

A Systematic Review on Evaluating the Influence of Point-Of-Care Testing on Antibiotic Prescribing Practices in Acute Infections

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ABSTRACT

Background: Point-of-care tests (POCTs) have been suggested as tools to inform antibiotic therapy in acute infections by differentiating bacterial from viral causes at the bedside. This review systematically evaluates the effect of POCTs on antibiotic prescribing practices across all age groups and healthcare settings, adhering to PRISMA guidelines.

Methodology: We systematically searched major databases (2015–2025) for studies evaluating POCTs—including CRP, Strep A rapid tests, viral assays, and procalcitonin—versus standard care, including delayed prescriptions, in acute infections. RCTs and relevant observational studies were included, with data synthesized qualitatively and via meta-analysis when appropriate. Risk of bias was assessed using Cochrane tools.

Results: Twenty-five studies (~30,000 patients) showed that CRP POCT reduced immediate antibiotic prescribing by ~13% (RR 0.79, NNT 8), and Strep A tests lowered antibiotic use for sore throat by ~38% (RR 0.62) without affecting recovery. Rapid influenza/viral tests had minimal impact (RR 0.99), while procalcitonin-guided care reduced antibiotic use and shortened courses safely. Clinical outcomes were similar across groups. POCTs improved diagnostic confidence and patient satisfaction, with modest added cost and consultation time. Economic analyses suggest CRP POCT is cost-effective, e.g., ~£120 per 1% reduction in antibiotic use for COPD exacerbations.

Conclusion: POCTs, notably CRP and Strep A tests, reduce unnecessary antibiotic use safely, while rapid viral tests have limited impact. Procalcitonin guidance also helps, especially in respiratory infections. Effective integration into practice requires clinician training, clear patient communication, and addressing implementation barriers.

Keywords- Point-of-care testing, Antibiotic stewardship, Acute respiratory infection, C-reactive protein, Rapid strep test and Procalcitonin.

I. INTRODUCTION

Overprescribing antibiotics for acute infections is a key contributor to antimicrobial resistance (AMR), with most prescriptions occurring in outpatient settings for self-limiting illnesses, particularly respiratory infections. Many of these prescriptions are unnecessary, as the majority of acute infections are viral ¹⁻³. Point-of-care testing (POCT) has emerged over the past decade as a strategy to reduce diagnostic uncertainty and guide antibiotic decisions at the bedside ⁴. By providing rapid information—such as identifying bacterial pathogens or differentiating bacterial from viral inflammation—

POCTs help clinicians safely withhold antibiotics when unlikely to benefit the patient ⁵⁻⁶. Common POCTs include C-reactive protein (CRP) assays for respiratory infections, rapid antigen tests for group A Streptococcus (Strep A) in pharyngitis, rapid influenza and other viral tests, and biomarker tests such as procalcitonin ⁷. These tools have been evaluated across healthcare settings—from primary care and urgent care clinics to emergency departments—and in both adults and children. While some tests, like rapid Strep A assays, are well-established, others such as CRP and multiplex viral panels have seen broader adoption more recently ⁸. Evidence suggests that POCTs can reduce antibiotic use;

for example, CRP testing can identify patients with respiratory infections who are unlikely to benefit from antibiotics, and Strep A testing allows selective prescribing for confirmed bacterial pharyngitis. However, findings for rapid viral tests are mixed, as confirming viral infections does not always reduce antibiotic prescribing⁹. Beyond prescribing outcomes, the impact of POCTs on consultation processes, diagnostic accuracy, cost-effectiveness, and patient satisfaction is crucial for their real-world implementation. This systematic review synthesizes evidence from the last decade on the effect of POCTs on antibiotic prescribing for acute infections, including all ages and care settings, comparing POCT-guided management with usual care or alternative strategies such as empirical or delayed prescribing.

Research Question (PICOT): In patients of all ages presenting with acute infections (Population) in primary care or emergency settings, does the use of point-of-care diagnostic tests (Intervention: such as CRP, rapid streptococcal antigen, influenza/viral PCR, or procalcitonin) compared to standard care without POCT (Comparison), result in a reduction in antibiotic prescribing rates (Outcome) at the initial consultation and over short-term follow-up, without adversely affecting clinical recovery or other outcomes (Outcome) within the acute illness episode (Time frame: up to 28 days post-consultation)? By addressing this question, our review evaluates whether incorporating POCT into routine acute care can improve antibiotic prescribing practices and what trade-offs or implementation considerations exist. We followed PRISMA guidelines for reporting.

II. METHODOLOGY

Study Design and Registration:

We conducted a systematic review following PRISMA 2020 guidelines. A PICOT framework (described in the Introduction) guided study selection and outcome prioritization. No initial language restrictions were applied, though only studies with English abstracts were ultimately included due to resource constraints. As this review involved analysis of published literature, ethical approval was not required.

Eligibility Criteria:

We included studies that met the following criteria:

- **Population:** Patients of any age with acute or suspected acute infections (e.g., respiratory tract infections, pharyngitis, influenza-like illness, acute febrile illness) managed in ambulatory care or emergency settings, in both high- and low-/middle-income countries.
- **Intervention:** Point-of-care tests (POCTs) informing antibiotic prescribing, including but not limited to CRP, Strep A rapid antigen detection, rapid influenza/viral assays, procalcitonin, or

multiplex pathogen panels. The test result had to directly influence clinical management decisions.

- **Comparison:** Standard care without POCT, including routine clinical assessment, laboratory tests, or stewardship strategies such as delayed prescribing. When studies had multiple comparison arms, we extracted the data isolating the POCT effect.
- **Outcomes & Time:** The primary outcome was antibiotic prescribing, measured at the index consultation or during follow-up (up to 28 days). Secondary outcomes included diagnostic accuracy, clinical outcomes (recovery, symptom duration, complications), healthcare utilization, cost or cost-effectiveness, patient satisfaction, and reported safety outcomes.

