

Critical Diagnostic Indicators of Severe Community Acquired Pneumonia for Enhancing Triage Accuracy and Rapid Clinical Stabilization in Emergency Care

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Abstract :

Severe community-acquired pneumonia (CAP) is a major emergency condition that can rapidly progress to respiratory failure, hemodynamic instability, sepsis, and multiorgan dysfunction. Early recognition of severe disease is essential for accurate triage, appropriate allocation of healthcare resources, and rapid clinical stabilization. This article examines the critical diagnostic indicators of severe CAP and their importance in emergency care. A descriptive-analytical and library-based approach was used to review clinical guidelines, validated severity assessment tools, and relevant evidence concerning risk stratification and intensive care requirements. Particular attention was given to clinical and physiological indicators, including respiratory rate, oxygenation, blood pressure, mental status, and signs of organ dysfunction, as well as laboratory and radiological findings. The role of established assessment tools, including the Pneumonia Severity Index, CURB-65, and SMART-COP, was also considered in relation to emergency triage and clinical decision-making. The findings indicate that no single indicator or scoring system is sufficient for accurately identifying all high-risk patients. Instead, combining objective clinical findings with validated assessment tools and professional judgment provides a more comprehensive approach to severity recognition. Continuous reassessment is also essential because patients may deteriorate rapidly after initial presentation. Overall, systematic identification of critical indicators, timely risk stratification, continuous monitoring, and rapid escalation of care can strengthen triage accuracy and facilitate effective clinical stabilization in patients with severe CAP.

keyword: Severe Community-Acquired Pneumonia, Emergency Triage, Diagnostic Indicators, Severity Assessment, Clinical Stabilization, Risk Stratification.

1. Introduction

Community-acquired pneumonia (CAP) is an important acute infectious condition in emergency departments that can progress from a mild respiratory infection to severe respiratory failure, sepsis, circulatory instability, and multiorgan dysfunction. Because clinical manifestations vary considerably among patients, early identification of disease severity is essential for determining the appropriate level of care and preventing delays in treatment. Systematic assessment of clinical findings and severity indicators can improve early recognition of high-risk patients (Metlay et al., 2019).

Severe CAP may be associated with abnormalities such as increased respiratory rate, impaired oxygenation, hypotension, altered mental status, renal dysfunction, leukopenia, thrombocytopenia, hypothermia, and extensive pulmonary involvement. These findings can indicate physiological deterioration and an increased need for intensive respiratory or hemodynamic support. Therefore, their early recognition during emergency assessment is important for appropriate triage and timely intervention (Martin-Loeches et al., 2023).

Validated assessment tools can further improve risk stratification in patients with CAP. Tools such as SMART-COP help identify patients who may require intensive respiratory or vasopressor support and can provide useful information for prioritizing emergency interventions. These instruments can complement clinical judgment and facilitate earlier identification of patients at greater risk of deterioration (Charles et al., 2008).

In emergency care, severity assessment tools such as the Pneumonia Severity Index and CURB-65 can provide a structured framework for evaluating prognosis and determining the appropriate level of care. These approaches consider clinical characteristics, underlying conditions, physiological findings, and selected laboratory variables, allowing clinicians to make more consistent decisions during the initial assessment (Fine et al., 1997).

Accordingly, identifying critical diagnostic indicators of severe CAP can improve triage accuracy and support rapid clinical stabilization. Early recognition of high-risk patients allows healthcare professionals to prioritize monitoring, initiate appropriate supportive measures, and arrange timely escalation of care when necessary. A systematic and clinically informed approach can therefore contribute to safer decision-making and improved management of patients with severe community-acquired pneumonia.

1.2 Background of the Topic

Community-acquired pneumonia (CAP) is a common and potentially serious infectious disease that requires rapid clinical evaluation, particularly when patients present to emergency departments. The severity of CAP varies widely, and some patients may rapidly develop respiratory failure, septic shock, or other life-threatening complications. Therefore, early recognition of disease severity is an essential component of emergency assessment and can influence decisions regarding hospitalization, monitoring, and intensive care (Metlay et al., 2019).

