CLINICIANS' ADHERENCE TO NATIONAL PNEUMONIA MANAGEMENT GUIDELINES AMONG CHILDREN ADMITTED TO KITALE COUNTY HOSPITAL, KENYA

INVESTIGATOR

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DECLARATION

Student's Declaration

This thesis is my original work and has not been presented for a degree in any other university. No part of this thesis may be reproduced without prior written permission of the author and Moi University.

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DEDICATION

This thesis is dedicated to my family.

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ABBREVIATIONS AND ACRONYMS

AAP	American Academy of Pediatrics
AGREE	Appraisal of Guidelines for Research and Evaluation
CAP	Community Acquired Pneumonia
CFR	Case Fatality Rate
CPG	Clinical Practice Guidelines
ETAT+	Emergency Triage, Assessment and Treatment plus Admission care
GAPPD	Global Action Plan for Pneumonia and Diarrhea
GRADE	Grading of Recommendations, Assessment, Development and Evaluation
HCW	Health Care Workers
HIV	Human Immunodeficiency Virus
IGAPPD	Integrated Global Action Plan for Stopping Preventable Deaths from Pneumonia
IMCI	Integrated Management of childhood Illnesses
IOM	Institute of Medicine
IREC	Institutional Review and Ethics Committee
KDHS	Kenya Demographic and Health Survey
KEMRI	Kenya Medical Research Institute
KNH	Kenyatta National Hospital

KPA	Kenya Pediatrics Association
KWRTP	Kemri-Wellcome Trust Research Programme
MOH	Ministry of Health
MSC	Management of Sick Child guidelines
MTRH	Moi Teaching and Referral Hospital
NICE	National Institute for Health and Care Excellence
PAR	Pediatric Admission Record
RCPCH	Royal College of Pediatrics and Child Health
RSV	Respiratory Syncytial Virus
SDG	Sustainable Development Goals
UNICEF	United Nations Children's Fund
WHO	World Health Organization

OPERATIONAL DEFINITIONS

Adherence-The state of documented management being consistent with the pneumonia management guidelines and treatment failure definitions in Basic Pediatric Protocols, February 2016 edition.

Adequate breastfeeding-Exclusive breastfeeding duration of a minimum of 6 months in a child older than 6 months or ongoing exclusive breastfeeding in an infant less than 6 months

Complete adherence-Adherence at admission (diagnosis classification, drug choice, dosage) and adherence during in-patient period (assessment, action)

Immunization-BCG, PCV 1, 2, 3, Pentavalent 1, 2, 3 as appropriate for age

Outcome-Length of hospital stay, death.

Pneumonia management guidelines-Kenya National pneumonia management guidelines and treatment failure definitions as outlined in Basic Pediatric Protocols (February 2016 edition).

Pneumonia-Diagnosis of pneumonia of all severity as documented on the Pediatric admission record (PAR) by the admitting clinician.

Underweight-Weight for age less than 80% of expected.

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ABSTRACT

Background: Pneumonia is the leading cause of childhood morbidity and mortality globally and in Kenya. Clinical practice guidelines for pneumonia are one of the tools advocated by WHO for reducing mortality. There are Kenyan national management guidelines adapted from WHO. Adherence to the latest guidelines has not been evaluated in Kenya.

Objective: To determine adherence to national guidelines for management of pneumonia and describe hospital outcomes and associated factors among children 2-59 months discharged from Kitale County Hospital with an admission diagnosis of pneumonia.

Methods: This was a retrospective chart review carried out in the Pediatric wards of Kitale County hospital in Trans Nzoia County, Kenya. Data were collected from the participant's inpatient records upon discharge or death. All files were included till a sample size of 380 was achieved. Data on demographics, management and outcomes was extracted from the pediatric admission form, daily ward round notes and treatment sheet. Data were then compared with the national guidelines to assess adherence. The outcomes of interest were duration of hospital stay and death.

Results: The median age at recruitment was 12 months (IQR7, 24). The gender was male in 52% (198) of the participants. The diagnosis was severe pneumonia in 56% (213) and pneumonia in 44% (167) of the participants. Adherence at admission was 32 %(121). Appropriate diagnosis was made in 53.4 %(202), correct drug chosen in 55.8 %(212) and correct dosage prescribed in 71.1 %(270) of the participants. The proportion of the patients correctly managed in accordance with guidelines during the inpatient stay was 0.6 %(2). Complete adherence from admission to discharge was in 2.1% (8) of the cases. Median length of stay was 3 days (IQR2, 4). Length of stay was not associated with age, gender, diagnosis classification, admitting clinician and nutritional status. The case fatality rate was 8.2%. Severe pneumonia (P=0.001) and overall adherence (P=<0.001) were significantly associated with mortality. On logistic regression, severe pneumonia (OR 6.365; CI 95% 1.841-22.000 P=<0.003) increased the odds of mortality.

Conclusion: The level of adherence to the guidelines was low, markedly decreasing from admission to discharge. Case fatality rate was higher than global average.

Recommendations: A study to evaluate factors affecting adherence to national pneumonia management guidelines and how to improve it should be carried out.

