

Assessing the quality of the management skills required for lower respiratory tract infections in Kilimanjaro, Tanzania

Bernard Mbwele^{1,2}

¹Kilimanjaro Clinical Research Institute, Kilimanjaro Christian Medical Centre, Moshi, Tanzania; benmbwele@gmail.com

²ART Project, Christian Social Service Commission, CSSC, Mwanza, Tanzania

Received 4 November 2013; revised 15 December 2013; accepted 26 December 2013

Copyright © 2014 Bernard Mbwele. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. In accordance of the Creative Commons Attribution License all Copyrights © 2014 are reserved for SCIRP and the owner of the intellectual property Bernard Mbwele. All Copyright © 2014 are guarded by law and by SCIRP as a guardian.

ABSTRACT

Background: Lower respiratory tract infections (LRTI) are among the leading causes of morbidity and mortality. A severe form of atypical pneumonia, Q fever, has been found in Northern Tanzania. Assessment of the quality of health care for lower respiratory tract infection from the clinicians' performance has rarely been performed. **Methods:** A cross sectional descriptive study using the qualitative and quantitative approaches for assessing clinicians and patient files from 11 health facilities of Kilimanjaro region. The facilities were of 4 different levels of public health care delivery and 1 private independent hospital. **Results:** Medications for LRTI were highly variable in 346 files and from attempts of treatment reported in 53 clinician's interviews. No file showed attempts for assessing the severity of Pneumonia. Only 6 (11.1%) clinicians could mention causes of atypical pneumonia. Only 7 clinicians (13.0%) were aware of Q-fever and could mention the cause. The quality of clinical records for monitoring the progress was not the same in all levels of care and the difference in availability was statistically significant as level of mental state $\chi^2(4) = 139.4$; P value < 0.001, blood pressure $\chi^2(8) = 75.2$; P value < 0.001, temperature $\chi^2(4) = 78.7$; P value < 0.001, pulse rate $\chi^2(4) = 139.1$; P value < 0.001, respiratory rate $\chi^2(4) = 197.7$; P value < 0.001, auscultation $\chi^2(4) = 92.2$; P value < 0.001. **Conclusion:** National guidelines for LRTI in Tanzania shall include severity assessments and how to rule out atypical pneumonia using evidence base ap-

proaches.

KEYWORDS

Quality; Health Care; Lower Respiratory Tract Infections; Tanzania; Sub-Saharan Africa

1. BACKGROUND

Since the beginning of WHO reports on Global Burdens of Diseases [1], lower respiratory tract infections (LRTI) have been reported to cause considerable morbidity and mortality worldwide [2-6]. They place a huge strain on the health budgets [7]. LRTI are responsible for an estimated 4% of all deaths in high income countries and for almost 7% of all cause mortality in low income countries [8,9].

Microbial agents causing community acquired pneumonia (CAP) are the commonest causes of LRTI in sub-Saharan Africa [4] in both HIV positive and HIV negative individuals [10]. The management of LRTI is complex due to the emerging drug resistant microorganisms [11]. It is now more evident in East Africa [12] that resistance jeopardises outcome of care. Following diversity in causality, severity and resistance patterns guiding management of LRTI is of paramount importance [13]. This has resulted in various national and international guidelines for the management of CAP in the developed world [14,15].

The most important guide is the assessment for the severity of the LRTI to guide management options by scores. One of clinical scores is CURB-65 (or in its simplified form CRB-65) by British Thoracic Society rules [14] and the other one pneumonia severity index (PSI) by American thoracic society (ATS)/Infectious diseases society of America (IDSA) [16-18].

Atypical pneumonia caused by *Chlamydia pneumoniae*, *Mycoplasma pneumoniae*, *Legionella pneumophila*, *Chlamydia psittaci* (psittacosis), *Francisella tularensis* (tularemia), and *Coxiella burnetii* (Q fever) [19,20] tends to present as a severe form of LRTI. Studying the epidemiology of atypical pneumonia is emerging to be of vital importance in East Africa (tropic countries) as in the temperate areas [21]. Currently, the incidence of infections with atypical micro-organisms such as Q-fever [22] or Legionella [23] is unknown, while those with known trends HIV and TB are further studied [24-26]. However, there is an advance in the management of atypical pathogens causing LRTI in developed temperate countries [27-29] than in the tropics. This scenario might be explained by the difficulty in culturing and the expense of serology. The guidelines for management of LRTI and atypical pneumonia will be more useful in the tropics diagnostic facilities and treatment options are often suboptimal.

While almost all high-income countries have national guidelines on LRTI's, there are only few countries in sub-Saharan Africa using LRTI guidelines [17]. Countries with a particular guideline in LRTI often do not actively monitor the adherence of such guidelines [30]. Evidence exists in that guidelines for LRTI in sub-Saharan Africa are often not followed, leading to longer hospital stay and increased mortality [30-32].

In Tanzania, patients with LRTI are managed by the standard treatment guideline [33]. Little is known about health care workers' (HCW) theoretical knowledge of LRTI and their daily practice for LRTI. Moreover, there is little insight in barriers they may experience while trying to provide optimal care, such as limited diagnostic facilities or lack of antibiotics. The aim of this project was to assess the current diagnostic and treatment practices in patients with LRTI in different health care settings in Tanzania.

2. METHODS

2.1. Study Design

The cross sectional study using both qualitative and quantitative methods. The study was conducted in the 11 hospitals of different levels of care in Tanzania.

The study population included health care providers (clinicians) from 11 facilities of Kilimanjaro region in northern Tanzania. The 10 facilities were public with 4 different levels of health care *i.e.* 1 zonal referral, 1 regional hospital, 4 district hospital and 4 health centers and the 11th was the independent private church based hospital. Data was collected by a semi-structured interview with HCW on their management of LRTI and 2 assessments of case record files of admitted patients with a LRTI.

By purposive sampling technique only clinicians who have been working in internal medicine and or outpatient and causality, where patients with lower respiratory tract

infections have been attended. From the list of clinicians available in the facility, a sample that covers a half or more of the clinicians was framed.

2.2. Sampling

Clinicians who have been working in internal medicine or outpatient clinic for the past 12 months with the possibility of seeing patients with LRTI were selected. Within the sample all levels clinicians at a proportion of 50% or more was used (a minimum of 10 clinicians).

For medical records, files of the patients who have been admitted in the hospital primary due to lower respiratory tract infection selected. By purposive sampling technique, hospital files were recruited from the list admitted patients with LRTI. Hospital files that show admission history in the past 6 months to 1 year was collected. Files of the patients admitted with many different diseases and files of the patients who have never been admitted were excluded.