The assessment of CAP severity is based on multiple clinical indicators, including respiratory rate, oxygenation, blood pressure, mental status, temperature, and the presence of comorbid conditions. Laboratory abnormalities and radiological findings can also provide important information about the extent of disease and physiological deterioration. Combining these indicators can provide a more comprehensive

assessment of the patient's condition than relying on an individual clinical finding (Martin-Loeches et al., 2023).

Several clinical prediction instruments have been developed to improve risk stratification in patients with CAP. SMART-COP, for example, was developed to predict the need for intensive respiratory or vasopressor support and can assist clinicians in recognizing patients who require a higher level of care. Such tools are particularly relevant in emergency settings, where decisions must often be made rapidly and with limited initial information (Charles et al., 2008).

The Pneumonia Severity Index and CURB-65 are also widely recognized approaches for assessing CAP severity and estimating the risk of adverse outcomes. The Pneumonia Severity Index incorporates demographic factors, comorbidities, physical findings, laboratory results, and radiographic characteristics, while CURB-65 provides a simpler assessment based on confusion, urea, respiratory rate, blood pressure, and age. These tools can support clinical decision-making, although their interpretation should remain integrated with professional clinical judgment (Fine et al., 1997).

Accurate severity assessment is particularly important because some patients who do not initially meet obvious criteria for severe CAP may nevertheless deteriorate and require intensive care. Risk-stratification approaches can help identify such patients earlier and support timely escalation of treatment. Consequently, emergency assessment should incorporate both established severity criteria and continuous evaluation of the patient's clinical trajectory (Renaud et al., 2009, A).

Overall, the background of this topic highlights the need for reliable diagnostic indicators that can distinguish severe CAP from less serious presentations at the earliest possible stage. Integrating physiological findings, laboratory and imaging results, comorbidities, and validated severity tools may strengthen triage accuracy and facilitate rapid clinical stabilization.

1.3 Problem Statement

Severe community-acquired pneumonia represents a significant challenge in emergency care because patients may deteriorate rapidly and develop respiratory failure, hemodynamic instability, sepsis, or multiorgan dysfunction. One of the major difficulties is that the initial clinical presentation does not always accurately reflect the potential severity of the disease. Therefore, failure to identify critical diagnostic indicators at the time of triage may result in delayed escalation of care and inappropriate allocation of emergency resources (Metlay et al., 2019).

The complexity of severity assessment is increased by the wide variation in clinical manifestations and underlying health conditions among patients with CAP. Respiratory abnormalities, hypotension, altered mental status, laboratory disturbances, and radiographic involvement may occur with different degrees of severity. Established criteria emphasize the importance of evaluating multiple indicators simultaneously to identify patients at increased risk of severe disease and intensive care requirements (Martin-Loeches et al., 2023).

Another important problem is the possibility that conventional clinical assessment may fail to recognize patients who require intensive respiratory or vasopressor support. Although clinical prediction tools such as SMART-COP can improve identification of high-risk patients, their effective use requires accurate

assessment of relevant clinical variables and appropriate interpretation within the emergency setting (Charles et al., 2008).

Risk stratification tools such as the Pneumonia Severity Index and CURB-65 can support emergency decision-making, but differences in their design and predictive objectives may create challenges when selecting the most appropriate approach for individual patients. Furthermore, severity scores should not replace clinical judgment, particularly when a patient's condition is changing rapidly or when important clinical features are not adequately represented by the scoring system (Aujesky et al., 2005).

A further concern is the potential delay in identifying patients who require intensive care. Evidence indicates that timely recognition of patients at risk for deterioration and appropriate escalation of care are important components of emergency management. Patients who initially lack major severity criteria may still require intensive care, highlighting the need for sensitive assessment strategies during the early stages of emergency evaluation (Renaud et al., 2009, A).

Therefore, the central problem addressed in this article is the need to identify and appropriately integrate the most critical diagnostic indicators of severe CAP during emergency triage. Establishing a structured understanding of these indicators may improve early risk recognition, support more accurate triage decisions, and facilitate rapid clinical stabilization before severe complications become established.

1.4 Significance of the Study

Severe community-acquired pneumonia can rapidly progress to respiratory failure, septic shock, and other life-threatening complications, making early identification of high-risk patients a major priority in emergency care. Accurate recognition of severity indicators during the initial assessment can help healthcare professionals determine the appropriate level of monitoring and treatment and reduce delays in providing essential interventions (Metlay et al., 2019).