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CHAPTER ONE: INTRODUCTION

1.1 Background Information

Pneumonia is an important cause of morbidity and mortality worldwide. There is an estimated 150 million new cases of pneumonia in children globally, with up to 13% severe enough to require admission. This translates to about 0.29 episodes per child per year globally. In the developed world, the incidence ranges from 0.06-0.1 episodes per child per year while in Africa, the incidence is three times higher (Rudan *et al.,* 2013; United Nations Childrens Fund (UNICEF) , 2015, Level and trends in child mortality).

Seventy five percent of all annual new cases worldwide are concentrated in only fifteen countries which include Kenya (Agweyu, 2015; Walker *et al*., 2013). Nine percent of all children participating in the Kenya Demographic Health Survey 2014 (KDHS) had symptoms of an acute respiratory infection reported. Annual incidence of pneumonia in Kenya is estimated at 0.25 episodes per child per year with 11% progressing to severe pneumonia. The prevalence ranges from 24 -30% in rural and national hospitals (Agweyu, 2015; Maina, 2007). Severe pneumonia is a common cause of admission to Kenyan hospitals with about eighteen thousand deaths occurring in children under 5 yearly due to pneumonia (Agweyu *et al*., 2014; Kenya National Bureau of Statistics (KNBS) , 2014; World Health Organization (WHO) ,2016 ,Pneumonia Factsheet) .

Pneumonia is the leading cause of childhood mortality globally accounting for about two million deaths of children under five per year globally, out of a population of about 605 million children. The case fatality rate for pneumonia in children under five years is 1.3-2.6% worldwide. This translates to about 20% of all deaths in children under five years and is more than malaria, Human immunodeficiency virus (HIV) and pulmonary tuberculosis combined (Rudan *et al.*, 2013; UNICEF, 2015b, Progress report). Fifty

percent of the worldwide deaths from pneumonia in children under 5 occur in Africa while in contrast less than 2% and 3% in Europe and America respectively (Rudan *et al*., 2013; WHO/UNICEF, 2006, Pneumonia the Forgotten Killer of Children).

Clinical practice guidelines (CPGs) are defined by America Institute of Medicine (IOM) as a set of statements that include recommendations informed by a systematic review of evidence to optimize patient care. These are strategies for quality improvement by utilization of evidence based health care practices and are part of the pillars of quality of care framework (Donabedian, 2005; Nolan *et al.*, 2001).

The use of CPGs is one of the most effective interventions in management of pneumonia. They have been shown to reduce mortality from pneumonia by 29-45% and total child deaths by 6% (Niessen *et al*., 2009; Sazawal & Black, 2003).

The Integrated Management of Childhood Illnesses (IMCI) strategy was developed by World Health Organization (WHO) in 1992 to address childhood illnesses and mortality that was on the rise. The IMCI set the standards for pneumonia management along with other childhood illnesses like malaria, HIV and malnutrition (WHO, 2013, Hospital Care for Children).

The Kenya Basic Pediatric Protocols are an adaptation of international best practices as outlined by WHO in IMCI and WHO Pocket Book of Hospital Care for Children. The protocols on pneumonia are a set of specific symptoms, signs, severity classification and treatment guidelines for children. These guidelines were adapted by the Kenya Ministry of Health (MOH) and first launched in the country in 2006 along with Emergency Triage Assessment and Treatment plus admission care (ETAT+), a 5 day course for their dissemination. These guidelines were developed by a collaborative effort among the MOH, Kenya Pediatric Association (KPA), University of Nairobi

medical school and Kenya Medical Research Institute (KEMRI)-Well come Trust Research Program (KWTRP). They were developed based on best available evidence through a process that began with defining target illnesses, heath care workers and the scope. Local ownership was promoted by adapting the guidelines to the Kenyan context and a training approach and course was developed. The course was adapted from WHO ETAT course (www.who.int/child-adolescent-health/publications) with extensions and linked to the structured pediatric admission record form (PAR) (Irimu *et al.,* 2008). Ministry of Health endorsed the guidelines for publication as a booklet known as the Basic Pediatric Protocols (www.guidelines.health.go.ke). The guidelines were revised in 2010, 2013, 2015 and lately 2016 through a formal guideline development approach of grading of recommendations, assessment development and evaluation (GRADE) while taking local contextual factors into account (Agweyu , Opiyo, & English , 2012; English *et al*., 2017).

The guidelines were introduced to the national hospitals, former provincial hospitals, currently referred to as county hospitals and University of Nairobi medical school from 2008 and later made part of national health planning with training allocated as per demand and availability of funds (English, Wamae, Nyamai, Bevins & Irimu,2011).

Currently there is a large number of trained health care workers in Kenya. These include doctors, nurses and clinical officers with a batch of new trainees every year. Trainings occur on demand, with the national hospitals and four of the medical universities having ETAT+ trainers. Undergraduate students in four out of the nine medical schools in Kenya are trained on the use of the guidelines before or during their clinical years of training. Pocketbooks and job aides have been distributed over the years by MOH, KPA and KEMRI-KWTRP. A soft copy version is available on the

websites of these institutions as well as a mobile application which has recorded over 5000 downloads to date (English *et al*., 2011, Communication from KPA ETAT coordinator).