2.3. Data Collection

Semi-structured interviews on dummy patients were conducted to study the current practice by clinicians. Two dummy cases of different presentation were described and then clinicians were asked to give responses on what they think might be appropriate in managing the patient with lower respiratory tract infection. Two dummy cases were used in the interview reflecting severity of illnesses. A first case was for a *55 year old male who presented with cough for 10 days, fever and shortness of breath*. A second one was for *68 year old woman who presents at the OPD (Out-Patient Department) with a history of productive cough for one week, a breathing rate of 32 breaths/min and a blood pressure of 85/55 mmHg*. Where the information was further needed probing for inner insight was done. Guided interviews were used to collect information from clinicians regarding what is used in reaching the diagnosis, assessing the severity of disease and treating the patients.

A guided data extraction was executed so as to compare current healthcare as provided with care as recommended. A review of patient files for the diagnoses and prescriptions was conducted. Then all files that were indicated by the admission book to contain any of the diagnosis of lower respiratory tract infection were recorded by registration numbers and then traced in the medical record unit. Matched names and hospital registration number was used to recruit files into the study.

2.4. Data Analysis

Data from the questionnaires and case report forms were entered in Microsoft Access 2007 database. Data cleaning was done by the principle investigator and

the IT data manager. Data were stored in a database with two data sets made by Microsoft Access 2007. Data on records and those from the interviews were analyzed by STATA v10 StataCorp, TX, USA).

Narratives were manually analyzed by Excel 2007, transcription into themes which were coded by footnotes and sub-coded into various categories which were then manually counted so as to gather summary information. For each striking finding in the qualitative narrative that provides evidence, was explored and described into meaningful results from which we could draw conclusion of the study we have conducted.

2.5. Ethics

Ethical approval was obtained from Local Ethical committee of Kilimanjaro Christian Medical College bearing number 477. Then a letter of approval was submitted to the regional medical officers and districts medical officers, then to Medical officer in-charges of the hospital facilities. Before the interviews the medical officer in charges and hospital administrators were given a leaflet of study information. Then a written signed consent was obtained for accessing hospital files. In parallel to this, hospital administration teams will be asked for arranging appointments the interviews, and then the consent was obtained from health workers. Information from the patient's files was entered using new codes that have been defined by the study designed.

3. RESULTS

3.1. From the Interviews

We were able to study a total of 53 narratives from the clinicians' interviews and 346 case report forms from 365 patient files were collected from 11 health facilities (19 files were excluded by age and diagnosis) (see **Table 1**). From the interviews, one had to be excluded because it was incomplete. **Table 2** shows an overview of the number of interviews and CRF per facility. A total of 54 interviews with an asymmetrical distribution of qualifications and an average experience of 7.7 years \pm 8.3 years, minimum of 0.17 years and a maximum of 38 years.

Fourteen (25.9%) reported having had training for diagnosis and management of TB, LRTI and/or TB in HIV-infected patients or training in LRTI in children.

Regarding the causes of atypical pneumonia only 6 (11.1%) clinicians could mention microorganisms causing atypical pneumonia. Chlamydia spp was mentioned five times, *Legionella* spp three times, *Mycoplasma* spp three times and *Coxiella burnetii* once. From these clinicians three were medical officer registrars; one was a resident, one a junior specialist and one a senior specialist. Only 7 clinicians (13.0%) Clinicians-mentioned to be aware of Q-fever and could mention the cause of Q-fever. Three of these clinicians were medical officer registrars from the designated district hospitals (Church supported), three were residents from the referral hospital and one was a junior specialist from the referral hospital.

None of the clinicians interviewed mentioned a scor-

Table 1. Summary of the hospital facilities, clinicians and patients studied.

Facility CODE	Level of facility	Support	District location	No. of interviews	No. of case report files
F01	District hospital	Government based	Hai District	8	41
F02	Health center	Government based	Hai District	4	21
F03	Regional hospital	Government based	Moshi District	6	31
F04	District hospital	Government based	Siha District	5	14
F05	Health center	RK church based	Siha District	2	18
F06	District hospital	Government and church based	Moshi Rural District	8	41
F07	Independent hospital	Church based	Moshi Rural District	5	30
F08	Health center	Government based	Moshi District	5	25
F09	District hospital	Church based	Moshi District	4	30
F10	Health center	Government based	Moshi Rural District	2	21
F11	Referral hospital	Government and church based	Moshi District	6	93

Table 2. Clinicians' experience of working for the respiratory diseases by the level of qualification.

Duration of experience in years	Qualification of the HCW						Total
	CO	AMO	MO registrar	Resident	Jr Spec	Sr Spec	
<1.00	5	1	1	0	0	0	7
1.00 - 4.99	8	5	2	4	1	0	20
5.00 - 9.99	4	6	1	0	0	1	12
10.00 - 24.99	5	6	0	0	0	1	12
25.00+	0	1	1	0	0	0	2
Total	22	19	5	4	1	2	53

HCW = health care worker, CO = clinical officer, AMO = assistant medical officer, MO reg = medical officer registrar, Res = resident, Jr Spec = junior specialist, Sr Spec = senior specialist.

ing system like PSI or CRB-65. Some clinicians mentioned the use of some parameters of the CRB-65 in their assessment of severity; however they did not refer to the specific scoring system. The level of consciousness was mentioned by 5 (9.3%) clinicians and the respiratory rate by 14 (25.9%). Age was only mentioned once and the level of blood pressure was not mentioned at all. Assessment of severity was mostly mentioned to be done on clinical findings related to the respiratory system and other results of the laboratory investigations. Decision to admit or to treat the patient at OPD is shown in **Table 3**.

There was no clear evidence on what guides clinicians to decide when, where and how to treat the patient with LRTI. A total of 50 (92.6%) clinicians would start treatment immediately after examination and/or reaching the provisional diagnosis. Three clinicians would say the patient should start with their treatment at home. One clinician will only start treatment immediately if the temperature was above the 38°C.

For inpatient the clinicians mainly monitor the patient clinically through the vital signs measured by nurses, clinical improvement of the patient and findings on physical examination. Most clinicians visit their patients daily during ward rounds. For outpatients monitoring is more difficult. Most clinicians ask the patient to come back to the hospital if the medication does not work. Some ask the patient to come back after a certain amount of days varying from 2 to 7 days.

Majority of the clinicians would treat the Lower respiratory tract infection patients empirically in the first attempts (see **Tables 4, 5** and **Tables A1-A3** where the later shows differences in prescriptions by the level of health care delivery from a referral hospital, regional

hospital, district hospital, health centers and one independent church based hospital). These medications were mentioned to be monotherapy of benzylpenicillin, amoxicillin, cloxacillin or Ampicillin. Alternatively benzylpenicillin for 72 hrs followed by ampicillin first choice. The double combined therapy of ampicillin/benzylpenicillin with aminoglycosides was spared mostly for severe forms. Two clinicians mentioned combination therapy directed at both typical and atypical pathogens. One clinician wanted to give erythromycin, which covers both types of pathogens. Erythromycin was also included as alternative for preferred initial treatment by three clinicians.