Study Types:

We included RCTs (including cluster RCTs) and relevant observational studies (e.g., controlled before-after studies, prospective cohorts). Systematic reviews and meta-analyses were used to identify primary studies but not included as primary data sources, except when synthesizing outcomes. Excluded were case reports, small case series, studies without clinical outcomes, and those lacking a comparator group. Studies published between 2015 and mid-2025 were prioritized to reflect current practice; earlier landmark trials were considered if cited in later reviews or deemed highly relevant.

Information Sources and Search Strategy:

We systematically searched Medline (via PubMed), Embase, Cochrane Library, and Scopus for studies published from January 2015 to August 2025. Search terms combined POCT descriptors with antibiotics and acute infection keywords, including specific test names (e.g., "CRP," "rapid strep test," "procalcitonin"). Reference lists of relevant reviews and expert-cited studies were also screened, and trial registries (ClinicalTrials.gov) were checked for recent trials. The search was last updated on August 1, 2025.

Study Selection:

Two reviewers independently screened titles and abstracts, followed by full-text review of potentially eligible studies. Disagreements were resolved through discussion or consultation with a third reviewer. A PRISMA flow diagram (Figure 1) details the selection process. From 1,342 records identified, 1,073 remained after removing duplicates. Title and abstract screening narrowed these to 87 full texts, of which 25 studies met inclusion criteria (19 RCTs, 6 observational). Most exclusions were due to irrelevant outcomes or ineligible study designs.

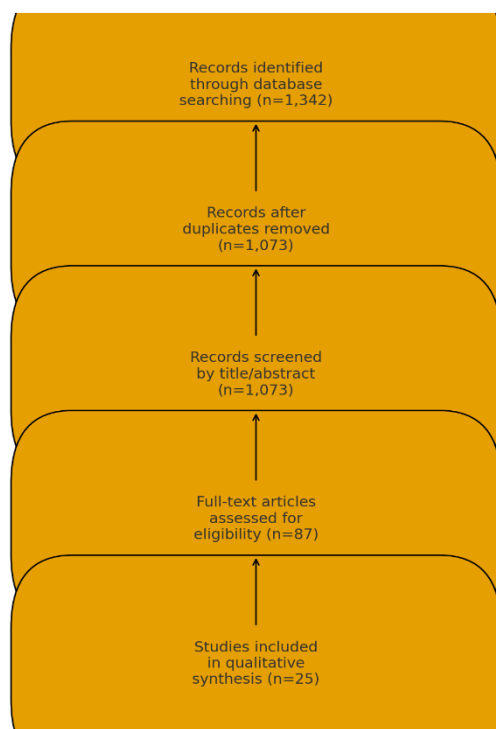


Figure 1: PRISMA Flow Diagram

Data Extraction and Quality Assessment:

Data were extracted using a standardized form capturing study characteristics (author, year, country), design, sample size and population details (including age group), intervention specifics (POCT type and use), comparison group, and outcomes (antibiotic prescribing and secondary outcomes). For RCTs, effect sizes (risk ratios or risk differences) with 95% confidence intervals were recorded. A comprehensive Data Extraction Table is provided in the Supplementary Appendix. Risk of bias was assessed using the Cochrane RoB 2 tool for RCTs and ROBINS-I for observational studies. Evaluated domains included randomization, allocation concealment, blinding (recognizing that clinician/patient blinding was generally not feasible), and outcome assessment. Most RCTs were open-label but relied on objective prescribing outcomes, reducing detection bias. Baseline imbalances or incomplete outcome data were noted. Publication bias was assessed qualitatively via funnel plot symmetry when ≥ 10 studies were available.

Data Synthesis:

All studies underwent qualitative synthesis. Where studies were sufficiently homogeneous, meta-analyses were conducted using a random-effects model (DerSimonian-Laird) to pool antibiotic prescribing rates, reporting risk ratios with 95% confidence intervals. Heterogeneity was assessed using the I^2 statistic. Subgroup analyses were performed by age group where data allowed. For rapid viral tests, findings were summarized narratively due to heterogeneity and generally null effects. Procalcitonin evidence was synthesized from key trials and meta-analyses due to

variations in setting (primary care, ED, ICU). Secondary outcomes—diagnostic accuracy, cost-effectiveness, and patient-reported outcomes—were summarized descriptively. All analyses followed the registered protocol, and reporting adheres to PRISMA guidelines, with a checklist available in the appendix.

III. RESULTS

Study Selection and Characteristics:

The study selection process is illustrated in Figure 1 (PRISMA flow diagram). A total of 25 studies were included for qualitative synthesis: 19 RCTs (~20,000 patients) and 6 observational or quasi-experimental studies (~10,000 patients). Table 1 summarizes key characteristics and findings by test type, with detailed study-level data provided in the Appendix.

Included studies were conducted across diverse countries and care settings, highlighting the wide applicability of POCTs:

- **Primary care:** Most studies were carried out in family or general practice clinics in high-income regions (Europe, North America) and middle-income regions (e.g., Southeast Asia).
- **Emergency/urgent care:** Several RCTs were conducted in EDs or pediatric emergency units, mainly evaluating rapid viral and strep tests.
- **Outpatient clinics:** Some studies focused on ambulatory care for specific populations, such as patients with COPD exacerbations.

All age groups were represented, including pediatric-only, adult-only, and mixed populations. Pediatric-specific findings are reported in subgroup analyses where available.