In Kitale County Hospital, all the clinical officers, medical officers and pediatricians based in the pediatric ward have undergone ETAT+ training. All new medical and clinical officers are given an induction course by an ETAT+ trained medical officer and issued with the Basic Pediatric Protocols before deployment to the pediatric wards (Kitale County Hospital Records,2015).

Kitale County Hospital is part of the Clinical Information Network which is a partnership between KEMRI-KWTRP, MOH, KPA and fourteen county hospitals that has been set up to provide accurate information about provision of health care provided to pediatric patients. One of the ways to achieve this has been development and implementation of a medical record tool that enables clinicians to record patient and treatment data in a standardized format and enable use of routine treatment charts (Ayieko *et al*., 2016 &Tuti *et al*., 2016).

Interventions have been put in place in Kitale County Hospital to improve documentation and data utilization since October 2013. Audit and feedback with enhancements is one of the interventions. These enhancements include frequent reporting, goal setting, benchmarking and clear action plans. Specifically Kitale County Hospital has been provided with technology and human resource support, feedback reports every two months, distribution of protocols and job aides, network meetings and peer to peer support. Other interventions include use of a structured pediatric admission form (PAR), audit of documentation and performance for management of common illnesses with frequent reports and provision of the new guidelines for management of

common childhood illnesses (Irimu *et al*.,2018). The PAR has been found to greatly improve documentation and enhance implementation of child health guidelines and IMCI (Mwakyusa *et al.,* 2006). Kitale Hospital staff in the pediatric wards were trained on the new case management guidelines in February 2016 with provision of new guidelines. Monthly audit feedback on pneumonia case management has been provided to the hospital from February 2016 to November 2016 using the national pneumonia guidelines as the audit criteria (Ayieko *et al* 2016).

1.2 Problem Statement

Pneumonia is a high burden disease with morbidity and mortality of 155 M new cases and 2M deaths respectively in children less than 5 years globally (WHO, 2016b, Pneumonia Factsheet; United Nations Childrens Fund (UNICEF) ,2018, One is too many. Ending Child deaths from pneumonia and diarrhea). In the pediatric ward at Kitale County Hospital, pneumonia contributes 25-30% of admissions and about 40% mortality among children under 5 years (Kitale County Hospital Records, 2015)

Use of clinical practice guidelines for management of pneumonia has been shown to effectively reduce mortality by up-to 50% and improve quality of care for children with pneumonia (Niessen *et al*., 2009; Sazawal & Black, 2003)

Despite the availability of pneumonia management guidelines in developing countries, studies continually highlight low health worker compliance with guidelines. This non-compliance along with poor follow up of patients are some of the identified problems facing health service delivery in pediatrics and could perhaps partly explain the high infant and childhood mortality rates seen in most Kenyan hospitals (WHO/UNICEF,2006, Pneumonia the Forgotten Killer of Children).

There is no local or current data on utilization of the new guidelines for management of pneumonia

1.3 Justification

Pneumonia is the leading cause of morbidity and mortality in the world and Kenya

Kenya along with other developing countries is committed to achieving the Sustainable Development Goals (SDGs) which call to ensure health and wellbeing for all. Reducing pneumonia deaths is vital to achieving SDG 3.2 which aims to reduce preventable deaths in newborns and children. Kenya has also committed to the Integrated Global Action Plan to end preventable deaths from pneumonia and diarrhea (IGAPPD) by 2025. One of the aims is to reduce mortality from pneumonia in children less than five years to fewer than 3 per 1000 live births. One of the identified targets for improvement is increasing to 90%, the access to appropriate case management for pneumonia by 2025 (http://www.who.int/maternal_child_adolescent/en). The IGAPPD targets 90% utilization level of the clinical practice guidelines in all countries by 2025.This can be achieved by consistent use of pneumonia treatment guidelines.

The level of utilization of clinical practice guidelines for pneumonia management in Kenya is at 54% (UNICEF, 2015b, Progress Report). This is below the level recommended level of 90%.

Standardized simple clinical practice guidelines have been shown to reduce mortality from pneumonia by up to 45% as shown in several published studies (English et al., 2011; Niessen *et al*., 2009; Sazawal & Black, 2003). Poor adherence to treatment guidelines despite their availability has been identified as a major challenge to pediatric service delivery in developing countries (Nyamande & Lalloo, 2007; Salih *et al*., 2014). It has been linked to the high mortality rate in Kenyan hospitals that could be averted by appropriate care (English *et al*., 2004; Irimu *et al.*, 2012; Mwakyusa *et al*., 2006).

The findings of this study will provide a framework for evaluating the current standards of care and can be used to inform and advise other hospitals in the country

The clinical and demographic characteristics have also been shown to impact outcome of pneumonia independent of management by clinicians (Tornheim *et al*., 2007). These characteristics of children admitted with pneumonia to Kitale County Hospital have not been described before. This description will form a basis for characterizing pneumonia epidemiology in the Western region of Kenya. Knowledge of the factors determining outcome in pneumonia is also necessary for further impact on morbidity and mortality in pneumonia.