Third generation cephalosporin were commonly used in the second attempts for LRTI treatment. For example in the first attempt by amoxicillin orally, cephalosporin were 13 out of 22 for the none severe form and 7 out of 24 for the severe one. For the IV benzylpenicillin, cephalosporin were 7 out of 15 from the non severe form of LRTI and 6 out of 8 among the severe one. For IV benzylpenicillin and followed by oral amoxicillin, 2 out of 4 second attempts were cephalosporin. However for amoxicillin/ampicillin and gentamycin, 1 or none of the second attempts were cephalosporin as there was a higher attempts to refer patients in this scenario.

3.2. From the Files

A total of 346 case files were studied where the average age of patients was 48.19 ± 22.02 years with a range of 18 to 107 years. The description of history of illness by the chief complaints and duration illnesses before presenting to the Hospital facility is described in **Table 6**. The attempts of clinician to do physical examination for the patients are shown in **Figure 1**.

Table 3. Clinicians' management for non severe LRTI and severe LRTI.

Criteria of the management	Case 1 (mild LRTI)	Case 2 (severe LRTI)
Most probable Micro-organisms causing LRTI	161 agents mentioned from 52 Clinicians. <i>Streptococcus pneumoniae</i> 47 times (87.0%), <i>Haemophilus influenzae</i> 20 (37.0%), <i>Staphylococcus</i> spp 16 times (29.63%), <i>Mycobacterium tuberculosis</i> 14 (25.9%). <i>Mycoplasma</i> 2 times (3.7%), <i>Legionella pneumophila</i> 2 times (3.7%) and <i>Chlamydia</i> spp 1 (1.8%). None of the interviewed named <i>Coxiellaburnettii</i> . Others Para-influenza virus, RSV, <i>Pneumocystis jiroveci</i> , <i>Campylobacter</i> spp, <i>unspecified</i> nosocomial infections.	149 agents from 52 Clinicians, <i>Streptococcus pneumoniae</i> 44 times (84.6%), <i>Staphylococcus aureus</i> 30 times (57.7%), <i>M. tuberculosis</i> 16 times (30.8%) and <i>Haemophilus influenzae</i> 10 times (19.2%). <i>Legionella</i> 8 times (5.4%), <i>Chlamydia</i> 6 times (4.0%) and <i>Mycoplasma</i> 6 (4.0%). <i>Coxiellaburnettii</i> was again not mentioned. Other micro-organisms mentioned included: PCP, <i>Rickettsia</i> spp, HIV, Duclii- <i>Haemophilus</i> , Para-influenza, <i>unspecified</i> anaerobic bacteria and fungal infections.
Diagnostic tests preferred	Chest X ray 90.6%, Full Blood Picture 58.5%, AFB test 49.1%, ESR 43.4%, Sputum Culture 20.8%, Blood culture 5.6%, Lung function test 5.6%, Bronchoscopy 0.0%, BAL 0.0%.	Chest X ray 78.4%, Full Blood Picture 60.8%, AFB test 58.8%, ESR 41.1%, Sputum Culture 25.5%, Blood culture 17.7%, Lung function test 5.8%, Bronchoscopy 5.8%, BAL 0.0%.
Place of treatment	OPD medication at home 14.8%, Start medication at OPD then home 13.0%, Admit and treat in the ward 68.5%, ICU 0.0%, Refer immediately 1.9%, Missing 1.9%.	OPD medication at home 13.0%, Start medication at OPD then home 11.1%, Admit and treat in the ward 64.8%, ICU 5.6%, Refer immediately 3.7%, Missing 1.9%.
First choice treatment	Benzylpenicillin iv or im 16 (29.6%), Ampicillin and gentamycin 11 (20.4%), Amoxicilline oral 10 (18.5%), Ampicillin iv 3 (5.6%), Benzylpenicilline and chloramphenicol 2 (3.7%). Benzylpenicillin and gentamycin 2 (3.7%), Ampiclox (cloxacillin and ampicillin) 2 (3.7%), Chloramphenicol single therapy 2 (3.7%), Amoxicillin-clavulanic acid and azithromycin 1 (1.9%).	Amoxicillin 24 (44.4%), Benzylpenicillin 8 (14.81%), Benzylpenicillin and then amoxicillin 4 (7.4%), Cloxacillin 3 (5.6%), Anti-TB treatment 2 (3.7%), Ceftriaxone 2 (3.7%), Cotrimoxazole 2 (3.7%), Gentamycin 2 (3.7%).

Table 4. The second and third attempt of treatment given after treatment failure in Case 1.

First mentioned treatment		Second attempt		Third attempt	
				Refer	5
				Further investigations	3
		Cephalosporin, ceftriaxone	13	Discuss with coworkers	2
				Consider TB	2
				Cocktail of antibiotics*	1
Amoxicilline	22	Continue amoxicillin treatment	2	Further investigations	2
		Benzylicillin chloramphenicol	2	Refer	1
				Further investigations	1
		Erythromycin	2	Benzylicillin	1
				Further investigations	1
		Cloxacillin	1	Benzylicillin	1
		Benzylicillin and gentamycin	1	Discuss with coworkers	1
		Broader spectrum antibiotics	1	Further investigations	1
				Refer	4
		Ceftriaxone	7	Further investigations	2
				Consider TB	1
		Add erythromycin	1	Further investigations	1
		Add gentamycin	1	Further investigations	1
Benzylicilline	15	Chloramphenicol	1	Further investigations	1
		Amoxicillin	1	Ceftriaxone	1
		Cloxacillin	1	Discuss with coworkers	1
		Refer	1		
		Further investigations	2		
		Gentamycin	1		
Benzylicilline and amoxicilline	3	Chloramphenicol	1	Refer	2
		Further investigations	1	Ceftriaxone	1
Ampiclox	2	Gentamycin and chloramphenicol	1	Refer	1
		Ceftriaxone	1	Further investigations	1
Chloramphenicol	2	Benzylicillin	1	Ceftriaxone	2
		Amoxicillin and gentamycin	1		
Gentamycin	2	Cotrimoxazole	1	Further investigations	2
		Ceftriaxone	1		
Amoxicillin-clav	1	Cephalosporins	1	Consider TB	1
Amoxicilline and gentamycin	1	Broader spectrum antibiotics	1	Further investigations	1
Benzylicilline and chloramphenicol	1	Ceftriaxone	1	Refer	1
Ceftriaxone	1	Anti-TB treatment	1	Fungal	1
Cotrimoxazole	1	Ciprofloxacin	1	Ceftriaxone	1
Erythromycin	1	Amoxicillin	1	Further investigations	1
Flucamox	1	Cephalexin	1	Discuss with coworkers	1
Paracetamol and await results	1				

*Cocktail of antibiotics: cephalosporins, knamycin, amikcin and gentamycin.

The trends of performing investigations and prescription found from the files are shown in the [Figures 2](#) and [3](#). Most of the tests like were not performed in the health centers due to unavailability of the radiography at the level of the health centers. HIV and AFB tests were performed at a frequency of 64 and 69 times respectively. The frequency was determined by the strength of internal audits and hospital based staff motivation. HIV test results were positive at a frequency of 33 (51.6%) and AFB were positive at a frequency of 22 files (31.9%).

