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Short-Course versus Standard-Course Antibiotic Therapy for Pneumonia in Adult: A Systematic Review

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Abstract

Pneumonia remains a significant cause of morbidity and mortality among adults worldwide, with substantial impacts on healthcare utilization and costs. Despite advancements in vaccines, diagnostics, and antimicrobial therapy, optimizing antibiotic duration remains a clinical challenge. Traditional regimens typically span 7–14 days, but prolonged therapy contributes to antimicrobial resistance, adverse events, and higher healthcare expenses. This study aims to evaluate the effectiveness and safety of short-course (≤7 days) versus standard-course (≥7 days) antibiotic therapy in adult patients with pneumonia. A systematic review was conducted following PRISMA guidelines, including randomized controlled trials and observational studies published between 2016 and 2026. Data on clinical cure, mortality, recurrence, hospital length of stay, and adverse events were extracted and analyzed. Results from seven studies involving 5,467 patients indicate that short-course therapy is generally non-inferior to standard-course therapy in terms of clinical cure and mortality, particularly among patients achieving early clinical stability. Recurrence rates were comparable, while some studies demonstrated reduced hospital stay and fewer antibiotic-related adverse events in short-course groups. These findings support individualized treatment durations guided by clinical response rather than fixed periods. In conclusion, short-course antibiotic therapy is an effective and safe strategy for appropriately selected adult patients with pneumonia, offering potential benefits for patient outcomes, antimicrobial stewardship, and healthcare resource optimization.

INTRODUCTION

Pneumonia remains a major cause of morbidity and mortality among adults worldwide, contributing substantially to healthcare utilization, hospital admissions, and economic burden (Gonçalves-Pereira et al., 2025). Despite advances in vaccination, diagnostics, and antimicrobial therapy, pneumonia continues to pose significant clinical challenges, particularly in older adults and patients with comorbidities. Early initiation of appropriate antibiotic therapy is a cornerstone of management and has been consistently associated with improved clinical outcomes, including reduced mortality and faster recovery (Yayan & Rasche, 2026; Kato, 2024).

Traditionally, antibiotic treatment durations for pneumonia have ranged from 7 to 14 days, largely based on historical practice rather than high-quality evidence (Dimopoulou et al., 2024). However, prolonged antibiotic use is increasingly recognized as a key driver of antimicrobial resistance, a growing global health threat (Salam et al., 2023). In addition, extended therapy may increase the risk of adverse drug events, reduce patient adherence, and contribute to higher healthcare costs. These concerns have led to a paradigm shift toward optimizing antibiotic duration, with growing interest in shorter-course regimens that maintain efficacy while minimizing harm (Llor et al., 2024; Llor, 2025).

Recent clinical trials and observational studies have explored the effectiveness of short-course antibiotic therapy, typically defined as ≤5–7 days, compared with conventional longer courses (Furukawa et al., 2023; Israelsen et al., 2023; Dinh et al., 2021). Emerging evidence suggests that in selected patients, particularly those who achieve early clinical stability, short-course therapy may be non-inferior in terms of clinical cure, mortality, and recurrence (Zhao et al., 2016; Wang et al., 2026). However, findings remain heterogeneous due to variations in patient populations, disease severity, definitions of clinical stability, and study designs.

Despite accumulating evidence, uncertainties remain regarding the effectiveness of short-course antibiotic therapy in critically ill patients, those with ventilator-associated pneumonia, and infections caused by high-risk pathogens such as Pseudomonas aeruginosa. Existing systematic reviews highlight the need for comprehensive evaluations that integrate both randomized controlled trials and real-world observational data to guide clinical decision-making and optimize antimicrobial stewardship practices (Bienvenu et al., 2025; Peiffer-Smadja, 2021; Pennisi et al., 2025; Rawson et al., 2017).

Several recent studies have demonstrated comparable clinical cure rates and mortality between short- and standard-course antibiotic regimens. For instance, Zhao et al. (2016) and Uranga et al. (2016) found that short-course therapy achieved cure rates of over 90% in mild to moderate community-acquired pneumonia, while maintaining a similar safety profile and reducing total antibiotic exposure. Conversely, Bouglé et al. (2022) reported higher recurrence in critically ill patients with Pseudomonas infections receiving short-course therapy, suggesting the need for tailored treatment strategies based on patient severity and pathogen characteristics.

