Placebo found Equivalent to Amoxicillin for Treatment of
Acute Bronchitis in Nairobi, Kenya: A Triple-Blind
Randomized Equivalence Trial

Videlis N Nduba, MB.ChB, MPH 1
Christina W Mwachari, MB.ChB, MSc, MPH 1
Amalia S Magaret, PhD 2
David R Park, MD 3
Andrew Kigo, MB.ChB, M.Med 1
Thomas M. Hooton, MD 4
Craig R Cohen, MD, MPH 5

1Center for Respiratory Disease Research, Kenya Medical Research Institute, Nairobi,
Kenya; 2Departments of Laboratory Medicine and 3Medicine, University of Washington,
Seattle, WA; 4Department of Medicine, University of Miami, Miami, FL; 5Department of
Obstetrics, Gynecology and Reproductive Sciences, University of California, San Francisco,
CA.

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Corresponding Author: Craig R. Cohen, MD, MPH
Department of Obstetrics, Gynecology and Reproductive
Sciences
University of California, San Francisco
50 Beale Street, Suite 1200
San Francisco, CA 94105
Email: ccohen@globalhealth.ucsf.edu

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Abstract

Context: Antibiotic treatment is not recommended for acute bronchitis in immunocompetent patients in industrialized countries. Whether these recommendations are relevant to the developing world and to immunocompromised patients is unknown.

Design, Setting and Participants: Randomized triple-blind placebo-controlled equivalence trial of amoxicillin vs. placebo in 660 adults presenting to two outpatient clinics in Nairobi, Kenya with acute bronchitis but without evidence of chronic lung disease.

Main Outcome Measure: The primary study endpoint was clinical cure as defined by a ≥ 75% reduction in a validated acute bronchitis severity score (ABSS) by 14 days; analysis was by intention-to-treat with equivalence defined as ≤ 8% difference between study arms.

Results: Clinical cure rates in the amoxicillin and placebo arms were 81.7% and 84.0% respectively (difference = 2.3%, 95% CI -8.6% to 4.0%). Of 131 HIV infected subjects (19.8%), cure rates for those randomized to amoxicillin (77.2%) and placebo (83.8%) differed by 6.6% (95% CI -21.7% to 8.6%). Among HIV uninfected subjects, the difference in cure rates was 1.6% (95% CI -8.5% to 5.3%). Potential drug side effects were similar in the two arms. No subjects required hospitalization or died.

Conclusion: Antibiotic treatment of acute bronchitis is unhelpful, even in populations with a high prevalence of HIV infection.

Key words: Acute bronchitis; randomized controlled trial; amoxicillin; placebo; equivalence; HIV; Kenya
**Introduction**

Acute bronchitis is the most common respiratory complication experienced by HIV infected persons, particularly in sub-Saharan Africa. In North American and European studies, antibiotic treatment has not been shown to benefit patients with acute bronchitis,[1-11] and antibiotic treatment is not recommended for this condition in immunocompetent patients in the developed world [12, 13]. Whether these findings and recommendations pertain to immunocompetent and immunocompromised patients in the developing world is unknown. No placebo-controlled trials of antibiotic treatment for acute bronchitis in these settings have been published. Nevertheless, the World Health Organization (WHO) has published guidelines recommending that HIV infected patients with acute bronchitis be treated with ampicillin, and rescue treatment with trimethoprim-sulfamethoxazole given to those patients who fail to respond [14]. A Cochrane database review by Fahey et al of randomized controlled trials comparing any antibiotic therapy with placebo in acute bronchitis concluded that antibiotics may have a modest beneficial effect. The benefit seen with antibiotics in the systematic review could be at least in part due to the anti-inflammatory actions of macrolides and tetracyclines. The magnitude of this benefit, however, was found to be similar to that of the detriment from adverse effects [15].