3.3. CURB 65 Matrix

It was possible to ascertain the use of CURB 65 parameters in a quarter of the files we assessed. This is because there were 89 files (25.72%) with records of the level of mental state. The possibilities for performing CRB 65 from the data we captured are shown in [Table 7](#). The antibiotics that were prescribed are shown in [Figure 3](#). Anti-TB treatment was prescribed in 27 (7.8%) of the cases.

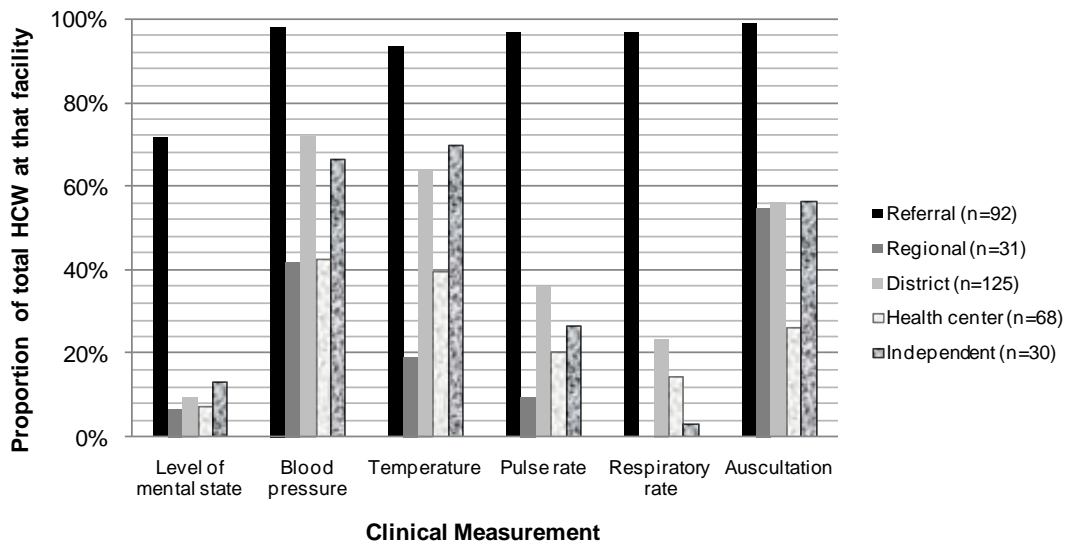
Table 5. Second and third attempt after treatment failure in Case 2.

First mentioned treatment		Second attempt		Third attempt	
				Refer	3
		Cephalosporin, ceftriaxone	7	Further investigations	3
				Discuss with coworkers	1
				Refer	1
		Add gentamycin	3	Further investigations	1
				Discuss with coworkers	1
		Erythromycin	2	Further investigations	2
		Cotrimoxazole	2	Benzylpenicillin	1
Amoxicillin	24			Further investigations	1
		Chloramphenicol	2	Cephalosporins	1
				Further investigations	1
		Benzylpenicillin and amoxicillin	1	Refer	1
		More broad spectrum antibiotics	1	Consider atypical pneumonia	1
		Continue treatment with amoxicillin	1	Cotrimoxazole	1
		Anti-histamine	1	Further investigations	1
		Further investigations	2		
		Refer	2		
				Refer	2
		Cephalosporin, ceftriaxone	6	Further investigations	2
				Cloxacillin	1
				Anti-TB treatment	1
		Erythromycin	1	Further investigations	2
		Amoxicillin	1		
		Ceftriaxone	2		
Benzylpenicillin and amoxicillin	4	Chloramphenicol	1	Refer	4
		Erythromycin	1		
		Ceftriaxone	2	Refer	1
				Anti-TB treatment	1
		Available alternative treatment	1	Further investigations	1
		Another anti-TB treatment	1	Further investigations	1
		Missing	1		
		Carbendazim	1	Further investigations	1
		Add cloxacillin and erythromycin	1	If HIV positive: add cotrimoxazole	1
		Amoxicillin	1	Further investigations	1
		Further investigations	1		
		Ceftriaxon	2	Further investigations	2
		Losartan	1	Discuss with coworkers	1
		Refer the patient	1		1
		Amoxicillin and gentamycin	1	Cephalosporin	1
		Ringer lactate	1	Discuss with senior	1
		Refer the patient	1		
		Missing	2		

Table 6. Chief complaints as found from the files of admitted patients.

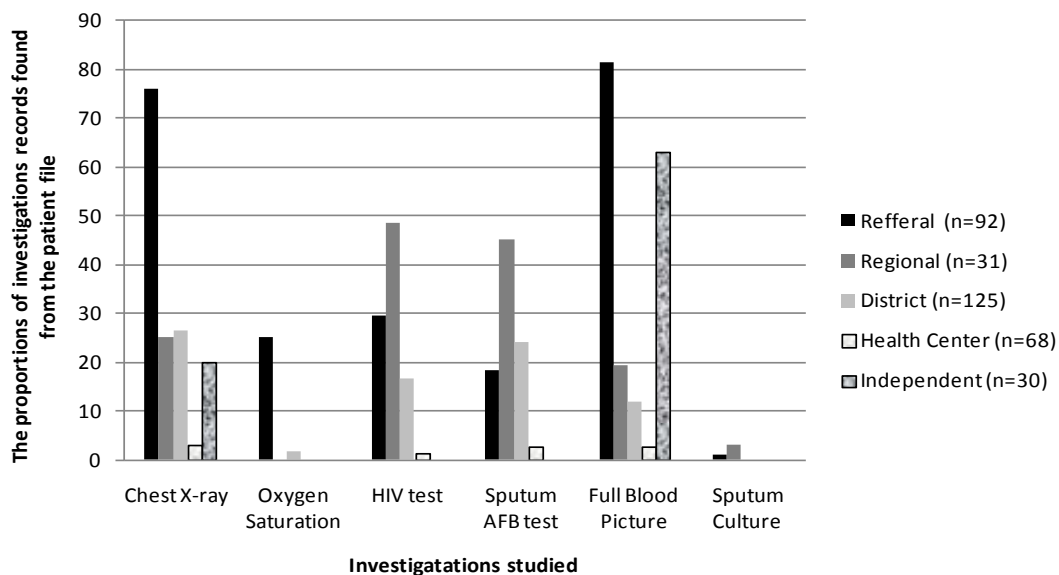
Chief complaints	Frequency	Proportion	No. of files with durations known	Median days (range)
Dry cough	168	50.9%	116 (69.1%)	3.50 (min 1, max 730)
Productive cough	92	27.8%	63 (68.5%)	7.00 (min 1, max 365)
Difficult breathing	93	28.2%	64 (68.8%)	5.00 (min 1, max 180)
Fever	119	36.1%	80 (67.2%)	3.00 (min 1, max 365)
Chest pain	135	40.9%	86 (63.7%)	4.00 (min 1, max 1825)
Chest tightness	79	23.9%	48 (60.8%)	3.00 (min 1, max 730)

The reason for admission has not been included in the analysis, because it was often not described why a patient had been admitted.