The existing literature presents a research gap regarding standardized clinical criteria for determining the optimal duration of antibiotic therapy, particularly for severe cases and ICU patients. Few studies rigorously stratify outcomes by clinical stability markers or pathogen-specific risks, leaving clinicians with limited guidance on applying short-course therapy safely across diverse adult populations.

The urgency of addressing this gap is amplified by the rising threat of antimicrobial resistance and the pressing need for effective stewardship strategies. Shortening antibiotic courses without compromising clinical outcomes could substantially reduce the selection pressure for resistant organisms, minimize adverse events, and lower healthcare costs, all of which are critical priorities in modern healthcare systems globally.

This study contributes novelty by systematically synthesizing evidence from both randomized and observational studies published over the past decade, providing updated, context-sensitive insights. By integrating data on treatment efficacy, recurrence, mortality, adverse events, and hospital stay duration, this research offers a more nuanced understanding of short-course antibiotic therapy in adult pneumonia than previously available.

The primary purpose of this research is to evaluate the comparative effectiveness and safety of short- versus standard-course antibiotic therapy for adults with pneumonia. Additionally, it seeks to identify patient subgroups for whom short-course therapy is most appropriate, thereby informing individualized treatment decisions and enhancing clinical guideline development.

Ultimately, this research aims to contribute both theoretical and practical value: informing clinicians on evidence-based antibiotic durations, supporting public health strategies to curb antimicrobial resistance, and guiding future trials focused on severe pneumonia and

high-risk pathogens. The findings are expected to improve patient outcomes, optimize resource utilization, and advance global antimicrobial stewardship efforts.

METHOD

Study Design and Reporting Standards

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The methodology was predefined to ensure transparency, reproducibility, and minimization of bias throughout the review process.

Eligibility Criteria

Studies were included based on the following criteria: (1) Population: Adult patients diagnosed with pneumonia; (2) Intervention: Short-course antibiotic therapy (generally ≤5 days);, (3) Comparator: Standard-course antibiotic therapy (≥7 days or as defined by the study); (4) Outcomes: At least one of the following: clinical cure, mortality, recurrence, length of hospital stay, or adverse events; (5) Study design: Randomized controlled trials (RCTs) and observational studies (prospective or retrospective cohort studies); (6) Publication period: Studies published within the last 10 years. Exclusion criteria included pediatric populations, hospital-acquired or ventilator-associated pneumonia, studies involving exclusively immunocompromised patients (unless adult subgroup data were extractable), case reports, reviews, editorials, conference abstracts without full text, and studies without a direct comparison of antibiotic duration.

Information Sources and Search Strategy

A comprehensive literature search was conducted in PubMed/MEDLINE, Scopus, and Cochrane Library for studies published within the last 10 years (from January 2016 to March 2026). The search strategy incorporated Medical Subject Headings (MeSH) and free-text terms such as “pneumonia,” “antibiotic duration,” “short-course,” “standard-course,” and “adult.” Additionally, reference lists of included studies and relevant reviews were manually screened to identify further eligible studies.

Study Selection

All identified records were imported into reference management software, and duplicates were removed. Two independent reviewers screened titles and abstracts for eligibility. Full-text articles were then assessed against inclusion and exclusion criteria. Discrepancies were resolved through discussion or consultation with a third reviewer.

Data Extraction

Data were independently extracted by two reviewers using a standardized form. Extracted data included study characteristics (author, year, country, study design), sample size, patient demographics, severity of pneumonia, antibiotic regimens, duration of therapy, and outcomes of interest.

Risk of Bias Assessment

The methodological quality of randomized controlled trials was assessed using the Cochrane Risk of Bias Tool 2, while observational studies were evaluated using the ROBINS-I (Risk Of Bias In Non-randomized Studies of Interventions). Each study was categorized as low, moderate, serious, or critical risk of bias according to the respective tool criteria.

Data Synthesis and Statistical Analysis

A qualitative synthesis of findings was performed for all included studies. Where appropriate, quantitative synthesis (meta-analysis) was conducted using Review Manager (RevMan) software. Dichotomous outcomes were pooled using risk ratios (RR) with 95% confidence intervals (CI), while continuous outcomes were analyzed using mean difference (MD) or standardized mean difference (SMD). Statistical heterogeneity was assessed using the I^2 statistic, with values >50% indicating substantial heterogeneity. A random-effects model was applied when heterogeneity was significant; otherwise, a fixed-effects model was used.