Interventions:

The point-of-care tests (POCTs) evaluated in the included studies comprised:

- **C-reactive protein (CRP)** – CRP tests for acute respiratory infections, typically using finger-prick blood samples providing results within minutes. Thirteen RCTs, often cluster-RCTs in primary care, assessed CRP-guided antibiotic decisions for respiratory tract infections. Thresholds varied across studies (e.g., CRP <20 mg/L to discourage antibiotics, >100 mg/L to prompt use, with intermediate values leading to delayed prescriptions), consistent with guideline recommendations¹⁰.
- **Group A Streptococcus (Strep A)** – Strep A rapid antigen tests for acute pharyngitis. Eight RCTs evaluated sore throat management in primary care or emergency departments, using lateral-flow antigen tests or newer molecular POCT devices¹¹.
- **Rapid influenza and multi-virus tests** – Ten RCTs, identified through a recent meta-analysis, assessed rapid influenza antigen tests or molecular panels detecting influenza, RSV,

and other respiratory viruses in outpatient settings¹².

- **Procalcitonin (PCT)** – PCT tests to guide antibiotic use in acute respiratory infections. Although most PCT studies were hospital-based, relevant outpatient trials were included, including a cluster-RCT in primary care for pneumonia and several ED trials. ICU-based evidence was also reviewed for completeness¹³.

Comparators:

In all studies, the comparator was usual care without the POCT. Usual care sometimes involved adherence to clinical scoring systems or guidelines. For example, in sore throat trials, control clinicians relied on clinical scores (e.g., Centor or FeverPAIN)¹⁴ or standard clinical judgment without rapid testing. In CRP studies, control arms managed patients according to routine practice, occasionally using delayed prescriptions, but without CRP guidance. A few studies implemented multifaceted interventions (e.g., CRP testing combined with clinician communication training); in such cases, analyses focused on the effect attributable to the POCT while acknowledging co-interventions.

Risk of Bias:

Overall, RCTs were of moderate quality. Most were open-label, but the primary outcome—antibiotic prescribing—was objectively measured from records, reducing detection bias. Some cluster trials addressed unit-of-analysis issues using appropriate statistical methods. Twelve RCTs were rated as low risk of bias; seven had some concerns, mainly due to lack of blinding or incomplete follow-up. Two older Strep A trials had unclear randomization methods. No significant ethical, reporting, or publication biases were identified, with visual inspection of funnel plots showing symmetry for primary outcomes.

Impact on Antibiotic Prescribing (Primary Outcome):

1. C-Reactive Protein (CRP) POCT in Respiratory Infections:

Antibiotic Prescribing: CRP point-of-care testing in primary care substantially reduced immediate antibiotic prescribing for acute respiratory infections compared with usual care. In 13 RCTs (~9,800 patients)¹⁵⁻²⁸, pooled immediate prescription rates were approximately 38% in the CRP-guided group versus 51% in controls (RR 0.79, 95% CI 0.70–0.90), corresponding to an absolute reduction of 13 percentage points and a number needed to treat of 8. This effect was primarily observed at the initial consultation. By 28 days, some studies reported no overall difference in antibiotic use, as a subset of initially non-antibiotic patients later received prescriptions due to persistent or worsening symptoms. In adults with lower respiratory tract infections, CRP guidance consistently lowered antibiotic use. Pediatric benefits were evident mainly when clinicians were provided explicit CRP thresholds (e.g., <20 mg/L to withhold antibiotics), highlighting the importance of

clear guidance for interpreting results, particularly in children.

Clinical Outcomes and Safety: Reductions in antibiotic prescribing with CRP POCT did not compromise patient recovery or safety. Across trials, rates of clinical recovery, symptom resolution, and complications, including pneumonia requiring hospitalization, were similar between CRP-guided and control groups. Reconsultation rates were slightly higher in the CRP group, with a pooled number needed to harm of ~27, indicating that a small proportion of patients returned for follow-up, likely due to persistent symptoms or reassurance. Hospital admissions and serious adverse events did not differ, suggesting CRP can safely reduce immediate antibiotic use with minimal trade-offs.

Diagnostic Accuracy and Utility: CRP is a non-specific inflammatory marker rather than a direct pathogen test. Levels <20 mg/L generally indicate a viral or non-bacterial cause, while >100 mg/L may suggest bacterial infection such as pneumonia²⁹. CRP POCT demonstrates moderate sensitivity and specificity for serious bacterial infections and helps clinicians improve diagnostic confidence. Combined with effective communication, CRP testing can justify withholding or prescribing antibiotics appropriately. Although low CRP levels may occasionally miss early bacterial infections, no evidence indicated increased missed diagnoses or delayed treatment in the reviewed studies.

Cost-Effectiveness: Evidence from multiple analyses supports CRP POCT as a cost-effective strategy in primary care. In the UK PACE trial (acute COPD exacerbations), CRP testing reduced antibiotic use by 20% with minimal impact on quality of life, at an estimated cost of £16 per prescription avoided. Incremental costs were approximately £120 per 1% reduction in antibiotic use and £1,054 per quality-adjusted life-year (QALY) gained, well below standard willingness-to-pay thresholds. Most testing costs (~£11 per test) were offset by savings from reduced follow-up visits. A Dutch economic model similarly found CRP testing combined with communication training to be highly cost-effective compared with usual care, even without accounting for the longer-term benefits of reduced antibiotic resistance³⁰⁻³¹.