Level of mental state $\chi^2 (4) = 139.4154$, P value < 0.001, Blood pressure $\chi^2 (8) = 75.2312$, P value < 0.001, Temperature $\chi^2 (4) = 78.7069$, P value < 0.001, Pulse rate $\chi^2 (4) = 139.0601$, P value < 0.001, Respiratory rate $\chi^2 (4) = 197.7278$, P value < 0.001, Auscultation $\chi^2 (4) = 92.1555$, P value < 0.001.

Figure 1. Clinical measurements that were recorded per level of facility.



Chest x ray $\chi^2 (8) = 130.4546$, P value < 0.001, Oxygen saturation $\chi^2 (4) = 59.3082$, P value < 0.001, HIV test $\chi^2 (4) = 41.6205$, P value < 0.001, Sputum for AFB $\chi^2 (4) = 29.7077$, P value < 0.001, Full blood picture $\chi^2 (4) = 163.6747$, P value < 0.001, Sputum Culture $\chi^2 (4) = 5.4928$, P value = 0.240.

Figure 2. Laboratory investigation as shown in the files.

Table 7. The CRB-65 score of the case files in which the CRB-65 could be measured.

Severity	CRB-65 score	frequency	Proportions of measurable CRB-65
Non-severe	0	18	26.9%
	1	26	38.8%
Mild	2	13	19.4%
	3	10	14.9%
Severe	4	0	0%
	5	0	0%

3.4. Outcome of Care of the Patient Files

The patients files showed that the majority of patients admitted with LRTI in the region were discharged with further treatments. The outcome of death was ranking the second of all possible outcome of care studied as shown in **Figure 4**.

4. DISCUSSIONS

Clinicians in Kilimanjaro region are not well informed

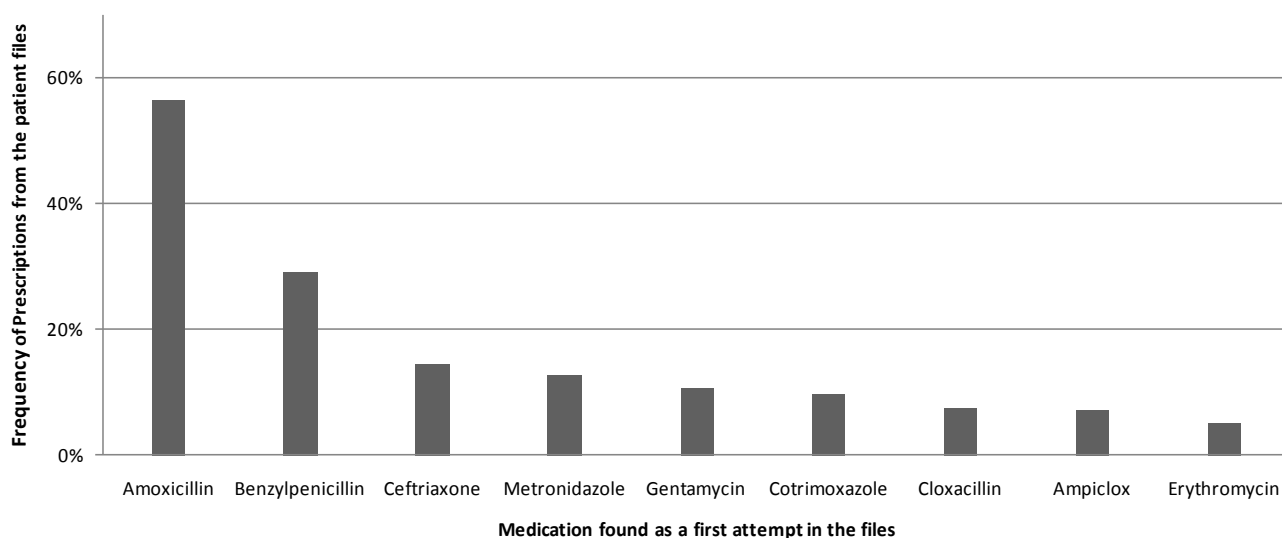


Figure 3. Antibiotics as prescribed in the patient files.

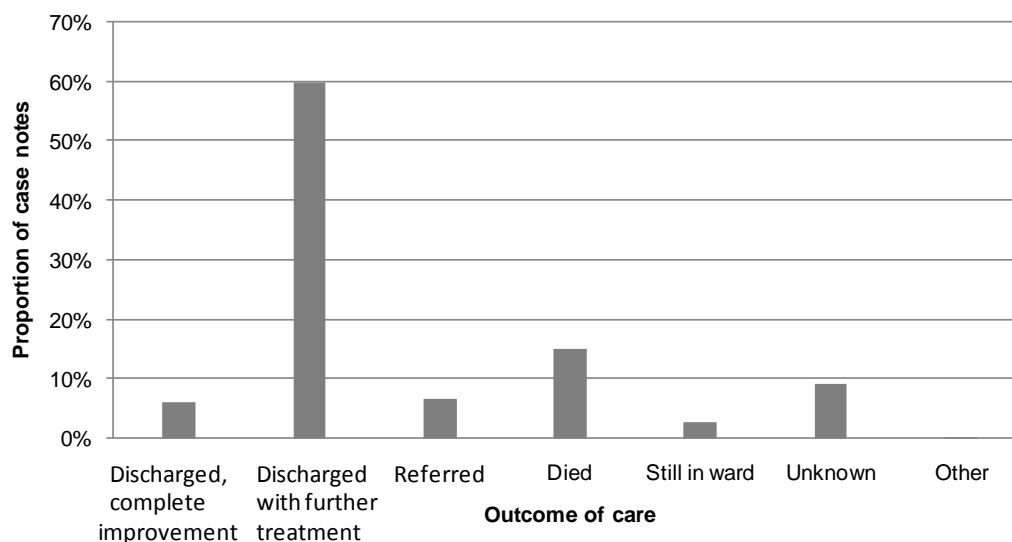


Figure 4. Outcome of care from patients with LRTI.

on the principles of management of LRTI. While Clinicians are guided by the Standard Treatment Guideline [33] and the TB/HIV manual for Clinicians in Tanzania [34], hardly clinicians could mention these guidelines to be in use. Despite massive efforts to diagnose [24] and treat Tuberculosis [25] a thin line of lung infection is forgotten and leave clinicians into dilemma.

Our findings from patient files assessment was similar to local audits that can be routinely performed in the health facilities of Kilimanjaro region, then Tanzania and sub Saharan Africa in general.

Most patient files in the hospitals of Kilimanjaro region presented with dry cough and chest pain as chief complaints. However, there was a strong tendency of clinicians not to write the duration of symptoms presented. physical examination was often not performed and there

was a high tendency of missing out of the records of care.