RESULTS AND DISCUSSION

Study Selection

A total of 634 records were identified through database searching. After removal of 329 duplicates, 329 studies were screened by title and abstract, of which 299 were excluded. Thirty full-text articles were assessed for eligibility, and 23 studies were excluded due to inappropriate population, intervention, or study design. Finally, 7 studies were included in the final analysis.

Study Characteristics

The 7 included studies comprised 5 randomized controlled trials and 2 cohort studies, with a total sample size of 5,467 patients. Studies were conducted across multiple countries, including Denmark, China, France, Spain, and multinational settings. Patient populations varied in disease severity, ranging from mild to moderate community-acquired pneumonia (CAP) in non-ICU settings to severe pneumonia in critically ill patients, including ventilator-associated pneumonia (VAP) in ICU settings.

Short-course antibiotic therapy generally ranged from 3 to 7 days, while standard-course therapy ranged from 8 to 14 days. Antibiotic regimens varied across studies, including β-lactams, fluoroquinolones, macrolides, and culture-guided broad-spectrum therapies. Several studies implemented a strategy of early discontinuation based on clinical stability criteria.

Clinical Cure

Clinical cure rates were reported in three randomized controlled trials. Short-course therapy demonstrated non-inferior efficacy compared to standard-course therapy. For instance, Zhao et al. (2016) reported clinical cure rates of 91.4% versus 94.3%, while Dinh et al. (2021) and Uranga et al. (2016) also showed comparable or numerically higher cure rates in the short-course groups at various follow-up time points.

Mortality

Across all included studies, no significant difference in mortality was observed between short-course and standard-course antibiotic therapy. This finding was consistent in both CAP and severe ICU populations, including studies with higher baseline mortality such as Wang et al. (2026), which reported similar 90-day mortality rates (~41%) in both groups.

Recurrence or Relapse

Recurrence rates were generally low and comparable between groups in most studies. However, one study (Bouglé et al., 2022) reported a higher recurrence rate in the short-course group among critically ill patients with Pseudomonas aeruginosa VAP, suggesting potential limitations of short-course therapy in severe or high-risk infections.

Length of Stay

Length of hospital stay was similar between groups in most studies. Some studies, particularly observational cohorts, reported shorter ICU and hospital stays in the short-course group, although these findings were not consistently observed across all studies.

Adverse Events

Adverse events were generally comparable between groups, with some studies reporting fewer antibiotic-related side effects in the short-course group. Notably, the REGARD-VAP trial demonstrated a substantially lower rate of adverse events in the short-course group (8% vs 38%), highlighting a potential safety advantage.