In a previous study in Nairobi, Kenya, the WHO approach to the treatment of acute bronchitis in HIV infected patients was prospectively evaluated. Of 401 episodes of acute bronchitis, 97% appeared to respond clinically to the 1991 WHO recommended antibiotic regimen [16]. However, we did not test the response rate to placebo alone. Conceivably, as in the case of immunocompetent patients, acute bronchitis may have resolved spontaneously without antibiotic treatment in the majority of the HIV infected subjects.

Treatment of acute bronchitis constitutes the most common indication for antibiotic use in the USA and probably in other regions [17]. This results in high costs, substantial risks of drug side effects, and an increased prevalence of antibiotic resistant pathogens [18]. If antibiotic treatment offers no benefit, it should be withheld in order to minimize these adverse outcomes.

Therefore, we performed a triple-blinded randomized placebo-controlled trial to determine whether amoxicillin and placebo produced equivalent clinical cure rates in the treatment of acute bronchitis in a developing world population with a high prevalence of HIV seropositivity.

**Methods**

The procedures followed were approved by the Kenya Medical Research Institute Ethical Review Committee, the University of Washington Human Subjects Review Committee and the University of California, San Francisco Committee on Human Research, and were in accordance with the ethical standards of the Helsinki Declaration of 1975, as revised in 1983 (Note that study was begun before clinical trial reporting was mandated). We screened all patients ≥ 18 years old presenting with a productive cough of ≤ 2 weeks duration at the Rhodes Nairobi City Council Clinic (RNCC) between October 2001 and February 2004 and at the Outpatient Department of the Nairobi Mbagathi District Hospital (MDH) between October 2002 and August 2003. Eligibility was determined by one of two experienced study nurse-counselors previously trained to identify patients who met eligibility criteria. Patients were excluded if they had another potential explanation for cough (history of chronic bronchitis, allergic rhinitis, sinusitis, asthma, or gastric reflux), serious medical comorbidity...
(heart disease or diabetes), penicillin allergy, antibiotic use in the preceding two weeks, or a concurrent infection (including tuberculosis) requiring antibiotic treatment. Otherwise eligible patients were not enrolled if they were unwilling or unable to participate or if they lived outside of Nairobi making follow-up impractical.

Eligible patients who gave written informed consent were tested for HIV seropositivity using a rapid HIV-1/2 test (Determine, Abbott Park, Illinois USA) with positive results confirmed using a different rapid HIV-1/2 test (Unigold, Trinity Biotech, Bray, Wicklow Ireland). A postero-anterior chest x-ray was performed on all subjects. Those with abnormal chest x-ray findings suggesting pneumonia, tuberculosis, or other diagnoses were excluded from further participation and were referred for appropriate management.

Subjects were randomly assigned one of two study drugs, amoxicillin 500 mg or placebo three times daily for seven days. All study drugs were prepared by the Investigational Drug Services at the University of Washington Medical Center (UWMC), placed in opaque sealed capsules that were identical in appearance, taste, and smell and shipped to the study site in three batches. Doses of twenty-one capsules were packaged in plastic bottles that were identical except for labels that differed only by a unique identification number. Before leaving the study clinic, each subject was observed to take the first dose of study medication.

Subjects were sequentially assigned a trial number previously allocated to either placebo or amoxicillin (randomized in blocks of 10) by the Investigational Drug Services at the UWMC. The randomization allocation of the amoxicillin or placebo was generated using the Excel (Microsoft Inc. Redman, WA) random number generator. In addition to subjects, all members of the research team—investigators, physicians, clinical staff, nurse-counselors, research assistants, data collectors, data-entry staff, and biostatistician—were unaware of the allocation schedule. During the trial the allocation schedule was kept in the office of the Chief Research Pharmacist at UWMC. Masking was maintained until the intention-to-treat analysis was complete; i.e. the analysis was performed by comparing group ‘A’ to group ‘B’.