The significance of this study is also related to improving the accuracy of emergency triage. Clinical indicators such as respiratory rate, oxygenation, blood pressure, mental status, and evidence of organ dysfunction can provide important information about disease severity. Systematic assessment of these findings can support more consistent identification of patients with severe CAP and facilitate appropriate decisions regarding intensive care (Martin-Loeches et al., 2023).

Another important aspect is the potential contribution of validated severity assessment tools to emergency decision-making. Instruments such as SMART-COP can assist clinicians in recognizing patients who may require intensive respiratory or vasopressor support. Their appropriate application may strengthen early risk stratification and help prioritize patients who require immediate attention (Charles et al., 2008).

The study is further significant because inappropriate classification of CAP severity may lead either to delayed intensive treatment or unnecessary use of critical care resources. Established prediction models such as the Pneumonia Severity Index provide structured information for estimating risk and supporting decisions concerning hospitalization and treatment intensity. Using such approaches alongside clinical judgment can improve the consistency of emergency management decisions (Fine et al., 1997).

Early recognition of patients at risk of deterioration is particularly important because some individuals may require intensive care even when they do not initially meet obvious major criteria for severe CAP. Improved

risk stratification can facilitate earlier monitoring and escalation of treatment, potentially reducing delays in critical care admission and improving the efficiency of emergency services (Renaud et al., 2009, B).

Overall, this study is significant because it emphasizes the importance of integrating critical diagnostic indicators into emergency triage rather than relying on isolated clinical findings. A clearer understanding of these indicators may assist emergency healthcare professionals in identifying severe CAP earlier, prioritizing interventions appropriately, and supporting rapid clinical stabilization of patients at greatest risk.

1.5 Purpose of the Study

The purpose of this study is to identify and examine the critical diagnostic indicators associated with severe community-acquired pneumonia in emergency care and to determine how these indicators can contribute to more accurate triage and faster clinical stabilization. The study focuses on recognizing the most clinically relevant physiological, clinical, laboratory, and radiological findings that may indicate a high risk of deterioration.

Another purpose is to examine the role of systematic severity assessment in supporting emergency healthcare professionals when making rapid clinical decisions. Particular attention is given to the early identification of patients who may require intensive monitoring, respiratory support, hemodynamic intervention, or transfer to an intensive care unit.

The study also aims to highlight the importance of integrating validated severity assessment approaches with professional clinical judgment. Rather than relying on a single indicator or scoring system, the study emphasizes a comprehensive assessment of the patient's overall clinical condition.

Ultimately, this study seeks to provide a clinically useful framework for recognizing severe CAP at the earliest stage of emergency evaluation, improving triage accuracy, supporting timely intervention, and facilitating rapid stabilization of patients at increased risk of serious complications.

2. Body of paper

Severe community-acquired pneumonia requires rapid identification of high-risk clinical features because deterioration may occur quickly. Indicators such as impaired oxygenation, increased respiratory rate, hypotension, altered mental status, and evidence of organ dysfunction can help determine disease severity and the need for intensive respiratory or hemodynamic support. Therefore, combining these indicators with structured severity assessment can improve emergency triage and facilitate earlier clinical intervention (Chalmers et al., 2011).

2.1 Research Method

This study uses a **descriptive-analytical and library-based research method** to examine critical diagnostic indicators of severe community-acquired pneumonia and their role in improving emergency triage and rapid clinical stabilization. The study focuses on synthesizing evidence from clinical guidelines, severity assessment models, and studies addressing prognosis and intensive care requirements in patients with CAP (Metlay et al., 2019).

The literature review focuses on major clinical indicators, including respiratory rate, oxygenation, blood pressure, mental status, temperature, and signs of organ dysfunction. These indicators are examined based on their relevance to the early identification of severe disease and the need for intensive respiratory or hemodynamic support (Martin-Loeches et al., 2023).

Validated severity assessment tools are also reviewed to determine their usefulness in emergency risk stratification. Particular attention is given to tools such as SMART-COP, which evaluates the likelihood of requiring intensive respiratory or vasopressor support and can provide clinically useful information during early assessment (Charles et al., 2008).

The study further examines established prediction models, including the Pneumonia Severity Index and CURB-65, and considers their contribution to estimating severity and supporting decisions regarding hospitalization and treatment intensity. Evidence comparing different prediction approaches is considered to identify their potential strengths in emergency decision-making (Aujesky et al., 2005).