1.4: Research Question

What is the adherence to national pneumonia management guidelines among children under five years admitted to Kitale County Hospital pediatric wards?

1.5: Objectives

1.5.1 Broad Objective

To determine adherence to national pneumonia management guidelines, hospital outcomes and associated factors among children under five years admitted to Kitale County Hospital.

1.5.2: Specific Objectives

1. To describe the demographic and clinical characteristics of children under five years admitted to Kitale County Hospital with an admission diagnosis of pneumonia.
2. To determine adherence to national guidelines for management of pneumonia in children under five years admitted to Kitale County Hospital Pediatric wards with an admission diagnosis of pneumonia.
3. To describe the hospital outcomes and associated factors for children under five years admitted to Kitale County Hospital with an admission diagnosis of pneumonia.

CHAPTER TWO: LITERATURE REVIEW

2.1. Pneumonia Disease Burden

Pneumonia is a major cause of morbidity and mortality worldwide. The incidence of pneumonia globally is 0.29 episodes per child per year which equates to about 155 million new cases annually. The incidence in developed countries is 0.06-0.1 episodes per child per year while it's three times higher in developing countries. Seventy four percent of the world's pneumonia cases occur in only fifteen countries that include Kenya (WHO, 2016b, Pneumonia Factsheet).

Childhood pneumonia is the leading killer of children under the age of five years. About 21% of children under five years in developing countries die from pneumonia, while its contribution to global childhood mortality is 29%. Mortality rates for children below five years of age range from 50 to 60 per 1000 live births in most developing countries, one fifth of these are attributed to pneumonia (UNICEF, 2015a, Level and Trends in Child Mortality).

Globally, 2 million children die annually from pneumonia with more of the deaths occurring in Africa (WHO/UNICEF, 2006, Pneumonia The Forgotten Killer of Children). In Kenya, the childhood mortality rate is 52 per 1000 with pneumonia contributing majorly. It is the leading cause of death in children under 5 years in Kenya according to 2013 economic survey (KNBS, 2014, Kenya Demographic Health Survey; UNICEF, 2015a, Level and Trends in Child Mortality).

2.2 Epidemiology of Pneumonia in Children

2.2.1 Demographic characteristics

Pneumonia is most common in the children younger than five years of age. The highest number of hospitalizations due to pneumonia occurs in children below five years of age and the mortality is highest in infants below one year of age (Lazzerini *et al*., 2016).

There have been contradictory findings in various studies done to assess gender as a risk factor for pneumonia, some have shown male gender to be a risk factor while others found it protective (Fonseca et al., 2016; Wiese, Grijalva, Zhu, Mitchel &Griffin, 2016).

2.2.2 Clinical characteristics

About fifty conditions have been described in literature that increase morbidity or mortality from pneumonia in children under the age of five years. These conditions fall in different categories such as environmental exposures, nutrition and nutritional status, comorbidities, socio economic status and maternal education level (Grant *et al.*, 2012; Wonodi *et al.*, 2012). In studies to evaluate the strength of association, seven were found to be significantly associated with risk of developing pneumonia. These are low birth weight, undernutrition, household air pollution, HIV infection, non-exclusive breastfeeding, household crowding and incomplete immunization. WHO classifies the risk factors for developing pneumonia in children living in developing countries as definite, likely or possible. Definite risk factors are: malnutrition, low birth weight, lack of exclusive breastfeeding, lack of measles immunization, indoor air pollution and overcrowding (WHO/UNICEF, 2013, The Integrated Global Action Plan for Pneumonia and Diarrhea; Wonodi *et al*., 2012). Co morbidities such as diarrhea, heart disease and asthma are classified by WHO as likely risk factors for developing pneumonia (Onyango, Kikuvi, Amukove, & Omollo, 2012).

2.3 Adherence to guidelines

2.3.1 Clinical Practice Guidelines

Clinical practice guidelines are defined by American Institute of Medicine (IOM) as "statements that include recommendations intended to optimize patient care that are informed by systematic review of evidence and an assessment of the benefits and harm of alternative care options". The purpose of guidelines is to improve effectiveness and quality of care, reduce variation in clinical practice, promote efficiency in resource use and decrease adverse events. CPGs offer potential benefits to the patient, health care provider as well as the health care system (WHO, 2011, Handbook for guideline development). CPGs include statements of expected practice and benchmarks for audit and comparison and they can include best-practice statements in regard to screening, diagnosis, management and monitoring. Clinical Practice guidelines are developed through an elaborate process described by various international guideline development groups, among them WHO (Kredo *et al*., 2016; WHO, 2011, Handbook for guideline development). This process entails demonstration of need for the guidelines, obtaining data from literature, weighing strength of evidence and there after appraisal and organization as guidelines. What follows is endorsement by the sponsoring organization and other interested parties and implementation with ongoing re-appraisal and evaluation (Davis & Taylor-Vaisey, 1997).