At enrollment trained personnel administered a questionnaire addressing sociodemographic information and medical history. The study physician (VN) performed a clinical examination and completed a standardized form that included an assessment of the baseline acute bronchitis severity score (ABSS). The ABSS measures a spectrum of 5 patient reported respiratory tract symptoms ranging from perceived severity of illness to subjective fever (Table 1). For each of several symptoms, subjects were asked to gauge severity on a 5-point scale, from non-existent (0) to very serious (4). Validation of the ABSS was carried out during the trial as previously reported [19]. During the enrollment visit sputum was collected for microscopy and culture.

Subjects recruited on Monday, Tuesday and Friday were expected to return for the initial follow-up after 3 days, those enrolled on Thursday were first reevaluated on Monday (4 days), and those recruited on Wednesday were reevaluated initially on Friday (2 days). Subjects were also asked to return for a reevaluation after 7 and 14 days. At each visit a standardized questionnaire was re-administered by a research nurse to assess treatment compliance, side effects and current symptoms. The study clinician repeated a physical examination and assessment of the ABSS. Those who were more than 2 days late for any follow-up visit were traced to either their residence or workplace and referred to the clinic for
evaluation. A trained field officer performed tracing, with every effort made to maintain the subject’s confidentiality. The primary outcome (clinical cure) was defined as a ≥ 75% reduction in baseline ABSS by 14 days. An ABSS at any follow-up visit greater than at enrollment led to open-label treatment with erythromycin 500 mg administered orally every 8 hours for 7 days.

**Statistical Analysis**

We designed the study with sufficient power to evaluate the primary hypothesis: equivalent cure rates for adults treated with amoxicillin or placebo for acute bronchitis. We expected 85% of patients with acute bronchitis treated with amoxicillin would be cured. Based on previous equivalency clinical trials and consensus among the investigators, a difference of 8% was chosen as a reasonable maximal difference in cure rates that could be considered equivalent. For example, any cure rate between 82-98% in the placebo group compared to a cure rate of 90% in the amoxicillin group would be defined as equivalent. Using this definition and a two-sided test with type I error = 5% we planned to enroll 335 per treatment arm to have ≥ 80% power to conclude equivalence and allow for a 10% loss to follow-up.

All data were entered using pre-coded data sheets in TELEform (Cardiff Software, Inc., Vista, CA). Data were analyzed using SPSS for Windows 10.0 (SPSS Inc., Chicago, IL). The analysis was performed in an intention-to-treat manner to evaluate our primary and secondary endpoints. The primary endpoint was the difference in clinical cure rates between the amoxicillin and placebo arms using survival analysis (Kaplan-Meier). Secondary endpoints included the proportion of subjects experiencing treatment failure, defined as subjects failing to achieve a ≥ 75% reduction in ABSS from baseline at 2 weeks of follow-up or requiring open label treatment with erythromycin, and the proportion of subjects reporting potential drug side effects.

The Breslow test statistic, appropriate for Kaplan-Meier survival analysis with heavy censoring was used to compare treatment arms. Ninety five percent confidence intervals (CI) were calculated around the difference in cumulative cure rates to determine whether these met our definition for equivalence (± 8%).

We planned a priori to perform analyses of the primary and secondary endpoints stratified by HIV serostatus. We evaluated whether treatment success rates differed for HIV infected and uninfected subjects that received amoxicillin versus placebo using survival analysis.

**Role of the Funding Source**

The Rockefeller Foundation did not participate in development of the study design, implementation, and analysis of the data or the decision to submit this manuscript for publication.