In addition from invariable explanations from Clinicians, patients' files have reveals no clear tool or score chart to be followed for the assessment of severity and choice of treatment regimen for LRTI. This means most of decisions to admit or to release the patient for home care were not well guided. Evidence from the files studied showed that CRB-65 [18] score could be calculated from only 20% of patient files.

The diagnostic tests such a chest X-ray is variably unavailable at district hospitals and not available at all in health centres where most of patient with LRTI are seen for primary care. Our study from the files reveals chest X-ray to be requested in only 33% of patients, compared to the 90% of clinicians who stated to wish to perform a

chest X-ray in the interviews. Sputum gram stain test was found to be not in practice for most of cases with sign and symptoms of LRTI despite attempt of requesting Sputum for AFB at 25%. While there is an emphasis on PITC in Tanzania [35], rarely HIV test was performed [36] despite higher proportions of seropositive results among admitted patients tested.

Clinicians often present with experience of irrational antibiotic prescriptions for LRTI. For example, antibiotics covering gram negative pathogens aminoglycosides were prescribed at a proportion higher than expected. While unguided third generation cephalosporin were prescribed after each finding of a clinical failure. This is not in line with the recommendations from Tanzania standard treatment guideline [33] or from South Africa guideline on CAP for the regional perspectives [17] or international references [28].

Very few clinicians had essential knowledge of atypical pathogens and these were not covered in the empiric antibiotic regimen in both non-severe and severe pneumonia. We could find that atypical species like *Coxiella* spp are not covered well by the experience of clinicians from Kilimanjaro region [22]. Therefore there is a missed focused for atypical pathogens, especially in patients with severe pneumonia. Our study brings up a concern of missed opportunities for diagnosis and treatment of atypical pneumonia like Q fever in Kilimanjaro region and so Tanzania as a representative of sub-Saharan Africa.

The clear need for the evidence based guideline to treat LRTI in sub-Saharan African countries needs to set into practice accordingly.

Study Limitations

One big limitation of the study is the lack enough records in the files as some tests might have been requested, but not recorded in the files. I was hard to estimate the time taken from the point of prescription to the point of administering the medication.

There was a limitation of funds, that made our study design to be a cross-sectional rather than a longitudinal one. The time to conduct a follow up of patients after health care. This means outcome of care and the current practice was difficult to study as a course of association. Due to a limitation of funds larger sample size was not easily attained but through the use of qualitative design it will be feasible to conclude from the results.

The design of the study contains qualitative approach and therefore the investigator has used semi structured questionnaires in which associations might be studied.

5. CONCLUSION

It is possible to work on the parameters for assessing the severity of illness for lower respiratory tract infec-

tion. Management of lower respiratory tract infection and atypical pneumonia shall be guided by the local audits reflected by the national guidelines.

ACKNOWLEDGEMENTS

Appreciation to Nijmegen University Medical College (UMCN) of Radboud University for the support. I acknowledge Quirijn de Mast, Marlies Hulscher, Andre van der Ven from the UMCN for the technical assistance provided for the study design. I also acknowledge, Patrick Kweka and Angelique Slot for data collection, Marycellina Msuya of KCMC nursing college Prof Gibson Kibiki and Prof Moshi Ntabaye for their technical input in logistics.

RECOMMENDATIONS

There is a need of strengthening the local audits for mapping the gaps of quality improvement. The tool for high suspicion of atypical pneumonia and severity index shall be developed and its use must be well guiding the health care workers.

COMPETING INTERESTS

The study was funded by the Radboud University Nijmegen Medical Centre, Institute of Quality of Healthcare as the pilot study for development of a research project for improving quality of lower respiratory tract infection in Tanzania. The author does not hold any stocks or shares in an organization that may in any way might be affected by this publication.

AUTHORS' CONTRIBUTION

BM developed a concept of research work, proposal development, data collection, database development, analysis, report writing and writing of the manuscript.

AUTHOR'S INFORMATION

BM is a Tanzanian medical doctor and a clinical researcher who worked at Kilimanjaro Clinical Research Institute of Kilimanjaro Christian Medical Centre, Moshi Tanzania. He is currently working for Christian Social Service Commission as a CQI specialist.

REFERENCES

- [1] Lozano, R., Naghavi, M., Foreman, K., Lim, S., Shibuya, K., *et al.* (2012) Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: A systematic analysis for the Global Burden of Disease Study 2010. *Lancet*, **380**, 2095-2128. [http://dx.doi.org/10.1016/S0140-6736\(12\)61728-0](http://dx.doi.org/10.1016/S0140-6736(12)61728-0)
- [2] Murray, C.J. and Lopez, A.D. (1996) Evidence-based health policy—Lessons from the Global Burden of Disease Study. *Science*, **274**, 740-743. <http://dx.doi.org/10.1126/science.274.5288.740>
- [3] Michaud, C.M., Murray, C.J. and Bloom, B.R. (2001) Burden of disease—Implications for future research. *JAMA*, **285**, 535-539.