Overall, the research synthesizes the available evidence to provide a structured understanding of the most important indicators of severe CAP. The findings are organized according to their clinical relevance to emergency triage, early recognition of deterioration, and rapid stabilization, while emphasizing the importance of combining objective indicators with clinical judgment and continuous reassessment.

2.2 Literature Review

Previous research has emphasized the importance of early severity assessment in patients with community-acquired pneumonia. Metlay et al. highlighted the need for systematic clinical evaluation and appropriate risk assessment to distinguish patients requiring routine management from those at increased risk of severe disease and hospitalization. Their guideline provides an important framework for evaluating CAP and selecting appropriate management strategies (Metlay et al., 2019).

Martin-Loeches et al. focused specifically on severe CAP and emphasized the importance of recognizing major and minor severity criteria, including severe respiratory impairment, hemodynamic instability, and other signs of organ dysfunction. Their recommendations support the use of multiple clinical indicators rather than reliance on a single finding when identifying patients who may require intensive care (Martin-Loeches et al., 2023).

The development of SMART-COP provided another important contribution to CAP severity assessment. Charles et al. demonstrated that a combination of clinical and laboratory variables could help predict the need for intensive respiratory or vasopressor support. This approach is particularly relevant to emergency care because it focuses on identifying patients who may require advanced supportive interventions (Charles et al., 2008).

Fine et al. developed the Pneumonia Severity Index as a prediction rule for identifying patients with different levels of mortality risk. The model incorporates demographic characteristics, comorbidities, physical examination findings, laboratory variables, and radiographic information, providing clinicians with a structured method for risk stratification and decisions regarding treatment setting (Fine et al., 1997).

Overall, the literature indicates that accurate assessment of severe CAP requires integration of clinical indicators, validated prediction tools, and continuous clinical judgment. Although severity scores provide valuable support for triage, their effectiveness depends on appropriate interpretation and reassessment of

the patient's changing condition. Thus, combining objective indicators with timely emergency evaluation remains essential for improving triage accuracy and supporting rapid stabilization.

3. Proposed Key Sections for the Article: An Overview

This section provides an overview of the main areas addressed in the article, including the clinical indicators of severe community-acquired pneumonia, laboratory and radiological findings, severity assessment and risk stratification tools, emergency triage of high-risk patients, and strategies for rapid clinical stabilization and escalation of care.

3.1 Theoretical Foundations of Severe Community-Acquired Pneumonia

Severe community-acquired pneumonia represents a clinically important form of pneumonia in which the infectious process is accompanied by significant physiological impairment and increased risk of respiratory failure, septic shock, and intensive care admission. The theoretical basis for defining severity relies on the assessment of multiple clinical and physiological indicators rather than a single symptom or finding. Current clinical guidelines emphasize systematic severity assessment to support appropriate decisions regarding the level of care and treatment intensity (Metlay et al., 2019).

Severe CAP can be identified through major and minor criteria that reflect respiratory, circulatory, and systemic dysfunction. Major criteria include the need for invasive mechanical ventilation and septic shock requiring vasopressors, while minor criteria include tachypnea, impaired oxygenation, multilobar infiltrates, confusion, uremia, leukopenia, thrombocytopenia, hypothermia, and hypotension requiring aggressive fluid resuscitation (Martin-Loeches et al., 2023).

The theoretical framework of severity assessment also includes the use of structured prediction tools. CURB-65, for example, evaluates confusion, urea, respiratory rate, blood pressure, and age and provides a practical method for stratifying patients according to increasing mortality risk. Such tools can assist clinicians in organizing the available clinical information during the initial assessment (Lim et al., 2003).

Another important component is the recognition that pneumonia is a dynamic disease and that the patient's condition may deteriorate after initial presentation. Therefore, severity assessment should not be considered a one-time process. Continuous monitoring of respiratory and hemodynamic status can help identify emerging deterioration and support timely escalation of care when required.