**Results**

Of the 2,677 subjects with an acute productive cough who were screened for study eligibility 1,230 were ineligible because of one or more exclusion criteria and an additional 787 were excluded due to abnormal chest x-ray findings as interpreted by the study physician; we enrolled 660 subjects (Figure 1). Antibiotic use in the past two weeks, and unwilling to undergo clinical investigation and/or present for follow-up comprised the two most common reasons for exclusion from enrollment at screening; those willing to participate were similar to those unwilling to participate in respect to mean age (31.2 ± 9.6 vs. 31.0 ± 9.5 years, p = .69) and proportion female (56.5% vs. 54.4%, p = .43).
Table 2 shows the baseline sociodemographic and clinical characteristics of the study participants. The baseline ABSS was normally distributed and had a mean score of 6.3 ± 3.6 out of 20 (Figure 2). Follow-up rates at 3, 7 and 14 days in the two treatment arms were not statistically different, with 275 (83%) in the placebo arm and 269 (82%) in the amoxicillin arm completing 14 days of follow-up (Figure 1). Ninety two percent of subjects enrolled in both arms reported taking ≥ 19 of 21 (90%) of the study drug capsules (p = .96). Treatment allocation was not unmasked during the study for any participant. Six hundred and twelve (92.7%) sputum cultures had no growth. Streptococcus pneumoniae was the most common bacteria detected in sputum (N = 40, 6%) followed by Haemophilus influenzae (N = 5, 0.8%) and Staphylococcus aureus (N = 3, 0.5%). Prior to the conduct of this trial the prevalence of penicillin-resistant pneumococci in the study area was 43.3% [20].

The initial reading of chest x-rays was performed by the study physician (VN) at the clinical research site. Subsequently, the chest x-rays were reviewed by a consultant radiologist. Of the participants whose initial chest x-ray was interpreted as normal, 101 (15%) were subsequently found to have abnormal chest x-ray findings, mostly “increased vascular markings” interpreted by the radiologist as suggestive of pneumonitis, with no statistical difference by study arm allocation (40 (12%) vs. 42 (13%)). According to our study protocol based on concerns for safety, participants with an abnormal chest x-ray consistent with pneumonitis were automatically switched to open label treatment with erythromycin at their first follow-up visit. Although the primary intention-to-treat analysis included all subjects randomized to one of the treatment arms, we also performed a subgroup analysis on the 559 (85%) subjects with normal chest x-ray findings by the radiologist’s reading.

Overall, subjects randomized to amoxicillin and placebo had no significant difference in the cumulative proportion achieving clinical cure by 14-days, 81.7% and 84.0%, respectively (difference = 2.3%, 95% CI -8.6% to 4.0%, p = .40; Figure 3). The mean decline in the ABSS score was 4.6 ± 3.7 and 4.8 ± 3.8 for the amoxicillin and placebo arms, respectively. The proportion who met our criteria for clinical cure (reduction in ABSS from baseline ≥ 75%) did not change after limiting the survival analysis to the 559 participants who had normal chest x-ray findings confirmed (82.2% vs. 84.7% overall, p = .29).

Symptoms that potentially represented adverse events attributable to treatment were reported during follow-up by 183 (58.5%) and 186 (60.4%) of those who received amoxicillin and placebo, respectively (p = .34). The number of subjects reporting anorexia (129 (42%) vs. 111 (36%), p = .12), nausea (92 (30%) vs. 94 (30%), p = 1.0), vomiting (17 (6%) vs. 18 (6%), p = 1.0), abdominal pain (74 (24%) vs. 80 (26%), p = .71) and diarrhea (26 (8%) vs. 34 (11%), p = .34) were not statistically different in the amoxicillin and placebo arms of the study, respectively.

We performed an intention-to-treat analysis of all participants, most of whom were unaware of their HIV serostatus at the time of presentation. An a priori goal of this study was to perform an analysis of clinical cure stratified by HIV serostatus. No statistical differences were found between the amoxicillin and placebo arms for either HIV infected (Figure 4, p = .94) or HIV uninfected subjects (p = .35; Table 3).