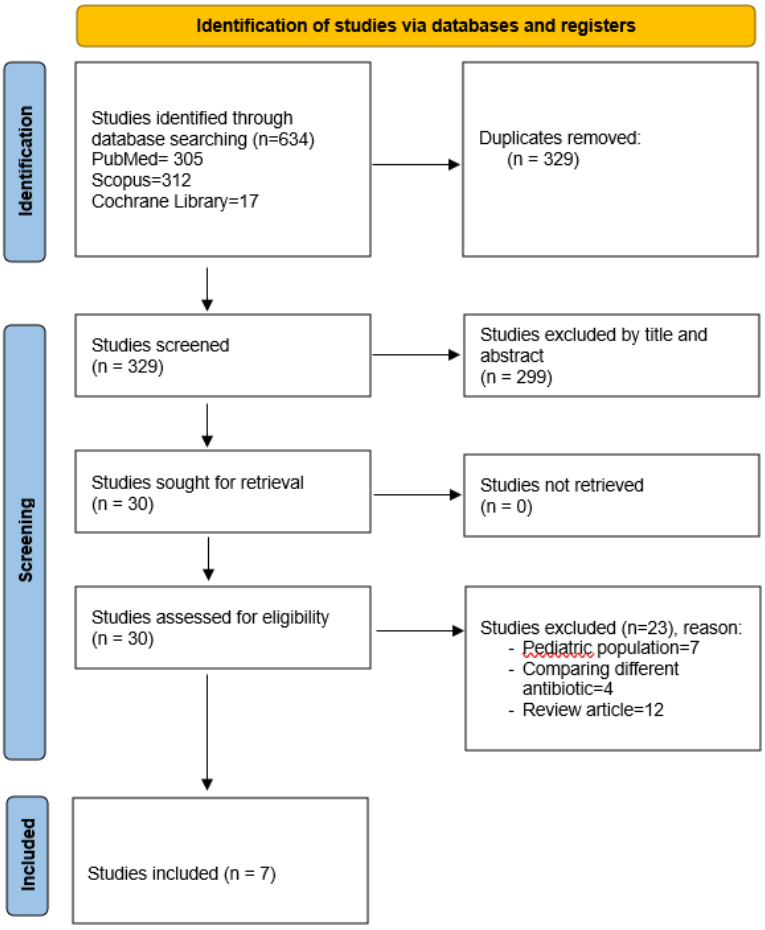

Figure 1. Prisma Flowchart

Table 1. Characteristics of Study

Author (Year)	Country	Study Design	Sample Size (n)	Population Characteristics (Age, Severity: CURB-65/PSI)	Setting (Inpatient/ Outpatient)	Antibiotic Regimen	Short-Course Duration (days)	Standard-Course Duration (days)	Key Findings
Israelsen et al. (2023)(Israelsen et al., 2023)	Denmark	Multicentre cohort study	1151 (short: 327; standard: 824)	Median age 74 years; predominantly mild–moderate CAP	Inpatient	Primarily β-lactam antibiotics	4–7 days (median 6 days)	8–14 days (median 9 days)	No significant difference in 30-day mortality (3.36% vs 3.40%),

				(CURB-65 0–2: ~88%)					readmission, or need for new antibiotics; short-course therapy showed comparable outcomes and supports its use in clinically stable patients
Wang et al. (2026)(Wang et al., 2026)	China (MIMIC-IV database, USA ICU data)	Retrospective cohort study	2590 (short: 1355; long: 1235)	Median age ~65–67 years; severe patients (sepsis, ICU, mechanically ventilated); severity assessed by SOFA, PaO_2/FiO_2	Inpatient (ICU)	Broad-spectrum antibiotics (β-lactams, macrolides, fluoroquinolones, etc.)	2–7 days (median ~4.6 days)	8–14 days (median ~9.7 days)	No significant difference in 90-day mortality (41.3% vs 41.2%); however, long-course may benefit high-risk subgroups (≥65 years, severe hypoxemia, high SOFA, RRT, S. aureus/P. aeruginosa infection)
Mo et al. (2024)(Mo et al., 2024)	Multicentre (Thailand, Singapore, Nepal)	Randomized controlled trial (open-label, non-inferiority)	461 (short: 232; standard: 229)	Median age 64 years; critically ill ICU patients with VAP; moderate severity (SOFA median 6)	Inpatient (ICU)	Culture-directed antibiotics (broad-spectrum, including combinations for MDR pathogens)	≤7 days (as short as 3–5 days; median 6 days)	≥8 days (median 14 days)	Short-course was non-inferior for 60-day mortality or recurrence; significantly reduced antibiotic use and side-effects (8% vs 38%)
Bouglé et al. (2022)(Bouglé et al., 2022)	France (multicentre nationwide)	Randomized controlled trial (open-label, non-inferiority)	186 (short: 88; standard: 98)	Mean age ~59 years; critically ill ICU patients with PA-VAP; moderate–severe illness (SOFA ~7–8)	Inpatient (ICU)	Empirical broad-spectrum followed by culture-guided therapy (β-lactam ± aminoglycoside/ fluoroquinolone)	8 days	15 days	Non-inferiority of short-course was not demonstrated; higher recurrence observed in short-course group, while mortality was similar between groups