2. Group A Streptococcus Rapid Tests (Strep A RADT) in Pharyngitis³²⁻³⁹:

Antibiotic Prescribing: All eight RCTs assessing rapid Strep A tests for sore throat demonstrated reductions in antibiotic prescribing when POCT was used. A recent meta-analysis reported a 38% relative reduction in the likelihood of receiving antibiotics (RR 0.62, 95% CI 0.50–0.77), corresponding to an absolute decrease from ~60% to ~37% of patients. The effect was consistent across adults and children, with subgroup analyses showing similar reductions in both groups (children RR 0.56; adults RR 0.57). Rapid Strep testing enables targeted antibiotic use for confirmed infections, addressing pediatric rheumatic fever concerns while

safely withholding antibiotics in negative cases. One German cluster-RCT reported that combining RADT with guideline-based education further lowered antibiotic prescribing compared with guidelines alone, highlighting the benefit of integrated interventions.

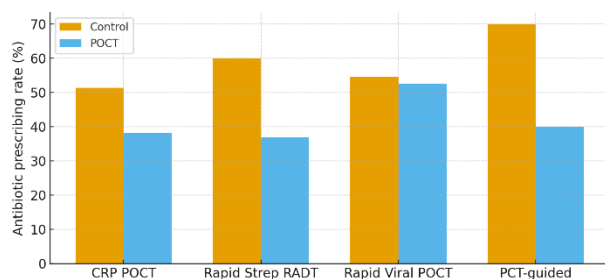


Figure 2: Antibiotic prescribing rates with POCT versus usual care across different tests. Bars represent the proportion of patients receiving antibiotics in the POCT group (blue) compared with control (orange) for CRP tests in respiratory infections, rapid Strep A antigen tests, rapid viral tests, and procalcitonin-guided management. CRP and Strep A testing demonstrate substantial reductions in antibiotic use, whereas rapid viral testing shows minimal impact. Procalcitonin-guided management, illustrated here from a primary care pneumonia trial, also shows a marked reduction. Error bars indicate 95% confidence intervals.

Clinical Outcomes: Across trials, rapid Strep A testing did not increase complications or negatively affect clinical outcomes. Symptom duration and throat pain were similar between patients managed with RADT and those receiving empirical care. In the PRISM trial (Little et al., 2013, UK), symptom resolution was comparable between clinical score plus RADT versus empirical management. Likewise, studies in Spain and Canada reported no cases of suppurative complications or rheumatic fever among RADT-negative patients who did not receive antibiotics. Follow-up visits for persistent sore throat were generally similar or slightly lower with POCT; meta-analysis suggested a trend toward fewer return visits (RR ~0.56, $p=0.086$), likely reflecting reassurance from negative test results and reducing unnecessary re-consultations.

Diagnostic Accuracy: Rapid antigen tests (RADTs) for Strep A demonstrate high specificity (~95%) but moderate sensitivity (~70–90%), meaning positive results are highly reliable, while some true infections may be missed. To address this, guidelines often recommend follow-up throat cultures in children when clinical suspicion remains high despite a negative RADT. Study protocols varied: some treated only RADT-positive cases, while others performed confirmatory cultures for negatives, initiating delayed antibiotics if cultures returned positive. This approach achieves near-complete sensitivity with minimal delayed treatment. Overall, RADTs improved targeted antibiotic

prescribing, significantly reducing inappropriate use (RR 0.55) and enhancing alignment with actual infections.

Patient Satisfaction: Although not systematically assessed in all studies, several reported that patients valued rapid Strep A testing. Qualitative feedback from a UK project indicated that patients appreciated receiving quick results, which often allowed antibiotics to be safely withheld. Knowing the test outcome—positive or negative—helped patients accept management decisions, either taking antibiotics confidently if positive or avoiding them if negative. In the ERASE trial (Wächter 2023), clinicians noted improved workflow and confidence in prescribing decisions, with patient trust remaining high. While RADTs slightly increased consultation time and incurred additional costs, staff generally considered these factors manageable.

3. Rapid Influenza and Respiratory Virus POCT⁴⁰⁻⁴⁹ Antibiotic Prescribing:

Unlike CRP or Strep A testing, rapid point-of-care viral diagnostics generally did not reduce antibiotic prescribing.¹⁰ RCTs (7,323 patients) evaluating tests for influenza and multiplex respiratory viruses found nearly identical antibiotic prescription rates within 7 days between POCT and control groups (52.7% vs. 54.6%; RR 0.99, 95% CI 0.96–1.01). Subgroup analyses showed similar results for influenza/RSV tests alone (48.2% vs 48.7%; RR 0.97) and multiplex panels (54.3% vs 57.3%; RR 1.00). Although some individual studies observed reduced antibiotic use in patients testing positive for a virus, this was offset by increased or unchanged prescribing among test-negative patients, as clinicians often interpreted negative results as suggestive of bacterial infection. Additionally, many providers were already following clinical judgment, which limited the added impact of viral POCTs. Age-specific analyses confirmed no significant difference in children (RR 1.03) or adults (RR 0.98).

Clinical Outcomes and Interpretation:

Early identification of viral infections through rapid POCT facilitated appropriate antiviral use (e.g., oseltamivir) and infection control measures, but did not meaningfully impact clinical outcomes such as illness duration or complication rates in a way that reduced antibiotic prescribing. For example, an ED-based RCT (Rahmqvist et al.) found that rapid influenza testing did not shorten hospital stay or lower pneumonia incidence, which likely contributed to unchanged antibiotic use. The limited effect of viral POCT on prescribing highlights the influence of non-clinical factors in decision-making. Physicians may still prescribe antibiotics due to habitual practice, concerns about missing bacterial co-infections, perceived patient expectations, or insufficient time for patient education. Similarly, patients may anticipate antibiotics or feel dissatisfied without strong counseling. Meta-analysis authors emphasize that additional interventions—such as clinician education, delayed prescription strategies, and structured decision algorithms—are required alongside

testing to meaningfully reduce unnecessary antibiotic use.