Our a priori definition of equivalent clinical cure between study arms was an outcome difference of ≤ 8%. To more easily interpret our findings in the context of an equivalence trial, we calculated the difference in clinical cure with corresponding 95% CI between the...
study arms. Table 3 demonstrates these results for the overall study population, for subjects with a confirmed normal chest x-ray, and for HIV infected and uninfected participants. For the overall study population, the difference in cure rate was 2.3% (95% CI -8.6% to 4.0%; meaning that in 95% of identically designed trials in the same population, the effect of amoxicillin would fall within 8.6% worse and 4.0% better than that of placebo. Thus, we had 95% confidence that the confidence limits only slightly exceeded our pre-selected definition of equivalence (± 8%). The difference and confidence limits were similar when the analysis was limited to include only those with a confirmed normal chest x-ray and for HIV seronegative participants. The difference in outcomes between study arms in the HIV-infected group was small (6.6%), but the 95% confidence limits were wider (-21.7% to 8.6%) due to the smaller numbers and limited statistical power [Note that the point estimate favors placebo in every comparison]. Further stratified analysis of the HIV infected subgroup using CD4 counts as a covariate did not change the outcome; similar findings were found when limiting the analysis to the 559 subjects with normal chest radiographic findings (data not shown).

Discussion

Our study is the largest placebo controlled trial of antibiotic treatment of acute bronchitis that has been reported [1-4, 6, 8-11]. It is the first to study patients in the developing world, and the first to include HIV infected subjects. Notably, ours is also the first study of acute bronchitis treatment to use an equivalence design—intended and powered to prove equivalent treatment effects as opposed to the lack of a significant difference in effects.

As an equivalence trial, this study is distinct from previous randomized controlled trials of acute bronchitis, which tested for superiority of an antibiotic over placebo [1-4, 6, 8-11]. Superiority trials that fail to demonstrate a statistical difference between two interventions, or an intervention and a placebo should not be misinterpreted as demonstrating equivalence when in fact they are underpowered to do so within the clinically relevant margins [21]. Interpretation of equivalence trials requires evaluation of confidence intervals for the differences in treatment outcomes and the clinical importance of such differences, rather than statistical significance [22].

The determination of what constitutes a clinically significant difference is an essential part of the design of an equivalence trial, but this is a necessarily arbitrary distinction. In computing the sample size for our study we arbitrarily defined ± 8% to be the minimum treatment difference that would be considered clinically significant. The 95% confidence interval for the difference in treatment effects in our study ranged from 8.6% worse cure rate to a 4.0% better cure rate with amoxicillin in comparison to placebo. This range is within our a priori criteria for equivalence at the upper level As a result, we are 95% confident that the outcomes of amoxicillin treated patients are ≤ 4.0% better than those of patients given placebo.

The burden of respiratory tract infection (RTI) is far greater in sub-Saharan Africa than in the US and Europe [16, 23], and sociodemographic and behavioral risk factors for acute bronchitis that may affect etiology and clinical course differ between developed and developing regions, e.g. cigarette smoking vs. poverty factors, respectively [24]. Thus findings of studies in North America and Europe may not be applicable to sub-Saharan Africa and other developing regions. In this context, it is reassuring to find that our results agree with those of earlier investigations including a recently published paper that did not find any benefit of azithromycin over low-dose vitamin C [3].
Our study measured disease severity using a pre-defined, easily replicable acute bronchitis severity score composed of RTI related symptoms, as well as an a priori definition of clinical cure. We chose to develop our ABSS due to the lack of published disease-specific severity scoring systems for patients with acute bronchitis. This newly developed score proved reliable, valid and highly responsive [19]. The only other acute bronchitis study that has used a disease-specific symptom scoring system was published after the design and onset of our study [3].

