electrolyte correction. Empirical antibiotics were given as intravenous levofloxacin, but administration was discontinued on day 4 due to suspicion of an allergic reaction to the drug. Other supportive therapies include mucolytic *Acetylcysteine* 200 mg per 8 hours for 6 days of hospitalization, *gastrointestinal protection* (ranitidine and sucralfate), and enteral nutritional support.

During the hospital treatment period, the patient's clinical condition was monitored based on subjective complaints and responses to therapy. On the second day, shortness of breath began to decrease, but heartburn began to worsen. On the third day, the tightness when walking has decreased, the cough is no longer there, but the patient is still easily tired, complains of abdominal pain, and cannot defecate. On the fourth day, the clinical condition improved: shortness of breath, chest pain, and cough no longer existed; abdominal pain disappeared; and the patient had started to defecate slightly, although he was still easily tired and had complained of unsmooth urination. On the fifth day, tightness was felt again, but milder, accompanied by heartburn, fatigue easily, and disturbed sleep. By the sixth day, shortness of breath has greatly reduced, and the main complaint of heartburn has disappeared.

Electrolyte abnormalities and decreased heart systolic function observed in patients were treated with cardiology consultations and hyponatremia correction, diuretics to reduce fluid load, and *vasodilators* according to clinical indications. Thoracocentesis was planned as part of pleural effusion management, but the patient refused the procedure. Overall, the therapy provided was multidisciplinary with a supportive approach, antibiotics, metabolic correction, and management of cardiopulmonary complications.

This case suggests that CAP in low-risk patients can still develop into serious complications, including massive pleural effusion and electrolyte disruption. Hyponatremia in CAP should be recognized as an indicator of systemic inflammatory response that can affect the prognosis.

The relationship between frailty, *inflammatory burden*, and the appearance of early complications

CAP, in this case, is understood not only as a local lung infection but also as a trigger of a systemic inflammatory response, including increased proinflammatory cytokines such as interleukin-6 (IL-6). An increase in IL-6 plays a role in the activation of *the syndrome of inappropriate antidiuretic hormone secretion* (SIADH) mechanism that causes hyponatremia.

In addition, endothelial dysfunction due to inflammation increases vascular permeability, leading to pleural effusion. (Imbriano et al., 2025) (C.-Y. Wang et al., 2026)

Even though the patient has no history of comorbidities, *the condition of frailty* still plays an important role in aggravating clinical symptoms, especially shortness of breath. *Frailty* causes decreased ventilatory function due to reduced respiratory muscle strength and lung elasticity, as well as increased uncontrolled inflammation. This condition, combined with massive pleural effusion and cardiac dysfunction, results in more severe symptoms of dyspnea than in patients without *frailty* (X. Wang et al., 2022) .

The clinical implications of this case are explicitly affirmed: a low PSI score should not be interpreted as a minimal monitoring need. Hyponatremia should be recognized as an early warning sign of systemic involvement, while massive pleural effusion can be an indicator of disease severity. In addition, (Aydin et al., 2025) *Frailty* conditions have been shown to modify clinical risk beyond the parameters covered by conventional scoring systems. (Moïsi et al., 2024)

As part of strengthening clinical learning, low-risk CAP can still develop into severe complications, such that the absence of comorbidities does not rule out multisystem involvement, and *frailty* is a key factor in determining disease severity. In addition, hyponatremia was identified as an important indicator of the mechanism of SIADH and systemic inflammatory responses, while massive pleural effusion reflected significant disease progression. (Al Zaman et al., 2025) (Barkas et al., 2024)

The Relationship of Community-Acquired Pneumonia with Pleural Effusion Complications and Electrolyte Disorders

In this case, the patient presents with progressive shortness of breath and cough without sputum, without fever, but with tachypnea and bilateral basal ronchi. This picture is consistent with CAP, even though the clinical presentation is relatively mild and the patient is hemodynamically stable, placing the patient in the low-risk category. Although the patient does not show signs of sepsis or severe hemodynamic disorders, a significant inflammatory response can still occur and contribute to the appearance of complications. This confirms that the low-risk classification does not negate the possibility of clinical deterioration. (Desai et al., 2022) (Hakansson et al., 2018) (Broughton et al., 2023)