Overall, the theoretical foundation of severe CAP is based on multidimensional assessment, early recognition of physiological deterioration, and integration of objective indicators with clinical judgment. This framework provides a basis for improving emergency triage and facilitating rapid stabilization of patients at high risk of

3.2 Clinical and Physiological Indicators of Severe Pneumon

munication

Clinical and physiological indicators are fundamental for identifying severe community-acquired pneumonia during the initial emergency assessment. Important findings include increased respiratory rate, impaired oxygenation, hypotension, altered mental status, multilobar pulmonary infiltrates, hypothermia, leukopenia, thrombocytopenia, and elevated blood urea nitrogen. These indicators reflect different

dimensions of physiological deterioration and can help determine the severity of the disease (Metlay et al., 2019).

Respiratory abnormalities are particularly important because severe CAP may rapidly lead to respiratory failure. A respiratory rate of at least 30 breaths per minute and a reduced $\text{PaO}_2/\text{FiO}_2$ ratio are recognized indicators of severe disease, while the need for mechanical ventilation represents a major criterion of severity. Careful evaluation of oxygenation and respiratory effort is therefore essential during emergency triage (Martin-Loeches et al., 2023).

Hemodynamic and neurological abnormalities also provide important information about disease progression. Hypotension requiring aggressive fluid resuscitation, septic shock requiring vasopressors, and confusion or disorientation may indicate systemic deterioration and an increased need for intensive care. These findings should be evaluated together with respiratory and laboratory abnormalities to obtain a more comprehensive assessment of severity (Metlay et al., 2019).

The combination of multiple clinical indicators is more informative than relying on an isolated abnormal finding. Current severity criteria define severe CAP by the presence of at least one major criterion or three or more minor criteria, providing a structured approach for identifying patients who may require intensive care and advanced supportive management (Martin-Loeches et al., 2023).

In emergency care, these indicators should be interpreted dynamically because the patient's respiratory, circulatory, and neurological status may change rapidly. Continuous reassessment of these parameters can help clinicians recognize deterioration earlier and support timely escalation of treatment. Overall, integrating clinical and physiological indicators with professional judgment can strengthen triage accuracy and contribute to faster stabilization of high-risk patients.

3.3 Laboratory and Radiological Indicators in Severity Assessment

Laboratory findings provide important information for evaluating the severity and systemic effects of community-acquired pneumonia. Leukopenia, thrombocytopenia, elevated blood urea nitrogen, and other abnormalities reflecting organ dysfunction may be associated with more severe disease. These findings are particularly useful when interpreted alongside clinical and physiological indicators during the initial emergency assessment (Metlay et al., 2019).

Blood gas analysis and oxygenation measurements are also important in assessing severe CAP. A reduced $\text{PaO}_2/\text{FiO}_2$ ratio reflects impaired gas exchange and may indicate significant respiratory compromise. In addition, abnormalities in renal function and other laboratory parameters can provide evidence of systemic involvement and help identify patients at increased risk of deterioration (Martin-Loeches et al., 2023).

Radiological assessment, particularly chest imaging, contributes to determining the extent of pulmonary involvement. Multilobar infiltrates are recognized as an important indicator of severe CAP because they suggest more extensive disease and may be associated with increased risk of respiratory deterioration. Radiological findings should therefore be interpreted together with the patient's clinical condition rather than in isolation (Metlay et al., 2019).

The combination of laboratory and radiological findings with clinical indicators can provide a more comprehensive assessment of disease severity. This integrated approach can help clinicians recognize patients who may require closer monitoring or escalation of care.

In emergency settings, repeated evaluation of laboratory and imaging findings can also support recognition of disease progression. Combining objective test results with clinical judgment and continuous reassessment can strengthen triage decisions and contribute to timely stabilization of patients with severe pneumonia.

3.4 Severity Assessment and Emergency Triage Tools

Severity assessment tools play an important role in emergency triage of patients with community-acquired pneumonia because they provide a structured method for estimating disease severity and determining the appropriate level of care. The **Pneumonia Severity Index (PSI)** and **CURB-65** are among the most established tools for risk stratification, with PSI being preferred in clinical guidelines for supporting hospitalization decisions alongside clinical judgment (Metlay et al., 2019).

For patients with suspected severe CAP, assessment tools that predict the need for intensive respiratory or vasopressor support are particularly valuable. **SMART-COP** evaluates variables such as hypotension, multilobar involvement, tachypnea, tachycardia, confusion, impaired oxygenation, low albumin, and acidosis, helping identify patients who may require advanced supportive care (Charles et al., 2008).