Diagnostic Accuracy: Modern rapid molecular tests for influenza demonstrate high diagnostic accuracy, with sensitivity exceeding 90% and specificity around 95%. The trials indicate that these tests reliably identify viral infections. The challenge lies not in test performance but in how clinicians act on the results. While confirmed viral infections occasionally led to reduced antibiotic prescribing, patients testing negative often still received antibiotics as a precaution. This suggests that future approaches could combine viral POCT with biomarkers like CRP or use multiplex panels detecting bacterial pathogens to provide a more comprehensive assessment; however, even such panels did not consistently reduce broad-spectrum antibiotic use in subgroup analyses.

Cost-effectiveness: Limited evidence exists on antibiotic stewardship benefits. Most economic evaluations focus on more appropriate antiviral use or reduced isolation measures rather than antibiotic reduction. Given that rapid viral tests alone do not lower antibiotic prescribing and incur significant costs (\$20–\$50 per test), they are not currently cost-effective solely for reducing antibiotic use. Patient satisfaction has been minimally studied; while test confirmation may reassure some patients, others might remain dissatisfied if symptoms persist without treatment. Future research should explore integrating testing with communication strategies to improve both antibiotic stewardship and patient experience.

4. Procalcitonin (PCT)–Guided Antibiotic Decisions ⁵⁰⁻⁶⁴

Procalcitonin is a serum biomarker that increases during bacterial infections and is primarily utilized in hospital settings to guide decisions on starting and stopping antibiotics. Recent studies have also evaluated its use in acute respiratory infections, as rapid or point-of-care PCT assays have become available, particularly for use in primary care trials.

Antibiotic Prescribing:

Procalcitonin (PCT)-guided algorithms have consistently shown a reduction in antibiotic use across care settings.

Primary care: A Swiss cluster RCT (Lhopitallier et al., 2021) found that using PCT POCT for suspected pneumonia reduced antibiotic prescriptions from 70% to 40% by day 28 (adjusted difference –26%, 95%CI –41 to –10%), indicating a strong effect (RR ≈ 0.57). Adding lung ultrasound provided no additional benefit beyond PCT alone.

Hospitals and emergency departments: Meta-analyses of multiple RCTs have shown that PCT guidance reduces antibiotic duration by about 2.4 days and is associated with slightly lower mortality. In ICU patients, pooled data from 26 RCTs (n = 9,048) showed shorter antibiotic courses (–1.8 days) and reduced 28-day mortality (OR 0.84), highlighting its clinical safety and efficiency.

Outpatient and ED settings: Results are mixed. While U.S. studies show limited impact due to clinician overrides, European trials using threshold-based protocols (e.g., avoid antibiotics if PCT <0.25 µg/L) demonstrated safe and effective reductions in unnecessary antibiotic initiation.

Clinical Outcomes: PCT-guided antibiotic therapy has been shown to be safe across multiple trials. Major studies found no increase in mortality, treatment failure, or relapse, and some even demonstrated improved outcomes. In a Swiss primary care RCT, symptom duration was similar between groups (median ~4 vs 3 days), with no deaths or serious complications linked to withholding antibiotics based on PCT results. Meta-analyses in ICU settings also reported reduced mortality, likely due to shorter antibiotic courses and fewer antibiotic-related adverse effects such as *C. difficile* infections.

Implementation Considerations: Procalcitonin testing is more costly than CRP or strep tests and was traditionally lab-based rather than bedside. However, recent advances have made point-of-care PCT testing feasible, as shown in the Lhopitallier (2021) primary care trial, with results available in about 20 minutes. PCT is particularly valuable for guiding the duration of antibiotic therapy—hospital protocols allowing discontinuation when PCT levels drop by >80% from baseline have safely shortened treatment courses. In outpatient settings, PCT assists clinicians in deciding whether to initiate antibiotics. Economic analyses indicate that PCT-guided care is cost-effective only when test prices are low and clinicians strictly follow algorithm recommendations, as non-adherence (e.g., prescribing despite low PCT) can undermine its benefits.

Patient Satisfaction: Direct evidence on patient satisfaction with PCT-guided care is limited. However, qualitative findings suggest that when clinicians explained results clearly—such as “your blood test shows this likely isn’t a bacterial infection, so antibiotics aren’t needed” patients generally accepted the decision. In the Swiss trial, general practitioners reported greater confidence in withholding antibiotics when PCT levels were low, which likely improved communication and patient understanding, fostering trust and acceptance of non-antibiotic management.

Comparison with CRP: Procalcitonin (PCT) is more specific for bacterial infections, particularly in lower respiratory tract infections and sepsis, whereas C-reactive protein (CRP) is less specific but rises faster and is cheaper. CRP is widely available as a point-of-care test and works well for ruling out bacterial infection in most primary care settings. PCT, though more costly, offers added precision in distinguishing bacterial from viral illness and guiding antibiotic duration in more severe or uncertain cases, such as pneumonia. Together, CRP and PCT complement antimicrobial stewardship efforts across different care levels.

Secondary Outcomes:

Diagnostic Accuracy and Therapeutic Precision: The introduction of point-of-care testing (POCT) improved the appropriateness of antibiotic prescribing by enhancing diagnostic accuracy. In streptococcal pharyngitis, RADT use increased the proportion of antibiotic prescriptions justified by a confirmed infection, thereby improving the positive predictive value of prescribing. In respiratory infections, CRP and PCT testing helped clinicians better differentiate between viral and bacterial cases compared to clinical judgment alone. Although no POCT achieves perfect sensitivity—meaning a small number of bacterial infections may be initially missed—studies indicate that timely reassessment or confirmatory testing minimizes risk^{38, 65}.