- <http://dx.doi.org/10.1001/jama.285.5.535>
- [4] Bates, M., Mudenda, V., Mwaba, P. and Zumla, A. (2013) Deaths due to respiratory tract infections in Africa: A review of autopsy studies. *Current Opinion in Pulmonary Medicine*, **19**, 229-237. <http://dx.doi.org/10.1097/MCP.0b013e32835f4fe4>
- [5] Beaglehole, R. (2004) The World Health Report 2004—Changing History. Geneva, 120-124.
- [6] Sligl, W.I. and Marrie, T.J. (2013) Severe community-acquired pneumonia. *Critical Care Clinics*, **29**, 563-601. <http://dx.doi.org/10.1016/j.ccc.2013.03.009>
- [7] Mizgerd, J.P. (2006) Lung infection—A public health priority. *PLOS Medicine*, **3**, e76. <http://dx.doi.org/10.1371/journal.pmed.0030076>
- [8] Mathers, C.D., Boerma, T. and Ma Fat, D. (2009) Global and regional causes of death. *British Medical Bulletin*, **92**, 7-32. <http://dx.doi.org/10.1093/bmb/ldp028>
- [9] Hoffken, G., Lorenz, J., Kern, W., Welte, T., Bauer, T., et al. (2010) Guidelines for the epidemiology, diagnosis, antimicrobial therapy and management of community-acquired pneumonia and lower respiratory tract infections in adults. *Deutsche Medizinische Wochenschrift*, **135**, 359-365.
- [10] Feldman, C. and Anderson, R. (2013) HIV-associated bacterial pneumonia. *Clinics in Chest Medicine*, **34**, 205-216. <http://dx.doi.org/10.1016/j.ccm.2013.01.006>
- [11] Feldman, C. and Anderson, R. (2012) Antibiotic resistance of pathogens causing community-acquired pneumonia. *Seminars in Respiratory and Critical Care Medicine*, **33**, 232-243. <http://dx.doi.org/10.1055/s-0032-1315635>
- [12] Mudhune, S. and Wamae, M. (2009) Network surveillance for pneumococcal disease in the East African Region. Report on invasive disease and meningitis due to *Haemophilus influenzae* and *Streptococcus pneumoniae* from the network for surveillance of pneumococcal disease in the East African Region. *Clinical Infectious Diseases*, **48**, S147-S152. <http://dx.doi.org/10.1086/596494>
- [13] Mandell, L.A., Wunderink, R.G., Anzueto, A., Bartlett, J.G., Campbell, G.D., et al. (2007) Infectious diseases society of America/American thoracic society consensus guidelines on the management of community-acquired pneumonia in adults. *Clinical Infectious Diseases*, **44**, S27-S72. <http://dx.doi.org/10.1086/511159>
- [14] Macfarlane, J.T. and Boldy, D. (2004) 2004 update of BTS pneumonia guidelines: What's new? *Thorax*, **59**, 364-366. <http://dx.doi.org/10.1136/thx.2004.024992>
- [15] Menendez, R., Torres, A., Aspa, J., Capelastegui, A., Prat, C., et al. (2010) Community acquired pneumonia. New guidelines of the Spanish Society of Chest Diseases and Thoracic Surgery (SEPAR). *Archivos de Bronconeumología*, **46**, 543-558. [http://dx.doi.org/10.1016/S1579-2129\(11\)60008-6](http://dx.doi.org/10.1016/S1579-2129(11)60008-6)
- [16] American Thoracic Society (2005) Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia. *American Journal of Respiratory and Critical Care Medicine*, **171**, 388-416. <http://dx.doi.org/10.1164/rccm.200405-644ST>
- [17] Working Group of the South African Thoracic Society (2007) Management of community-acquired pneumonia in adults. *South African Medical Journal*, **97**, 1295-1306.
- [18] Heppner, H.J., Sehlhoff, B., Niklaus, D., Pientka, L. and Thiem, U. (2011) Pneumonia severity index (PSI), CURB-65, and mortality in hospitalized elderly patients with aspiration pneumonia. *Zeitschrift für Gerontologie und Geriatrie*, **44**, 229-234. <http://dx.doi.org/10.1007/s00391-011-0184-3>
- [19] Cunha, B.A. (2006) The atypical pneumonias: Clinical diagnosis and importance. *Clinical Microbiology and Infection*, **12**, 12-24. <http://dx.doi.org/10.1111/j.1469-0691.2006.01393.x>
- [20] Hartung, T.K., Chimbayo, D., van Oosterhout, J.J., Chikaonda, T., van Doornum, G.J., et al. (2011) Etiology of suspected pneumonia in adults admitted to a high-dependency unit in Blantyre, Malawi. *American Society of Tropical Medicine and Hygiene*, **85**, 105-112. <http://dx.doi.org/10.4269/ajtmh.2011.10-0640>
- [21] Kim, C., Nyoka, R., Ahmed, J.A., Winchell, J.M., Mitchell, S.L., et al. (2012) Epidemiology of respiratory infections caused by atypical bacteria in two Kenyan refugee camps. *Journal of Immigrant and Minority Health*, **14**, 140-145. <http://dx.doi.org/10.1007/s10903-011-9494-1>
- [22] Prabhu, M., Nicholson, W.L., Roche, A.J., Kersh, G.J., Fitzpatrick, K.A., et al. (2011) Q fever, spotted fever group, and typhus group rickettsioses among hospitalized febrile patients in northern Tanzania. *Clinical Infectious Diseases*, **53**, e8-e15. <http://dx.doi.org/10.1093/cid/cir411>
- [23] Cunha, B.A., Pherez, F. and Walls, N. (2009) Severe cytomegalovirus (CMV) community-acquired pneumonia (CAP) in a nonimmunocompromised host. *Heart Lung*, **38**, 243-248. <http://dx.doi.org/10.1016/j.hrtlng.2008.05.008>
- [24] Kibiki, G.S., Mulder, B., van der Ven, A.J., Sam, N., Boeree, M.J., et al. (2007) Laboratory diagnosis of pulmonary tuberculosis in TB and HIV endemic settings and the contribution of real time PCR for M. tuberculosis in bronchoalveolar lavage fluid. *Tropical Medicine & International Health*, **12**, 1210-1217. <http://dx.doi.org/10.1111/j.1365-3156.2007.01907.x>
- [25] Semvua, H.H. and Kibiki, G.S. (2011) AtriplaR/anti-TB combination in TB/HIV patients. Drug in focus. *BMC Research Notes*, **4**, 511. <http://dx.doi.org/10.1186/1756-0500-4-511>
- [26] Kabali, C., von Reyn, C.F., Brooks, D.R., Waddell, R., Mtei, L., et al. (2011) Completion of isoniazid preventive therapy and survival in HIV-infected, TST-positive adults in Tanzania. *International Journal of Tuberculosis and Lung Disease*, **15**, 1515-1521. <http://dx.doi.org/10.5588/ijtld.10.0788>
- [27] Thiem, U., Heppner, H.J. and Pientka, L. (2011) Elderly patients with community-acquired pneumonia: Optimal treatment strategies. *Drugs Aging*, **28**, 519-537. <http://dx.doi.org/10.2165/11591980-000000000-00000>
- [28] Wiersinga, W.J., Bonten, M.J., Boersma, W.G., Jonkers, R.E., Aleva, R.M., et al. (2012) SWAB/NVALT (Dutch

- Working Party on Antibiotic Policy and Dutch Association of Chest Physicians) guidelines on the management of community-acquired pneumonia in adults. *Netherlands Journal of Medicine*, **70**, 90-101.
- [29] Watkins, R.R. and Lemonovich, T.L. (2011) Diagnosis and management of community-acquired pneumonia in adults. *American Family Physician*, **83**, 1299-1306.
- [30] Arnold, F.W., La Joie, A.S., Brock, G.N., Peyrani, P., Rello, J., *et al.* (2009) Improving outcomes in elderly patients with community-acquired pneumonia by adhering to national guidelines: Community-Acquired Pneumonia Organization International cohort study results. *Archives of Internal Medicine*, **169**, 1515-1524. <http://dx.doi.org/10.1001/archinternmed.2009.265>
- [31] Menendez, R., Ferrando, D., Valles, J.M. and Vallterra, J. (2002) Influence of deviation from guidelines on the outcome of community-acquired pneumonia. *Chest*, **122**, 612-617. <http://dx.doi.org/10.1378/chest.122.2.612>
- [32] Nyamande, K. and Lalloo, U.G. (2007) Poor adherence to South African guidelines for the management of community-acquired pneumonia. *South African Medical Journal*, **97**, 601-603.
- [33] Ministry of Health and Social Welfare, The Government of Tanzania (2007) Standard Treatment Guidelines (STG) and the National Essential Medicines List (NEMLIT) for mainland Tanzania. Dar es Salaam.
- [34] National Tuberculosis and Leprosy Control Programme, NTLP (2008) Management of TB/HIV co-infected patients Manual for Health Care Workers at TB clinics and HIV Care & Treatment Centers. Ministry of Health and Social Welfare, Dar es Salaam.
- [35] Ntuli, A.K., Kabengula, J.S. and Msuya, S.E. (2011) Perceived barriers and attitudes of health care providers towards Provider-Initiated HIV Testing and Counseling in Mbeya region, southern highland zone of Tanzania. *Pan African Medical Journal*, **8**, 17.
- [36] Tribble, A.C., Hamilton, C.D., Crump, J.A., Mgonja, A., Mtalo, A., *et al.* (2009) Missed opportunities for diagnosis of tuberculosis and human immunodeficiency virus co-infection in Moshi, Tanzania. *International Journal of Tuberculosis and Lung Disease*, **13**, 1260-1266.