Zhao et al. (2016)(Zhao et al., 2016)	China (multicentre, 17 hospitals)	Randomized controlled trial (open-label, non-inferiority)	457 (750 mg: 228; 500 mg: 229)	Mean age ~39–42 years; mild–moderate CAP (CURB-65 0–2)	Inpatient & Outpatient	Levofloxacin 750 mg IV vs 500 mg IV/PO sequential	5 days (mean 4.86 days)	7–14 days (mean 10.35 days)	Short-course high-dose regimen was non-inferior in clinical efficacy (91.4% vs 94.3%); reduced total antibiotic exposure; similar safety profile
Dinh et al. (2021)(Dinh et al., n.d.)	France (16 centres)	Randomized controlled trial (double-blind, placebo-controlled, non-inferiority)	310 randomized (303 ITT)	Median age 73 years; moderately severe CAP (non-ICU); PSI median ~82	Inpatient (noncritical care wards)	β-lactam (amoxicillin-clavulanate or 3rd gen cephalosporin)	3 days	8 days (3 + 5 additional days)	Short-course (3 days) was non-inferior to 8 days in clinical cure at day 15; no difference in mortality or LOS; supports early discontinuation in clinically stable patients
Uranga et al. (2016)(Uranga et al., 2016)	Spain (4 teaching hospitals)	Multicenter randomized controlled trial (non-inferiority, open-label)	312 (intervention: 162; control: 150)	Mean age ~65 years; moderate CAP (PSI mean ~82; PSI I–V included)	Inpatient	Empirical antibiotics (mostly fluoroquinolones, physician-guided)	≥5 days (stopped if clinically stable)	~10 days (physician-determined)	Short-course based on clinical stability was non-inferior in clinical success at day 10 and day 30; reduced antibiotic duration without increasing adverse outcomes

Source: Israelsen 2023; Wang 2026; Mo 2024; Bouglé 2022; Zhao 2016; Dinh 2021; Uranga 2016

Abbreviations: CAP, community-acquired pneumonia; VAP, ventilator-associated pneumonia; PA-VAP, Pseudomonas aeruginosa ventilator-associated pneumonia; ICU, intensive care unit; CURB-65, Confusion, Urea, Respiratory rate, Blood pressure, age ≥65 years; PSI, Pneumonia Severity Index; SOFA, Sequential Organ Failure Assessment; PaO_2/FiO_2, ratio of arterial oxygen partial pressure to fractional inspired oxygen; MDR, multidrug-resistant; RRT, renal replacement therapy; ITT, intention-to-treat.

Table 2. Outcomes of Study

Author (Year)	Clinical Cure (%)	Mortality (%)	Recurrence/Relapse (%)	Length of Stay (days)	Adverse Events (%)
Israelsen et al. (2023)	Not reported	3.36% vs 3.40%	11.9% vs 12.1%	3 vs 4 (median)	Not reported
Wang et al. (2026)	Not reported	41.3% vs 41.2% (90-day) 34.7% vs 33.4% (30-day)	Not reported	ICU: 5.9 vs 11.3 Hospital: 11.0 vs 16.8	Not reported
Mo et al. (2024)	Not reported	35% vs 38%	14% vs 13%	ICU: 27.0 vs 28.5 Hospital: 35.1 vs 35.0	8% vs 38%
Bouglé et al. (2022)	Not reported	24.4% vs 18.6%	17% vs 9.2%	ICU: 34 vs 34	Not reported
Zhao et al. (2016)	91.40% vs 94.27%	0% vs 0%	0.49% vs 1.41%	8.42 vs 10.19	24.56% vs 18.78%
Dinh et al. (2021)	77% vs 68% (day 15) 72% vs 72% (day 30)	2% vs 1%	Not explicitly reported	5 vs 6 (median)	14% vs 19%
Uranga et al. (2016)	Day 10: 56.3% vs 48.6% Day 30: 91.9% vs 88.6%	2.1% vs 2.2% (30-day)	2.8% vs 4.4%	5.7 vs 5.5	11.7% vs 13.1%

Source: Israelsen 2023; Wang 2026; Mo 2024; Bouglé 2022; Zhao 2016; Dinh 2021; Uranga 2016

Data are presented as short-course versus standard-course antibiotic therapy. ICU: intensive care unit; LOS: length of stay.

For community-acquired pneumonia (CAP), this review found that short-course antibiotic therapy (generally 3–7 days) is non-inferior to standard-course therapy in terms of clinical cure and mortality, particularly in patients with mild to moderate disease who achieve early clinical stability (Dinh et al., 2021; Zhao et al., 2016; Uranga et al., 2016). Randomized controlled trials consistently demonstrated comparable cure rates and very low mortality across both treatment durations (Zhao et al., 2016; Uranga et al., 2016). Recurrence rates were also low and similar between groups, while some studies showed reduced length of hospital stay and decreased antibiotic exposure with shorter regimens (Israelsen et al., 2023; Dinh et al., 2021). These findings support current guideline recommendations that antibiotic duration in CAP should be guided by clinical response rather than fixed durations, reinforcing the role of short-course therapy as an effective and safe strategy in appropriately selected patients (Uranga et al., 2016).