Our inclusion of HIV infected subjects is another important contribution. Acute bronchitis arguably may be the most common HIV associated opportunistic infection [23]. Although antibiotic treatment is recommended by the WHO for HIV infected subjects with acute bronchitis [14], whether antibiotic treatment results in any benefit has been unknown. To address this issue, we chose to enroll all subjects with acute bronchitis, then to stratify our analyses based on HIV serostatus. This reflects the real-world situation in which diagnosis and treatment decisions often must be made in advance of awareness of an individual patient’s HIV serostatus. In our study, HIV infection did not affect the resolution of acute bronchitis. Furthermore, separate analysis of HIV infected and uninfected participants demonstrated similar responses for those randomized to amoxicillin and placebo. However, this study was not powered to unequivocally establish equivalence in the HIV infected subgroup; comparing amoxicillin to placebo the 95% CI (-21.7% to 8.6%) extends slightly beyond our pre-defined criteria for a clinically important treatment difference. An adequately powered randomized placebo controlled equivalence trial of antibiotic treatment for acute bronchitis in HIV infected adults would be needed to definitively settle this question.

Our study had several limitations. The lack of a substantial effect of antibiotic treatment might be attributed to the use of the wrong antibiotic. We chose to use amoxicillin rather than a newer antibiotic because it is affordable, widely available and prescribed, and, most importantly, was recommended by the WHO for the management of acute bronchitis in HIV infected patients [14]. The lack of an effect of azithromycin in another recent trial further supports the notion that antibiotic therapy, in general, offers little benefit for the treatment of acute bronchitis [3]. The argument against antibiotics for treatment of acute bronchitis is further re-enforced by the Cochrane review by Fahey et al which concluded that the magnitude of benefit of antibiotics was similar to detriments from adverse effects [15].

Fifteen percent of randomized subjects had abnormal chest x-rays identified by the consultant radiologist after randomization. In most of the cases, the finding was “prominent vascular markings” that may have represented pneumonitis, or may have been unrelated to the acute respiratory illness. In any case, for safety reasons these subjects were withdrawn from the randomized treatment trial and given open label erythromycin at the next follow-up visit (usually day 3). This delay in receiving treatment may have inadvertently increased the rate of treatment failure in both arms. However, limitation of the analysis to those with confirmed normal chest radiographs did not affect our study outcome. Our defaulter rate was similar in both study arms; 17.6% of study participants did not complete full evaluation of study outcomes. Unfortunately, we cannot determine whether those lost to follow-up improved, worsened or remained clinically unchanged.

Several additional factors related to selection of participants may limit the external validity of our study and therefore require further discussion. Although most patients diagnosed with acute bronchitis do not have a chest x-ray performed, we excluded those with abnormal
radiographic findings to avoid delaying treatment of individuals with pneumonia and tuberculosis. Future investigations should prospectively measure the predictive values of clinical algorithms to diagnose pulmonary infiltrates in populations with high HIV seroprevalence, a method found moderately useful in studies conducted in the U.S. [25, 26]. For obvious reasons we excluded patients unwilling to participate in the study. Although those unwilling to participate were more likely to report another exclusion criterion such as recent antibiotic use, and duration of cough $\geq$ two weeks than those willing to participate, the analysis revealed no major source of selection bias that could seriously invalidate the generalizability of the study results.

This study was conducted in cooperation with the Integrated Management of Adolescent and Adult Illness (IMAI), part of the 3 by 5 Initiative at the WHO [27]. As such these data have provided necessary evidence to help revise the IMAI Acute Care Module for first level facility health workers in resource poor settings [27]. Results from this and other trials need to influence not only treatment guidelines, but also patient awareness [12] in order to guide more responsible antibiotic use in the treatment of RTIs.
Conflict of interest statement
We declare that we have no conflict of interest.

Authors’ Contributions
I declare that I participated in the following in respect to the development of this manuscript and that I have seen and approved the final version of this manuscript: V Nduba implemented the study, collected the data, performed the analysis and wrote the manuscript. C Mwachari designed the protocol and supervised study implementation, analysis of the data and writing of the manuscript. A Magaret advised on study design, supervised data analysis and assisted with manuscript preparation. D Park helped oversee study implementation, and supervised data analysis and writing of the manuscript. A Kigo assisted with study implementation, and oversaw the radiographic elements of the study. T Hooton helped with study design and review of the manuscript. C. Cohen designed the protocol and supervised study implementation, analysis of the data and writing of the manuscript.
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Reference:


Figure 1: Trial profile of a triple-blind randomized placebo controlled trial of amoxicillin for treatment of acute bronchitis

Figure 2: Distribution of baseline clinical severity score (ABSS) used to determine the severity of the 660 enrolled cases of acute bronchitis in 660 (Mean = 11.0 ± 5.1).