ABBREVIATIONS

CAP: community acquired pneumonia
CRF: case report forms

LRTI: lower respiratory tract infection
PITC: provider initiated testing and counseling

APPENDIX

Table A1. The summary of treatment patterns for LRTI in the patient files within the hospitals of Kilimanjaro region.

		Zonal Referral hospital		Regional hospital		District hospital		Health center		Independent hospital		Total	Pearson Chi χ^2 df (4)	P value
		n	%	n	%	n	%	n	%	n	%	Total		
Antibiotics	Benzylpenicillin	10	9.90	19	20.88	45	49.45	18	19.78	9	9.89	191	33.4506	<0.001
	Amoxicillin	15	12.50	11	10.48	44	41.9	37	35.24	13	12.38	205	26.4155	<0.001
	Ampicillin	46	61.33	0	0	27	93.1	1	3.45	1	3.45	129	74.3495	<0.001
	Ampiclox	4	25.0	2	9.52	18	85.71	1	4.76	0	0	21	13.179	0.002
	Chloramphenicol	4	25.0	2	16.67	5	41.67	5	41.67	0	0	12	2.9636	0.564
	Gentamycin	2	5.40	1	2.86	28	80	5	14.29	1	2.86	35	29.2360	<0.001
	Ceftriaxone	24	48.0	3	11.54	19	73.08	2	7.69	2	7.69	26	19.4613	0.001
	Co-trimoxazole	8	23.53	7	26.92	7	26.92	7	26.92	5	19.23	26	9.9445	0.041
	Cloxacillin	9	34.62	0	0	17	100	0	0	0	0	17	17.8233	0.001
	Metronidazole	24	54.55	2	10	14	70	4	20	0	0	20	23.4046	<0.001
	Doxycycline	1	16.67	0	0	2	40	3	60	0	0	5	4.1769	0.383
	Erythromycin	0	0.00	6	33.33	8	44.44	3	16.67	1	5.56	18	18.3013	0.001
	Azithromycin	4	50.0	1	25	2	50	1	25	0	0	4	3.0064	0.557
	Ciprofloxacin	1	11.11	0	0	3	37.5	2	25	3	37.5	8	8.1938	0.085
Anti-TB treatment		10	37.04	6	35.29	8	47.06	0	0	3	17.65	17	13.2505	0.010
Anti-retrovirals		5	62.50	1	33.33	2	66.67	0	0	0	0	3	6.6865	0.153
Bronchodilators	Aminophylline	10	15.63	8	14.81	25	46.3	17	31.48	4	7.41	54	7.2743	0.122
	Salbutamol	8	25.0	1	4.17	13	54.17	6	25	4	16.67	24	2.1817	0.702
	Hydrocortisone	15	36.59	4	15.38	18	69.23	2	7.69	2	7.69	26	8.4970	0.075

Table A2. The summary of Additional treatment options for LRTI found in the patient files hospitals of Kilimanjaro region.

		Zonal Referral hospital		Regional hospital		District hospital		Health center		Independent hospital		Total	Pearson Chi χ^2 df (4)	P value
		n	%	n	%	n	%	n	%	n	%	Total		
Anti-pain	Asprin	9	56.2	0	0	1	14.29	6	85.71	0	0	7	15.3718	0.004
	Diclofenac	4	14.8	1	4.35	12	52.17	8	34.78	2	8.7	23	4.5277	0.339
	Ibuprofen	0	0.0	0	0	2	22.22	1	11.11	6	66.67	9	27.1467	<0.001
Paliative medication	Cough Syp	2	3.1	7	11.11	22	34.92	22	34.92	12	19.05	63	34.1011	<0.001
	IV infusion	18	36.7	9	29.03	18	58.06	2	6.45	2	6.45	31	16.2837	0.003
	Vitamin B complex	2	7.4	5	20	12	48	6	24	2	8	25	7.7523	0.101
	Oxygen	10	58.8	0	0	7	100	0	0	0	0	7	13.7781	0.008
Anti-histamine	Prednisolone	4	26.7	0	0	7	63.64	1	9.09	3	27.27	11	5.5537	0.235
	Chlorpheniramine	0	0.0	0	0	3	18.75	11	68.7	2	12.5	16	28.2253	<0.001

Table A3. The summary of treatment options for co-morbidities among patients presenting with LRTI as done by clinicians in the hospitals of Kilimanjaro region.

		Referral hospital		Regional hospital		District hospital		Health center		Independent hospital		Total	Pearson Chi χ^2	P value
		n	%	n	%	Frequency	%	Frequency	%	Frequency	%	Total		
Anti-malaria treatment	Quinine	5	23.8	2	12.5	14	87.5	0	0	0	0	16	12.1769	0.016
	ALU	3	11.11	1	4.17	13	54.17	10	41.67	0	0	24	11.7553	0.019
Anti-worms	Mebendazole	0	0.00	3	42.86	1	14.29	3	42.86	0	0	7	14.5827	0.006
	Albendazole	1	12.5	3	42.86	3	42.86	1	14.29	0	0	7	8.9843	0.061
Anti-acids	Omeprazole	6	40.00	1	11.11	7	77.78	1	11.11	0	0	9	4.3397	0.362
Cardiovascular medication	Furosemide	32	62.75	2	10.53	11	57.89	3	15.79	3	15.79	19	40.9197	<0.001
	Captopril	13	93.8	0	0	0	0	1	100	0	0	1	33.1019	<0.001
	Digoxin	7	58.33	1	20	2	40	1	20	1	20	5	6.8317	0.145
	Nifedipine	7	46.67	0	0	6	75	2	25	0	0	8	5.5251	0.238
Anti-diabetic treatment	Metformine	2	66.67	0	0	1	100	0	0	0	0	1	2.9628	0.564
	Diabenes	1	33.33	0	0	2	100	0	0	0	0	2	1.9613	0.743
	Insulin	2	40	0	0	2	66.67	1	33.33	0	0	3	1.2589	0.868

Note: These were the medications used to treat comorbidities and differential diagnoses reported in the files of patients admitted for symptoms that were mimicking or related to lower respiratory tract infections.