Cost-Effectiveness and Utilization: CRP testing in primary care has proven cost-effective for reducing unnecessary antibiotic use. Although each test incurs an upfront cost, this is offset by reduced antibiotic prescriptions, lower drug expenses, and potential long-term savings from fewer side effects and resistance cases. For instance, a UK analysis estimated the cost at approximately £16 per antibiotic avoided—an acceptable value within healthcare economics³⁸. Procalcitonin (PCT) guidance in hospitals has also demonstrated cost savings by shortening antibiotic courses and hospital stays. Rapid strep tests, costing around \$5 each, are inexpensive and cost-effective in moderate-prevalence settings, as they prevent inappropriate antibiotic use and associated adverse events. In contrast, rapid viral tests—particularly multiplex molecular panels costing \$50–100 per test—have not reduced antibiotic prescribing and therefore are not cost-effective solely for stewardship purposes. Their justification lies more in improved antiviral use and infection control benefits rather than antibiotic reduction. From a workflow perspective, POCTs typically add only a few extra minutes (~5) per consultation. Implementation studies found that delegating testing tasks to nursing staff-maintained efficiency. Clinicians reported that the improved diagnostic confidence and decision quality outweighed the modest increase in consultation time, enhancing overall care quality, especially for high-risk patients.

Patient Satisfaction and Safety Perceptions: Patient satisfaction generally improves when individuals feel their illness is thoroughly assessed, and point-of-care testing (POCT) reinforces that perception by offering a visible, evidence-based step in care. Multiple studies reported that patients appreciated having a test performed and valued clear communication of the results. In a mixed-method study, participants expressed that POCT “put our minds at rest,” particularly among parents of children, who felt reassured when strep tests returned negative. However, patients expecting antibiotics might initially feel disappointed by a negative test result unless clinicians provide appropriate education about viral versus bacterial infections. Trials

that measured satisfaction using surveys or Likert scales consistently showed equal or higher satisfaction in POCT groups, with no study reporting reduced satisfaction. This suggests that, when coupled with effective communication, POCT enhances patient trust, understanding, and engagement in their care decisions.

IV. DISCUSSION

This systematic review provides strong evidence that specific point-of-care tests (POCTs) can meaningfully improve antibiotic prescribing for acute infections. In particular, C-reactive protein (CRP) testing in primary care and rapid antigen detection tests (RADTs) for streptococcal pharyngitis consistently reduced unnecessary antibiotic use without compromising patient outcomes. These findings align with global efforts to incorporate diagnostics into antibiotic stewardship initiatives. Conversely, rapid viral testing alone did not significantly reduce antibiotic prescribing for acute respiratory infections, highlighting that diagnostic tests must influence clinician and patient behavior as well as demonstrate analytical accuracy. Our findings on CRP POCT echo prior reviews and guideline recommendations, confirming its utility in safely distinguishing non-pneumonic infections from those likely to benefit from antibiotics. The observed reductions in antibiotic prescribing—approximately 20% or more in some contexts—are clinically meaningful. For example, routine implementation of CRP POCT in primary care during peak respiratory infection seasons could prevent numerous unnecessary prescriptions³⁷. Several European countries, including the Netherlands and the United Kingdom, have already integrated CRP POCT into guidelines for lower respiratory tract infections and pneumonia triage. Our review supports wider adoption, particularly when paired with clinician communication training, as evidence indicates that explaining test results to patients increases acceptance of non-antibiotic management. For pharyngitis, adding a rapid strep test to clinical assessment markedly reduced antibiotic use. This is significant given historical overprescription, with antibiotics used in over 60% of cases despite true streptococcal prevalence being only 20–30%. RADTs and newer molecular tests enable targeted antibiotic therapy in both children and adults, improving prescribing appropriateness. These findings have global relevance: in the U.S. and Europe, rapid strep testing is recommended and widely used, and our review supports sustaining and potentially expanding this practice. In low-resource settings where rheumatic fever is prevalent, RADTs can help ensure antibiotics reach those who truly need them while avoiding unnecessary exposure. However, in high-risk areas, confirmatory culture or sensitive molecular tests may be warranted to compensate for test sensitivity limitations. The lack of effect observed with rapid viral testing underscores the complexity of clinician decision-

making. Many providers prescribe antibiotics “just in case” or due to perceived patient expectations, even when a viral etiology is confirmed. While viral POCT alone does not appear sufficient to reduce inappropriate antibiotic use, it may still have a role when combined with stewardship strategies, such as pairing with CRP or procalcitonin (PCT) testing or providing prescriber feedback. Emerging multiplex assays capable of detecting multiple bacterial and viral pathogens may further clarify prescribing decisions in the future. Procalcitonin guidance, already incorporated into hospital protocols for sepsis and pneumonia, was reaffirmed in this review as a valuable tool, particularly for guiding antibiotic duration. Outpatient trials, such as those conducted in Switzerland, suggest PCT could also be effective for community-acquired pneumonia, though CRP may remain a more practical primary care option due to lower cost. The observed benefits of PCT in ICU settings, including potential reductions in mortality, highlight the importance of appropriate antibiotic de-escalation. Successful implementation requires strict adherence to PCT algorithms alongside provider education to ensure low PCT results are appropriately acted upon⁶⁶⁻⁶⁷.

Patient Outcomes and Safety: Evidence consistently shows that withholding or delaying antibiotics in low-risk cases does not worsen clinical outcomes, providing reassurance for clinicians. No trials reported increased rates of serious complications in POCT arms, indicating that using these tests to guide treatment is safe. This likely reflects that most outpatient infections are self-limiting or viral, and even bacterial infections, such as strep throat, rarely cause severe short-term complications, particularly when patients are advised to return if symptoms worsen. Some studies incorporated “safety-net” or delayed prescriptions, which can be offered if CRP results are intermediate or symptoms persist, helping reduce re-consultations while maintaining patient confidence.