For ventilator-associated pneumonia (VAP), the findings were more nuanced and dependent on disease severity and pathogen profile. While short-course therapy (≤7–8 days) was generally non-inferior to longer regimens in terms of mortality (Mo et al., 2024; Bouglé et al., 2022), evidence regarding recurrence was less consistent. In particular, studies involving infections caused by high-risk pathogens such as Pseudomonas aeruginosa demonstrated higher recurrence rates in the short-course group, suggesting that longer durations may be necessary in these populations (Bouglé et al., 2022). Nevertheless, short-course therapy was associated with a substantial reduction in antibiotic-related adverse events and overall antibiotic exposure (Mo et al., 2024). These findings indicate that while short-course therapy

can be safely applied in selected VAP patients, especially when guided by clinical response, caution is warranted in critically ill patients and those with resistant or difficult-to-treat organisms (Wang et al., 2026).

This study is consistent with several previous systematic reviews and meta-analyses that reported no significant difference between short- and long-course antibiotic therapy in pneumonia (Khowaja & Karimi, 2023; Furlan et al., 2019; Daghmouri et al., 2023). However, this study incorporates more recent and diverse evidence, including both randomized controlled trials and real-world observational studies, thereby improving external validity and clinical applicability. This review not only confirms existing evidence but also strengthens it by incorporating newer data, a wider range of patient populations, and more detailed clinical interpretation, making it more applicable to contemporary clinical practice and antimicrobial stewardship strategies.

From a clinical perspective, the findings of this review support a shift toward shorter antibiotic durations in adult patients with pneumonia, particularly those who demonstrate early clinical improvement. However, clinicians should exercise caution in applying short-course therapy in critically ill patients, those with resistant pathogens, or cases with delayed clinical response. Future research should focus on high-quality randomized trials in specific subgroups, including severe pneumonia and pathogen-directed therapy, to further refine optimal treatment durations.

This review has several limitations. First, there was considerable heterogeneity among included studies in terms of patient populations, disease severity, and study settings, ranging from outpatient CAP to critically ill ICU patients with ventilator-associated pneumonia. This heterogeneity limits direct comparability and may affect the generalizability of the findings. Second, variations in definitions of clinical cure, recurrence, and clinical stability across studies may introduce measurement bias. Third, the inclusion of observational studies introduces potential confounding, particularly confounding by indication, where sicker patients are more likely to receive longer antibiotic courses. Although randomized controlled trials provide higher-quality evidence, their number remains limited. Furthermore, not all studies reported all outcomes of interest, particularly adverse events and recurrence, which may lead to incomplete assessment of safety and long-term effectiveness. Publication bias and language restrictions may also have influenced the selection of studies, although efforts were made to minimize these through comprehensive database searching.

CONCLUSION

This systematic review demonstrates that short-course antibiotic therapy is generally non-inferior to standard-course therapy in adult patients with pneumonia, particularly in those with community-acquired pneumonia who achieve early clinical stability. Shorter treatment durations provide comparable outcomes in terms of clinical cure, mortality, and recurrence, while offering additional benefits such as reduced antibiotic exposure, reduced hospital length of stay in some cases, and fewer adverse events, supporting antimicrobial stewardship principles. However, in more severe cases, especially ventilator-associated pneumonia or infections caused by high-risk pathogens such as Pseudomonas aeruginosa, the risk of recurrence may be higher with short-course therapy, indicating that longer durations may still be necessary in selected patients. Therefore, antibiotic duration should not be universally

standardized but individualized based on clinical response, disease severity, and microbiological factors. Overall, these findings support the implementation of shorter antibiotic courses in appropriately selected adult patients with pneumonia, while emphasizing the need for careful clinical judgment in high-risk populations. Further high-quality randomized controlled trials focusing on severe pneumonia and pathogen-specific strategies are warranted to refine optimal treatment durations.

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