Figure 3: Cumulative proportion clinically cured, as defined by a ≥ 75% reduction in baseline clinical severity score (in days), by treatment group (See Figure 1 for numbers censored at 3, 7 and 14 days because of drop out).

Figure 4: Among HIV-infected participants, cumulative proportion clinically cured, as defined by a ≥ 75% reduction in clinical severity score (in days), by treatment group (numbers censored at 3, 7 and 14 days were 10, 17 and 33, respectively).
Table 1: Acute Bronchitis Severity Score (ABSS) for acute bronchitis based upon 0 to 4 for each of 5 symptoms (maximum score = 20).

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall severity of illness</td>
<td>Very mild</td>
<td>Mild</td>
<td>Moderate</td>
<td>Serious</td>
<td>Very serious</td>
</tr>
<tr>
<td>Day cough</td>
<td>1-2 times/day</td>
<td>3-5 times/day</td>
<td>6-10 times/day</td>
<td>11-20 times/day</td>
<td>&gt; 20 times/day</td>
</tr>
<tr>
<td>Night cough</td>
<td>1-2 times/night</td>
<td>3-5 times/night</td>
<td>6-10 times/night</td>
<td>11-20 times/night</td>
<td>&gt; 20 times/night</td>
</tr>
<tr>
<td>Limit daily activity</td>
<td>None</td>
<td>Mild</td>
<td>Moderate</td>
<td>Severe</td>
<td>Very severe</td>
</tr>
<tr>
<td>Subjective fever</td>
<td>None</td>
<td>Mild</td>
<td>Moderate</td>
<td>Severe shaking chills</td>
<td>Very severe</td>
</tr>
<tr>
<td>Characteristic</td>
<td>Placebo n = 330</td>
<td>Amoxicillin n = 330</td>
<td>P Values</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>-----------------</td>
<td>---------------------</td>
<td>----------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sociodemographic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean age ± SD</td>
<td>29.7 ± 9.4</td>
<td>29.8 ± 8.8</td>
<td>.94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>205 (62.1)*</td>
<td>195 (59.1)</td>
<td>.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIV-infected</td>
<td>66/330* (20.0)</td>
<td>65/329 (19.8)</td>
<td>.94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- CD4 counts (25, 75 percentiles)</td>
<td>303 (119, 516)</td>
<td>367 (197, 530)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cigarette smoker</td>
<td>38/323 (11.8)</td>
<td>40/326 (12.3)</td>
<td>.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Single</td>
<td>109/328 (33.2)</td>
<td>114/330 (34.5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Married/cohabiting</td>
<td>202/328 (61.6)</td>
<td>189/330 (57.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Divorced/separated/widowed</td>
<td>17/328 (5.2)</td>
<td>27/330 (8.2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>215/327 (65.7)</td>
<td>235/330 (71.2)</td>
<td>.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has savings</td>
<td>103/327 (31.5)</td>
<td>108/329 (32.8)</td>
<td>.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education ≤ 8 years</td>
<td>164/327 (50.2)</td>
<td>160/330 (48.5)</td>
<td>.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Symptoms</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>shortness of breath</td>
<td>108/323 (33.4)</td>
<td>106/326 (32.5)</td>
<td>.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>chest pain</td>
<td>240/323 (74.3)</td>
<td>237/325 (72.9)</td>
<td>.72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>wheezing</td>
<td>149/323 (46.1)</td>
<td>134/326 (41.1)</td>
<td>.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean duration of cough days ± SD</td>
<td>8.3 ± 4.3</td>
<td>8.4 ± 4.4</td>
<td>.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>anorexia</td>
<td>109/323 (33.7)</td>
<td>117/326 (35.9)</td>
<td>.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nausea</td>
<td>58/323 (18.0)</td>
<td>73/326 (22.4)</td>
<td>.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vomiting</td>
<td>21/323 (6.5)</td>
<td>21/326 (6.4)</td>
<td>.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>abdominal pain</td>
<td>58/323 (18.0)</td>
<td>59/326 (18.1)</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>diarrhea</td>
<td>14/323 (4.3)</td>
<td>17/326 (5.2)</td>
<td>.71</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*All parenthesis represent percentages except where noted