Developed countries have invested in guideline development and therefore various clinical practice guidelines are available for management of more than 200 conditions. American Academy of Pediatrics (AAP) and Royal College of Pediatrics and Child Health (RCPCH) which is accredited by National Institute for Health and Care Excellence (NICE) sets standards for guideline development internationally (Royal College of Pediatrics and Child Health (RCPCH), 2016, Setting Standards for

Development of Clinical Guidelines in Pediatrics and Child Health). WHO uses the GRADE approach in guideline development while acknowledging that evidence must be coupled with local contextual factors. In Kenya, national guidelines for management of common pediatric conditions were developed in 2006 by MOH in collaboration with KPA and KEMRI-KWTRP and have been revised three times in the last ten years through the GRADE approach (Irimu *et al*., 2008 &English *et al*., 2017).

2.3.2 General Adherence to Clinical Practice Guidelines (CPGs)

Recommendations ascribed to in clinical guidelines are not always adhered to in clinical settings (Fretheim, Schunemann, & Oxman, 2006; Grol & Grimshaw, 2003).

There is wide variation in adherence to clinical practice guidelines among health professionals worldwide. The range is from 0-98% across settings and cadres according to Ebben, Vloet & Achterberg (2013) in a systematic review of 35 studies. Various studies have been published on adherence to guidelines across various settings. Grog *et al* (1998) in a study on ten Dutch guidelines, found that general practitioners followed guideline recommendations in 61% of relevant decisions. In the field of mental health, guideline adherence of 27% was found in 41 cross sectional and controlled studies published by Bauer (2002) on patient care for various diseases.

2.3.3 Factors associated with adherence to clinical practice guidelines

There are various factors that influence implementation of clinical practice guidelines. These factors are varied and stem from characteristic guidelines, implementation strategy, health care professional, the patient and environment.

Complexity of the guideline is the most frequently cited guideline characteristic that hampers implementation according to Simpson, Marrie & Majumdar (2005). Implementation strategies that are multi-faceted, intensive, coupled with system

redesign and additional resources have greater impact (Bauer, 2002; Grimshaw *et al.*, 2004). Lack of awareness or familiarity with guidelines among health care professionals was the main barrier to adherence as well as young age and less experience in practice (Cabana *et al*., 1999; Saillour-Glenisson & Michel, 2003; Simpson *et al*., 2005). Presence of a co-morbidity in a patient leads to less guideline adherence among professionals according to Davis & Taylor-Vaisey (1997).

Environmental characteristics, time limits, personnel in availability and work pressure negatively affect guideline implementation and adoption (Cabana *et al*., 1999; Saillour-Glenisson & Michel, 2003).

A study done in Benin across 87 health facilities to evaluate adherence to IMCI guidelines in management of common childhood illnesses showed that health workers diagnoses did not match IMCI classification in most of the cases. Selection of treatment for severe pneumonia as per IMCI recommendations was at zero percent. The reasons cited for noncompliance to guidelines are predictable from other studies across the world and are as cited above (Rowe, Onikpo, Lama, Cokou, & Deming, 2001).

In Khartoum, Sudan, adherence to WHO guidelines for pneumonia management was found to be at 18%. This low adherence level was thought to be because of use of WHO guidelines in the study instead of the local guidelines that have been developed by Sudan Association of Pediatricians (Salih *et al*., 2014).

In Tanzania, adherence to the Referral care Manual in care of children with common childhood illnesses was at 1% during a 48 hour assessment period (Reyburn *et al*., 2008).

In Kenya, adherence to Management of Sick Child (MSC) guidelines which is a modification of IMCI among community health workers was evaluated in Siaya

district. The clinical recordings were compared with the gold standard which was re-examination of patients by a clinician. Eighty percent of the 125 health care workers adhered to the guidelines and the factors identified to affect adherence were use of job aide, older children and absence of danger signs (S. Y. Rowe *et al.*, 2007).

Another study in Kenya across 14 hospitals assessed adherence to guidelines on pneumonia management by extracting data from clinical records and interviews of health workers and guardians. There was infrequent recording of the signs recommended for classifying pneumonia with only 41% of respiratory rates recorded. Correct drug prescription was also only done in 1% of the cases (English *et al*., 2004).

2.3.4 Clinical Practice Guidelines in Pneumonia Management

Clinical practice guidelines for management of community acquired pneumonia have been developed by several international bodies such as the WHO, Pediatric Infectious Diseases Society of America, American Academy of Pediatrics, British thoracic society, among others (Bradley *et al.*, 2011)**.**

The growing number of guidelines on management of community acquired pneumonia, with variations and conflict among institutions and countries necessitated appraisal of existing guidelines to evaluate strengths, limitations and offer guidance. An appraisal of ten CPGs that included the WHO guidelines was done using Appraisal of Guidelines for Research and Evaluation (AGREE) II instrument. The domains of appraisal were, "scope and purpose, stakeholder involvement, rigor of development, clarity of presentation, applicability, editorial independence and overall guideline assessment." All the guidelines were found to be of acceptable quality and scored higher than international quality level (Alonso-Coello *et al*., 2010; Xie *et al.*, 2016).