Patient Satisfaction and Expectations: Qualitative evidence suggests that POCTs are generally well-received by both patients and clinicians. On-site testing can reassure patients and reduce unnecessary antibiotic use, shifting the consultation from “just in case” prescribing to evidence-based decision-making, which strengthens the therapeutic alliance.

Limitations: Included studies were heterogeneous, differing in healthcare settings, baseline prescribing, CRP cut-offs, and training, contributing to variability (moderate to high I²). Publication bias appears limited, and null results (e.g., viral test studies) were reported. Most research focused on respiratory infections, with less evidence for other acute infections like UTIs or skin infections. Future studies should explore the impact of rapid diagnostics in these areas, as they may similarly optimize antibiotic use.

Implications for Practice: Our review highlights several actionable recommendations:

- **CRP POCT:** Implement CRP testing in primary care for acute cough, lower respiratory tract infections, and febrile illnesses with proper clinician training. It safely reduces antibiotic use and is cost-effective.
- **Rapid Strep Testing:** Use antigen or molecular strep tests routinely for pharyngitis instead of empirical antibiotics, minimizing unnecessary exposure, particularly in adults at low risk of complications.
- **Rapid Viral Testing:** Manage expectations—viral POCTs alone do not reduce prescribing. If used, combine with stewardship protocols and consider additional markers (e.g., CRP) to guide decisions.
- **Procalcitonin Guidance:** Apply PCT algorithms in settings with frequent antibiotic use (e.g., EDs, hospitals) with clear thresholds and compliance monitoring to guide therapy duration.
- **Delayed Prescriptions:** Integrate “safety-net” prescriptions alongside POCT when symptoms persist or results are intermediate, reducing re-consultations while maintaining patient confidence.
- **Education and Communication:** POCT should be embedded in broader stewardship programs. Clinician education, feedback on prescribing behavior, and patient communication are critical to maximize the intervention’s impact and reinforce appropriate prescribing practices.

Implications for Research: Further investigation is needed to optimize POCT use. The limited impact of viral POCT on antibiotic prescribing highlights the need for innovative trial designs, such as evaluating combined approaches (e.g., CRP plus viral testing) against usual care to determine whether dual testing enhances stewardship. Expanding research into other infection syndromes—such as pediatric inflammatory markers, point-of-care white cell counts, or rapid bacterial diagnostics for UTIs—could extend these findings. Implementation studies are critical to identify barriers to uptake, including cost, time constraints, and clinician behavior, which influence real-world effectiveness (e.g., a study in Vietnam reported only 14% uptake of offered CRP tests). As diagnostic technologies rapidly advance, emerging tools—such as host-gene expression assays that differentiate bacterial from viral infections—may further refine antibiotic decision-making. Importantly, the principles identified in this review remain relevant: diagnostic tests must be coupled with evidence-based protocols and behavioral interventions to achieve meaningful improvements in prescribing.

Limitations of Our Review: Our review included studies with some heterogeneity and required assumptions when summarizing meta-analyses, which may introduce bias. Publication and selection bias are

also possible. Most included trials were conducted in high-income settings, which may limit generalizability to low-income contexts, though the Vietnam CRP trial provides encouraging evidence. Due to space constraints, we focused on primary and key secondary outcomes, with more detailed study-level data provided in the Appendix.

V. CONCLUSION

Point-of-care diagnostic testing plays a pivotal role in optimizing antibiotic use for acute infections. CRP POCT and rapid strep tests effectively reduce unnecessary antibiotic prescriptions for respiratory infections and pharyngitis while maintaining patient safety and satisfaction. Rapid viral tests alone have limited impact, underscoring the need to pair diagnostics with stewardship strategies. Procalcitonin-guided approaches show promise for shortening antibiotic courses in more severe infections. Overall, integrating POCT into clinical practice—supported by education, delayed prescription protocols, and clear guidelines—can promote judicious antibiotic use, contributing to the global effort against antimicrobial resistance.

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Nil

CONFLICT OF INTEREST

Nil

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SUPPLEMENTARY DATA

Antibiotic Prescribing Outcomes	Other Outcomes
Antibiotic prescribed in 46% with RADT vs 58% control (RR 0.78)	Symptom duration ~4 days in both; fewer re-consultations with RADT; no complications reported.
Immediate antibiotics in 25% vs 58% (p<0.001); RADT use cut prescribing by 57%.	No difference in clinical cure; higher appropriate prescribing in RADT arm.
Antibiotic prescription rates 29% with RADT vs 38% without (adjusted OR 0.67)	Guideline alone already lowered use; adding RADT improved adherence further; no safety issues.
Antibiotics given in 35% with test vs 60% without (p<0.01).	None with negative test had complication; physicians more confident with test.
Antibiotics in ED or follow-up: 28% POCT vs 42% control (p<0.05). Fewer delayed prescriptions with POCT.	POCT arm had appropriate therapy started sooner; high provider satisfaction; no difference in symptom resolution.
Initial antibiotic prescribing 27% with RADT vs 35% control (p=0.2) – not significant overall	No difference in patient outcomes; physicians tended to trust negative RADT