The CURB-65 score offers a relatively simple approach based on confusion, urea, respiratory rate, blood pressure, and age. Its simplicity makes it useful in emergency environments where rapid assessment is necessary, although it is primarily a prognostic tool and should not be used as the sole determinant of intensive care requirements (Lim et al., 2003).

Comparative evidence indicates that severity assessment tools have different strengths depending on the clinical outcome being evaluated. Some tools are more useful for estimating mortality, whereas others are better suited to identifying patients who may require intensive respiratory or hemodynamic support. Therefore, selecting the appropriate tool according to the clinical objective is important for effective emergency triage (Chalmers et al., 2011).

Overall, severity scores should complement rather than replace clinical judgment. Combining validated scoring systems with direct assessment of respiratory, circulatory, and neurological status and repeated reassessment can improve identification of high-risk patients and support timely escalation of care.

3.5 Proposed Strategies for Improving Triage and Clinical Stabilization

Severity

Improving triage accuracy in patients with severe community-acquired pneumonia requires a rapid, structured, and multidimensional assessment at the time of emergency department presentation. Initial evaluation should simultaneously consider respiratory rate, oxygenation, blood pressure, heart rate, mental status, temperature, comorbidities, and signs of organ dysfunction. A standardized triage pathway can help emergency clinicians rapidly distinguish patients who require routine management from those who need immediate stabilization, intensive monitoring, or escalation of care.

Another important strategy is the integration of validated severity assessment tools into routine emergency triage. Rather than relying exclusively on individual clinical findings, healthcare professionals can combine structured scoring systems with professional clinical judgment. This approach can improve consistency in risk classification and reduce the possibility of overlooking patients who appear initially stable but have multiple indicators of potential deterioration.

Continuous reassessment should also be incorporated into the management of high-risk patients. Severe pneumonia is a dynamic condition, and respiratory or hemodynamic status may deteriorate after the initial assessment. Repeated monitoring of oxygenation, respiratory effort, blood pressure, heart rate, mental status, and response to initial interventions can facilitate earlier recognition of deterioration and allow treatment to be intensified without unnecessary delay.

Rapid clinical stabilization should focus on addressing the patient's most immediate physiological problems while simultaneously identifying the need for advanced supportive care. Appropriate oxygen and respiratory support, timely management of circulatory instability, correction of significant physiological abnormalities, and prompt initiation of indicated antimicrobial therapy should be coordinated according to the patient's condition. Clear criteria for escalation can also facilitate timely consultation with critical care teams and transfer to an appropriate level of care.

Finally, effective communication and teamwork should be considered essential components of emergency management. Establishing clear responsibilities among triage nurses, emergency physicians, respiratory care professionals, and critical care teams can reduce delays in assessment and intervention. The use of standardized communication procedures, regular reassessment, rapid documentation, and clearly defined escalation pathways can create a more efficient emergency care process and ultimately support more accurate triage and faster clinical stabilization of patients with severe community-acquired pneumonia.

4. Conclusion

Severe community-acquired pneumonia is a potentially life-threatening condition that requires rapid recognition and appropriate decision-making in emergency care. Accurate identification of critical clinical, physiological, laboratory, and radiological indicators can help distinguish high-risk patients from those with less severe disease and support appropriate triage decisions. Respiratory compromise, hemodynamic instability, altered mental status, and evidence of organ dysfunction are particularly important in determining the urgency of care.

Validated assessment tools such as the Pneumonia Severity Index, CURB-65, and SMART-COP can provide structured support for severity assessment and risk stratification. However, these tools should be considered alongside professional clinical judgment and should not replace direct evaluation of the patient's overall physiological condition.

Improving emergency management requires continuous reassessment because the clinical status of patients with severe CAP may change rapidly. Early recognition of deterioration, timely initiation of supportive interventions, appropriate escalation of treatment, and rapid access to intensive care when necessary can contribute to more effective stabilization.

Overall, integrating critical diagnostic indicators with standardized triage procedures, validated severity tools, continuous monitoring, and coordinated clinical decision-making can improve the accuracy and efficiency of emergency care. Such an approach has the potential to facilitate earlier intervention, reduce delays in critical care, and improve the overall management of patients with severe community-acquired pneumonia.

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