WHO and UNICEF developed the Integrated Management of Childhood Illnesses in 1992 to address the rising burden of childhood morbidity and mortality. IMCI is an integrated approach to child health that promotes improved case management of illnesses, health system, family and community health (WHO, 2016a, Integrated Management of Childhood Illness).

The Kenya Basic Pediatric Protocols that contain the guidelines on management of pneumonia in Kenya are an adaptation of WHO Pocketbook of Hospital Care for Children. The Kenyan guidelines were developed through an elaborate process by MOH in collaboration with KPA, KEMRI-KWTRP and other collaborators. They were adapted by the Ministry of Health in 2006 and endorsed for publication as a booklet in 2006 and have been revised three times in 2010, 2013 and 2015 through GRADE approach. The guidelines were then introduced to national hospitals, former provincial hospitals and University of Nairobi medical school in 2008. Dissemination is through five day ETAT+ course as well as pre-service and in service training for health care workers and pocket books and job aides that are availed in the hospitals (Irimu *et al*., 2008, Agweyu *et al*.,2012).

2.3.5 Kenya National guidelines for pneumonia management

The Kenya National guidelines for pneumonia management as elaborated in the Basic Pediatric protocols recommend intravenous benzyl penicillin and gentamicin for severe pneumonia while oral amoxicillin is used for non- severe pneumonia (Ministry of Health (MOH), 2016, Basic Pediatric Protocols).

The Ministry of Health pneumonia management guidelines stipulate that pneumonia is signified by presence of cough or difficulty in breathing of less than 14 days duration, increase in respiratory rate for age or presence of lower chest wall in drawing without danger signs in a child aged between 2-59 months and is treated by oral amoxicillin.

Severe pneumonia in a child with cough or difficulty in breathing is diagnosed by the presence of one of the danger signs that include an altered level of consciousness, grunting, cyanosis, inability to feed or oxygen saturation less than 90% .It is treated by intravenous crystalline penicillin, gentamicin, oxygen for hypoxemia and nutrition support by use of a nasogastric tube for those that cannot take orally. Intravenous fluids are reserved for patients not tolerating enteral intake (MOH, 2016, Basic Paediatric Protocols).

Worsening condition in a child at 48 hours should be managed by thorough reassessment and obtaining chest x-ray if not already done to assess for complications or alternative diagnosis and the treatment should be switched to ceftriaxone. Where *Staphylococcal Pneumonia* is suspected, flucloxacillin and gentamicin are the mainstay of treatment (MOH 2016, Basic Paediatric Protocols).

Treatment failure at day 5 is indicated by at least three of fever of more than 38 degrees Celsius, tachypnea of more than 60 breaths per minute, cyanosis or saturation less than 90% and no better than admission, chest in-drawing or worsening chest x-ray. It should be managed by changing medication to penicillin and gentamicin if on amoxicillin or changing to ceftriaxone if on penicillin and gentamicin Persistent fever and respiratory distress after one week should be considered tuberculosis and investigated appropriately by a thorough history, physical examination, tuberculin skin test, chest x-ray and sputum or gastric aspirate for bacteriological testing through microscopy, culture or gene expert (MOH 2016, Basic Paediatric Protocols).

2.3.6 Adherence to national guidelines for pneumonia management

Adherence to the pneumonia guidelines in Kenya was described in a study at Garissa County Hospital in 2012. Adherence was based on the 2010 edition of the guidelines which have now been revised severally and simplified to the 2016 edition. This study

relied on clinical records as well as interviews to health care workers and found an adherence level of 43% at admission while adherence during in-patient stay was not assessed (Mutinda *et al*., 2012).

Mama Lucy Kibaki Hospital Kenya was one of the first Kenyan hospitals to achieve full utilization of a structured admission record form as introduced by the Ministry of Health. Adherence to the national guidelines for management of pneumonia was assessed in this hospital in 2012. Correct classification and documentation of severity was found in 52% of the cases with correct treatment documented in 77% of the cases (Ford 2012).

2.4 Treatment Outcomes

2.4.1 Duration of Hospital Stay

Length of hospital stay is an important outcome measure in pneumonia management. The American Academy of Pediatrics (AAP) reports that average length of hospitalization for childhood pneumonia is approximately three days (Harman & Kelleher, 2001). Agweyu (2015) reported a median length of stay of three days among children hospitalized with pneumonia across seven Kenyan hospitals. Two thirds of the patients were hospitalized for five days or less with surviving children experiencing a longer duration of stay than those who died. In another study at Kenyatta National Hospital, two thirds of the deaths occurred within 48 hours of admission with survivors having a longer hospital stay than those who died. The median length of stay for children with pneumonia at Kenyatta National Hospital (KNH) was five days (Maina, 2007) .

Length of hospital stay can be affected by several factors. Harman & Kelleher (2001) in a study published in BMC Pediatrics found that factors leading to prolonged hospital

stay include overcrowding at home, lack of exclusive breastfeeding and an abnormal chest radiograph. These same factors were associated with an increased mortality risk.