ϕ Relevant denominator indicated
Table 3: Clinical cure estimates and confidence intervals in the two treatment arms.

<table>
<thead>
<tr>
<th></th>
<th>All subjects included N = 660</th>
<th>Subjects with normal x-ray* N = 559</th>
<th>HIV +/ve N = 131</th>
<th>HIV -/ve N = 529</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Placebo</td>
<td>Amox</td>
<td>Placebo</td>
<td>Amox</td>
</tr>
<tr>
<td>Cumulative proportion cured</td>
<td>84.0%</td>
<td>81.7%</td>
<td>84.7%</td>
<td>82.2%</td>
</tr>
<tr>
<td>Difference in cure rates</td>
<td>2.3%</td>
<td>2.5%</td>
<td>6.6%</td>
<td>1.6%</td>
</tr>
<tr>
<td>95% CI for difference</td>
<td>-8.6% to 4.0%</td>
<td></td>
<td>-9.2% to 4.2%</td>
<td></td>
</tr>
</tbody>
</table>

* After enrollment and randomization, 101 subjects were determined to have an abnormal chest x-ray by the consultant radiologist leaving 559 evaluable participants.
Figure 1: Trial profile of a triple-blind randomized placebo controlled trial of amoxicillin for treatment of acute bronchitis

Assessed for Eligibility
n = 2,677

Excluded
n = 1,230 (45.9%)

Reasons for exclusion not mutually exclusive
322 (26.2%) Cough > 2 weeks
11 (0.9%) Less than 18 years of age
501 (41%) Unable or unwilling to undergo clinical investigation and/or present for follow-up
74 (6.0%) Living out of Nairobi
89 (7.2%) Chronic bronchitis
130 (10.6%) Asthma
200 (16.3%) Postnasal drip or allergic rhinitis
42 (3.4%) Sinusitis
63 (5.1%) Allergic to penicillin
474 (38.5%) Antibiotic use in the preceding 2 weeks

Eligible
n = 1,447 (54.1%)

CXR performed

Abnormal x-ray
n = 787 (54.4%)

Normal CXR
Randomized
n = 660 (45.6%)

330 allocated to treatment Placebo
330 received intervention

330 allocated to treatment Amoxicillin
330 received intervention

Followed up at
3 days: n = 313 (95%)
7 days: n = 294 (89%)
14 days n = 275 (83%)

Followed up at
3 days: n = 315 (95%)
7 days: n = 298 (90%)
14 days n = 269 (82%)

All included in survival analysis

All included in survival analysis
Figure 2: Distribution of baseline clinical severity score (ABSS) used to determine the severity of the 660 enrolled cases of acute bronchitis in 660 (Mean = 11.0 ± 5.1).
Figure 3: Cumulative proportion clinically cured, as defined by a $\geq 75\%$ reduction in baseline clinical severity score (in days), by treatment group (See Figure 1 for numbers censored at 3, 7 and 14 days because of drop out).
Figure 4: Among HIV-infected participants, cumulative proportion clinically cured, as defined by a ≥75% reduction in clinical severity score (in days), by treatment group (numbers censored at 3, 7 and 14 days were 10, 17 and 33, respectively).