Parapneumonic pleural effusion is a frequent complication of CAP due to the spread of inflammation to the *pleural space* (Alwesaibi et al., 2025) . Radiologically, pleural effusion

appears to be a homogeneous opacity in the hemithorax with a meniscus border, as seen in this patient who exhibits massive pleural dextral effusion (Bravo Jover et al., 2025). The decrease in breathing sound in the right hemithorax supports the radiological findings. Pleural effusion in pneumonia is reported to occur in approximately 20–40% of hospitalized patients and can worsen respiratory symptoms as well as increase the length of hospitalization. (Putra et al., 2022) Based on research, there has been a significant increase in the incidence of CAP, mainly due to the dominance of (Li et al., 2025) *Mycoplasma pneumoniae* (MP), which reached 72.1% in 2023, as well as an increase in virus-bacterial co-infections related to rapid *onset* and worse *prognosis*. The study also showed a surge in post-pandemic cases due to the phenomenon of "*immunity debt*" and changes in the seasonal pattern of infection, which contributed to an increase in hospitalization cases with more severe disease degrees.

In addition to pleural complications, electrolyte disorders, especially hyponatremia, were also found in these patients with *sodium levels* of 123 mmol/L. Hyponatremia in CAP is generally due to SIADH, triggered by the release of proinflammatory cytokines such as interleukin-6. (Behera et al., 2022) Studies from (Putot et al., 2025) show that hyponatremia in CAP is associated with increased disease severity and length of treatment, even in patients who initially appear to be clinically stable, especially in elderly patients. Studies explain that hypovolemic hyponatremia is often associated with comorbidities such as heart disease, which increases the risk of mortality. In addition, in CAP patients with (Salman Khan et al., 2022) For patients with SIADH-related hyponatremia or those who do not improve after inhaled steroid therapy, it is necessary to consider the possibility of *adrenal* insufficiency, which may also contribute to hyponatremia.

The uniqueness of this patient's case also shows electrocardiographic changes in the form of antero-septal NSTEMI with RBBB, which develops into Complete RBBB, so that the patient *may have type 2 myocardial infarction*. Systemic inflammation in *pneumonia* is known to cause myocardial stress through relative hypoxia, increased myocardial oxygen requirements, and the direct effects of inflammatory mediators on heart tissue. This condition illustrates that CAP is not just a local lung disease, but can have (Aldás et al., 2020) a multi-system (Stotts et al., 2023) impact. The study explains that severe pneumonia accompanied by acute myocardial infarction (AMI) is a critical condition and is rare. Systemic stressors due to both conditions increase the secretion of stress hormones, including glucocorticoids, which can suppress the immune response. Based on the guidelines of Liu et al. (2022) and the *European Society of Cardiology* (ESC) 2020, patients with a diagnosis of NSTEMI are

recommended to undergo early intervention therapy (<24 hours). (Collet et al., 2021)

Patient management is comprehensive, including oxygen therapy and the immediate administration of anti-mucolytic agents. *N-acetylcysteine* (NAC) is used in *Community-Acquired Pneumonia* (CAP) as an adjuvant therapy, primarily due to its antioxidant and antiinflammatory properties, rather than as the primary therapy. NAC is known to reduce oxidative stress and lower inflammatory markers, such as TNF- α , CRP, and D-dimer, in patients with pneumonia. (Tieu et al., 2023) The antibiotic *levofloxacin* was given as an initial empirical therapy but was discontinued due to suspected allergic reactions, with a high success rate (about 94%). Serious allergic reactions were rare in clinical trials, while mild rashes were more commonly reported (about 0.5–1%). (Sheth et al., 2017)

Regimen therapy and cardiology consultation are initiated immediately to evaluate heart function. In CAP patients with massive pleural effusion accompanied by systolic dysfunction and NSTEMI, the therapy regimen provided was comprehensive and focused on the management of cardiovascular complications and *fluid overload*. Diuretic therapy with furosemide and a mineralocorticoid receptor antagonist (MRA) such as spironolactone is used to reduce fluid retention and lower cardiac load, with potassium supplementation (KSR) to prevent hypokalemia from diuretics. (McDonagh et al., 2021; Velat et al., 2020) *Candesartan* and *amlodipine* are given for blood pressure control and reducing *afterload*, while *clopidogrel* acts as *antiplatelet therapy* in acute coronary syndrome. Although it does not directly treat lung infections, this combination of therapies is important for hemodynamic stabilization and optimization of clinical outcomes in CAP with multi-system complications. (Febriyenti et al., 2025) (Martin et al., 2020) Thoracocentesis was planned for the management of massive pleural effusion, but was not performed because the patient refused the procedure.