Length of stay in hospital is also affected by severity of pneumonia as well as comorbidities with a longer duration among those with co-morbid conditions and the more severe diagnosis (Harman & Kelleher, 2001).

2.4.2 Mortality in Pneumonia

The risk of death in children with pneumonia differs across different populations and disease severity. A systematic review across 37 hospital based observational studies in children 0-59 months with severe pneumonia revealed a case fatality rate of 0.4 %, 2.1% and 3.9% in industrialized countries, Asia and Africa respectively (Agweyu, 2015; Nair *et al.*, 2013). A WHO bulletin published in 2015 reported a case fatality rate of 1.3-2.6% based on published data (Rudan *et al.,* 2013).

In Malawi, a case fatality rate (CFR) of 10% was found in a hospital based survey of patients with severe forms of pneumonia aged 0-59 months (Osterholt, Onikpo, Lama, Deming, & Rowe, 2009). Pneumonia related mortality is higher in Africa than other regions of the world where more than 50 % of the deaths occur. No published estimates of mortality in non- severe pneumonia are available because most management of this form of pneumonia occurs in the community (Agweyu, 2015; Nair *et al*., 2013).

In Kenya, the case fatality rate of pneumonia has been reported in three observational studies across rural and urban hospital. For all forms of pneumonia, the CFR ranged from 3.3% to 6.2% while for severe forms it was 5.9% to 11.2% (Agweyu, 2015; Berkley *et al*., 2005; Webb *et al.*, 2012). Maina (2007) in a study done at Kenyatta National Hospital (KNH) found a CFR of 13.2% in children with all forms of pneumonia.

The high risk of death from pneumonia in children in Africa may stem from differences in demographic and clinical characteristics (Agweyu, 2015). In a large published systematic review of 77 studies done in low and middle income countries, the factors that were independently associated with mortality in children with pneumonia were several. Severe disease, age below 2 months, comorbidities and malnutrition were associated with mortality as well as young maternal age, low maternal education, low socio economic status and exposure to second hand cigarette smoke. Low risk of death was associated with immunization and antenatal care attendance (Sonego, Pellegrin, Becker & Lazzerini, 2015). Maina (2007) found the following factors to be associated with mortality in KNH: Illness duration, disease severity, hypoxia, HIV and malnutrition.

Tachypnea and low weight for age in non-severe pneumonia was associated with a higher risk of in-patient mortality comparable to severe pneumonia in a retrospective cohort study at 14 public hospitals in Kenya (Tuti *et al*., 2017).

CHAPTER THREE: METHODOLOGY

3.1 Study Design

This was a retrospective chart review.

3.2 Study Site

The study was carried out at the pediatric wards of Kitale County Hospital. This is the largest public referral facility in Trans Nzoia County which is in North Western Kenya. It is ranked as a tier three facility under the Kenya Health Sector Strategic plan III 2012-2017, formerly level 4 under National Health Sector Strategic plan II. A tier three hospital provides curative care in inpatient and outpatient setting, preventive and health promotive services as well as training and technical supervision to lower tier hospitals (Government of Kenya (GOK), 2015, Healthcare System in Kenya).

The hospital has a 250-bed capacity. The general pediatric ward has a total of 50 beds with 50% occupancy rate. The ward admits an average of 10 patients per day ranging from neonates to 14 years of age. Pneumonia contributes 25-30% of the admissions.

Children admitted to the ward are seen by a clinical officer intern or medical officer intern on duty and reviewed by the medical officer or pediatrician within 24 hours and everyday subsequently to evaluate progress. Admissions and ward rounds are done daily.

Patient admission notes are recorded on the pediatric admission record (PAR) (appendix F) which is a comprehensive tool covering demographic data, clinical features, diagnosis and treatment. The PAR is used in about 98 % of the patients in the pediatric wards at Kitale County Hospital and complete data captured on more than 90% of the patients' records. (Ayieko *et al*., 2016; Tuti *et al.,* 2016).

Kitale County Hospital is one of fourteen centers countrywide involved in Clinical Information Network which is a collaborative project by MOH, KPA and KEMRI-KWTRP to improve data collection and use of hospital data. The Basic Pediatric Protocols are key in gauging performance of this project and therefore all clinicians working in the pediatric wards regularly undergo trainings and refresher courses on use of the protocols (Ayieko *et al*., 2016; Tuti *et al*., 2016).

The hospital formally adopted the national protocols for management of common pediatric illnesses including pneumonia since 2008. All clinicians including doctors and clinical officers have been trained on the national management protocols for pneumonia through ETAT + trainings or induction sessions before deployment to the pediatric wards. Four out of the nine medical schools in the country have also incorporated training on use of protocols in the curriculum and therefore some of the medical officer interns are trained before graduating. Training on the use of the new guidelines, February 2016 edition was conducted before their introduction to the hospital.

3.3 Study Population

The study population was all children that were admitted to Kitale County Hospital pediatric wards from February 2016 to September 2016 with an admission diagnosis of pneumonia recorded on PAR by the admitting clinician.