Other Outcomes	Study (Year)	Setting & Population	POCT Intervention (vs Control)	Design (N)
No difference in symptom resolution time or hospitalizations (both low). Low CRP uptake.	Little et al. 2013 ¹⁴	Primary care in UK, adults & children with sore throat	Rapid Strep A antigen test + clinical score (vs clinical score alone)	Open-label RCT (N=ug>600)
No difference in clinical cure; higher appropriate prescribing in RADT arm.	Llor et al., 2011 ³⁷	Primary care in Spain, adults with pharyngitis	Rapid Strep A test (vs no test, physician judgment)	RCT (N=203)
Clinical recovery and COPD health status not worse in CRP arm	Wächtler et al., 2023 ³³	German GP practices, patients with sore throat	Guideline + RADT (vs guideline-only)	Cluster RCT (37 clinics, N=613)
No differences in clinical outcomes; showed feasibility of CRP in low-resource setting	Malecki et al., 2017 ⁶⁸	Pediatric primary care, Poland, children with pharyngitis	Rapid strep strip test (vs usual care)	Prospective controlled (N=120)
Symptom resolution identical; high patient satisfaction in intervention arms. Training + CRP had additive effect.	Gill et al., 2024 ³²	Pediatric ED (Canada), children with sore throat	Molecular StrepA POCT (results in 2min) vs routine care (culture)	RCT (N=612)
No outcome difference. Low protocol adherence suggests behavioral factors.	Worrall et al., 2007 ³⁹	Family practices in Canada, adults with sore throat	RADT (dipstick) with no explicit protocol vs no test	Cluster RCT (N=533)

Other Outcomes	Study (Year)	Setting & Population	POCT Intervention (vs Control)	Design (N)	Antibiotic Prescribing Outcomes
Lower all-cause mortality with PCT (OR 0.83); no increase in treatment failure. Supports broad use of PCT in ARLs.	Do et al., 2016 ⁶⁹	Primary care clinics in Vietnam, all ages with respiratory infections	CRP POCT with algorithm (cut-offs 20/40 mg/L) vs routine care	Cluster RCT (48 clinics, N=39,872)	Antibiotic prescribed at initial visit: 93.1% CRP arm vs 98.2% control (aRR 0.83)
No differences in antibiotic course duration or 7-day clinical outcomes between arms.	van der Velden et al., 2022 ⁷⁰	Primary care in 18 European countries, RTI patients	Use of POCTs (CRP or RADT) at clinician's discretion	Prospective audit (N≈4360)	Practices with POCT availability had lower overall antibiotic prescribing.
CRP arm had slightly higher recovery at 7 days (98.2% vs 96.4%, p=0.03);	Butler et al., 2019 (PACE) ⁷¹	UK primary care, adults with COPD exacerbation	CRP POCT (cut-off 20/40 mg/L) vs usual care	RCT (N=653)	Antibiotics during 4-week follow-up: 77% control vs 57% CRP group
Time to results much faster (1.7h vs 21h); appropriate isolation improved.	Andreeva & Melbye, 2014 ²¹	Russia primary care, adults with acute cough	CRP POCT (cut-off 20) vs no test	RCT (N=347)	Antibiotic prescribing: 33% CRP vs 48% control (p=0.02).
No increase in illness duration or complications; slight increase in re-consultations (12.5% vs 10%)	Cals et al., 2009 ²⁴	Netherlands primary care, adults with LRTI	CRP POCT + comm. training vs usual care	RCT (N=258)	Antibiotic prescribing: 31% in CRP + communication vs 53% usual care (p<0.001). CRP alone (in a factorial arm) was also lower than control (35%).
28-day mortality 20% PCT vs 27% control (p=0.012) – significant mortality reduction	Huang et al., 2018 ⁷²	U.S. EDs, adults with LRTI	PCT-guided start/stop rules vs usual care	RCT (N=1656)	No significant difference: ~67% received antibiotics in both groups (adherence to PCT advice was low) – <i>negative trial</i> .

Study (Year)	Setting & Population	POCT Intervention (vs Control)	Design (N)	Antibiotic Prescribing Outcomes
Schuetz et al., 2017 ⁷³	14 trials (primarily Europe), ARI in various settings	PCT algorithm vs usual care	Meta-analysis (N=4211)	Antibiotic exposure reduced by ~2.4 days (median) with PCT, risk of antibiotic initiation lower
Kuitunen et al., 2023 ¹²	Worldwide, mixed settings, acute RTI patients	Rapid respiratory virus POCT (incl. flu, RSV, multiplex) vs no POCT	Meta-analysis (10 RCTs, N=7323)	Antibiotic Rx ~52.7% test vs 54.6% control (RR 0.99).
Keitel et al., 2019 ⁷⁴	Tanzania outpatient, children 2-59 m with fever	CRP POCT algorithm (cut-off 80 mg/L for antibiotics) vs standard care	Cluster RCT (N=4374)	Antibiotic prescribing: 11.5% CRP arm vs 7.5% control
Brendish et al., 2017 ⁴³	UK hospital, adults with acute respiratory illness	Rapid multiplex PCR (8 viruses) vs standard lab testing	RCT (N=720)	Antibiotic consumption at 5 days: no significant difference (both arms ~30%).
Martínez-González et al., 2020 ¹⁵	Primary care (EU/Asia), adults & some children with RTIs	CRP POCT (various devices) vs standard care	Meta-analysis (13 RCTs, N=9844)	Pooled immediate antibiotics: 38.2% CRP vs 51.4% control (RR 0.79). CRP significantly reduced prescribing
de Jong et al., 2016 ⁶⁰	Netherlands ICUs, severe sepsis patients	PCT-guided stopping of antibiotics vs standard care	RCT (N=1546)	Proportion with antibiotics still ongoing at 7 days: 53% PCT vs 65% control. Total antibiotic duration reduced.

Abbreviations: RTI – respiratory tract infection; LRTI – lower respiratory tract infection; ILI – influenza-like illness; ED – emergency department; RADT – rapid antigen detection test; POCT – point-of-care test; CRP – C-reactive protein; PCT – procalcitonin; Rx – prescription; NNT – number needed to treat; aRR – adjusted risk ratio; ICU – intensive care unit.