In support of scientific validity, the management of these cases has been associated with relevant clinical guidelines, including the 2019 ATS/IDSA guideline for the management of *community-acquired pneumonia* and the 2021 ESC guideline for acute coronary syndrome without ST-segment elevation. Nonetheless, this case shows that the application of risk scores should still be accompanied by a thorough clinical assessment, especially in geriatric populations with *frailty*. This case shows that CAP in low-risk patients can still develop into significant complications in the form of massive pleural effusion, hyponatremia, and systemic inflammatory secondary cardiac dysfunction.

State of the Art	Research Gap	Novelty
Community-acquired pneumonia (CAP) remains a major	Existing severity scoring systems such as PSI	This study demonstrates that patients

State of the Art	Research Gap	Novelty
global cause of morbidity and mortality, with severity commonly assessed using clinical scoring systems such as the Pneumonia Severity Index (PSI).	primarily focus on physiological stability and comorbidities, but they may not adequately capture frailty-related risks and early systemic complications in elderly patients.	classified as low-risk CAP based on PSI can still develop significant multisystem complications, highlighting the limitation of traditional risk stratification tools.
Parapneumonic pleural effusion is a recognized complication of CAP and is associated with increased morbidity and prolonged hospitalization.	Most studies describe pleural effusion in moderate to severe CAP cases, while limited evidence explores its occurrence in patients initially categorized as low-risk CAP.	The study provides clinical evidence that massive pleural effusion can occur even in low-risk CAP patients and may serve as an early indicator of disease progression.
Hyponatremia is frequently observed in CAP patients and is often associated with the syndrome of inappropriate antidiuretic hormone secretion (SIADH) triggered by systemic inflammation.	Previous research has focused on hyponatremia as a complication in severe pneumonia, but there is insufficient understanding of its prognostic value in low-risk CAP populations.	This study identifies hyponatremia as an early warning sign of systemic inflammatory response and potential disease deterioration in low-risk CAP patients.
CAP is increasingly recognized as a systemic inflammatory disease that can affect multiple organs, including the cardiovascular system.	The relationship between low-risk CAP and secondary cardiac dysfunction remains underexplored, particularly in elderly patients without significant comorbidities.	The study highlights the occurrence of secondary cardiac dysfunction (reduced left ventricular ejection fraction) as part of multisystem complications in low-risk CAP.
Frailty has been recognized as an important clinical factor influencing outcomes in elderly patients with infectious diseases.	Clinical risk assessment tools rarely integrate frailty as a primary determinant of disease severity in CAP management.	The study emphasizes frailty as a key modifier of clinical risk beyond conventional scoring systems, suggesting the need for frailty-inclusive risk assessment models.

CONCLUSION

CAP is a common yet potentially complex clinical condition, even in patients initially classified as low-risk. This case highlights that CAP can develop into meaningful complications such as massive pleural effusion and electrolyte disorders, including hyponatremia, although hemodynamic parameters appear stable at initial presentation. The systemic inflammatory response that occurs is not only limited to the pulmonary parenchyma but can also extend to the pleura, causing neurohormonal dysregulation.

This case confirms the importance of comprehensive clinical evaluation, early detection of complications, and multidisciplinary management in CAP patients, regardless of initial risk stratification. Timely supportive therapy, appropriate antibiotic administration, correction of metabolic disorders, and consideration of invasive measures when indicated are important steps to optimize clinical outcomes. Early identification and adequate management

of CAP complications are crucial to prevent further deterioration of the clinical condition and improve patient prognosis.

This case report also lists several limitations, including its nature as a single case report that cannot be generalized, the absence of thoracocentesis, which precludes pleural fluid analysis, and the absence of specific inflammatory biomarker examinations, such as IL-6, that could strengthen the pathophysiological explanation. In addition, the patient's refusal to cooperate limits the diagnostic evaluation.

Recommendations

Clinical practitioners should maintain a high level of vigilance for possible complications, such as pleural effusion and electrolyte disturbances, in all CAP patients, including those initially categorized as low risk. Regular monitoring of laboratory parameters, especially serum electrolytes, as well as serial clinical and radiological evaluations, is strongly recommended to detect signs of deterioration early.

Multidisciplinary collaboration, especially involving pulmonary and cardiology specialists when indicated, can improve the quality of patient management and reduce the risk of adverse outcomes. Further research is still needed to more clearly identify the predictors of complications in low-risk CAP patients and to optimize evidence-based management strategies.

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