3.4 Eligibility Criteria

3.4.1 Inclusion criteria

Children aged 2-59 months with an admission diagnosis of pneumonia documented by admitting clinician on the PAR from February 2016 to September 2016.

3.5 Sampling Procedure

3.5.1 Sample Size Determination

We used Fisher's Formula to determine the sample size. In Kenya, the adherence to national pneumonia management guidelines was found to be at 43% in a study done at Garissa County Hospital (Mutinda et al., 2014). Due to the expected similarity in the management of patients by the clinicians and there being no other similar study, this proportion was used as P and an assumption made that these proportions compare.

Z_{α} - Standard normal deviate (1.96 for 95% CI)

P- Level of adherence 43 %=0.43 (Mutinda *et al.*, 2014)

e- Margin of error (5% i.e. 0.05)

Therefore, sample size =

$$n = \frac{(Z\frac{\alpha}{2})^2 p(1-p)}{(e)^2}$$

Substitution

$$\boldsymbol{n = \frac{1.96^2 \; x \; 0.43 \; x \; 0.57}{(0.05)^2} = 377}$$

3.6 Sampling Technique

All medical records of patients that met the inclusion criteria during the study period were recruited till the sample size of 380 was achieved.

3.7 Study Period

February 2016 to August 2016

3.8 Study procedure

A pretested data collection tool in form of a checklist was used (Appendix A). The checklist was adapted from MOH Basic Pediatric Protocols, February 2016 edition (Appendix B and C) and the structured pediatric admission record (Appendix F).

Study was conducted by the principal investigator and two research assistants (clinical officers) hired for the duration of the study. All the research personnel were not involved in the care of patients in the pediatric ward at the time of the study.

The research assistants were trained by the principal investigator on pneumonia management guidelines as per the Basic Pediatric Protocols, February 2016 edition. They were also trained on professional conduct during the study period as well as the data collection procedure.

Principal investigator or research assistant checked daily discharge and death records to identify patients with an admission diagnosis of pneumonia as documented on PAR. The files that met the inclusion criteria were then collected from the ward and data extracted till the calculated sample size was achieved.

Data were collected from medical records of all patients who were discharged or died with a documented admission diagnosis of pneumonia.

Where a patient was seen by more than one clinician, information from the senior most clinician was considered and therefore assessed for adherence.

Data on clinical and demographic characteristics were extracted using a pretested data extraction tool in the form of a checklist adapted from the PAR (Appendix F). Additional data on patient management was obtained from the daily ward round notes and treatment sheet and ticked on a checklist in the data collection. This was done for management at admission, 24 hours, 48 hours, 5^{th} and 7^{th} day or up-to discharge or

death. It was then compared against the pneumonia management guidelines (Appendix B) and pneumonia treatment failure definitions (Appendix C) to check for adherence.

3.8.1 Data collection on demographics and clinical characteristics

Data on the patients' age, sex, immunization status, breastfeeding history, nutritional status and comorbidities and pneumonia classification were obtained from the pediatric admission record (Appendix F) and entered into the data collection form (Appendix A).

3.8.2 Data collection on adherence at admission

Adherence to the guidelines for admission was checked for: Pneumonia classification, drug choice and dosage. Adherence was assessed by checking for correctness through comparing against the guidelines and grading the management as either adhering or not.

a) Pneumonia classification

Making a diagnosis of pneumonia involves checking for specific symptoms and signs that guide the diagnosis classification and documenting their presence or absence on the PAR (Appendix F). A patient's diagnosis classification was considered to be adhering to the guidelines if the minimum clinical features documented matched the diagnosis classification assigned and documented.

b) Drug choice

Different antibiotics are indicated based on the diagnosis classification. Adherence on drug choice meant that the drug documented as prescribed correctly matched the diagnosis classification indicated.

c) Dosage

Adherence on drug dosage meant that the prescribed dosage is correct per body weight and the route and frequency are appropriate as per the Basic Pediatric Protocols.

3.8.3 Data collection on adherence during in-patient period

Adherence in these two areas was assessed for in-patient period: patient assessment and action taken at designated points. These were at 24 hours, 48 hours, 5th and 7th day or up-to discharge or death. The designated points were chosen based on the treatment failure definitions (Appendix C) in the Basic Pediatric Protocols

3.8.3.1Patient assessment

According to the treatment failure definitions in the Basic Pediatric Protocols February 2016 edition (Appendix C), specific clinical features should be checked at different points of management to determine patient improvement or deterioration. Data was extracted from the daily ward round notes and entered into the data collection form and compared against the treatment failure definitions to determine adherence. Radiological features were excluded from this assessment due to the in-availability for all patients. Data collected was on whether the clinical features were documented as either present, absent or were not documented. Assessment was then found to be ‘done’ when some or all of the features were documented as either present or absent. It was considered ‘not done’ when none of the features were documented as either present or absent. Those ‘done’ were further graded as ‘correctly’ or ‘incorrectly done’ as per the protocols where ‘correctly’ done was defined by documented assessment of all the required clinical features as per the protocols and incorrectly done was where the assessment was incomplete. Adherence to the guidelines on patient assessment was defined by patients’ assessment being ‘done’ and being done ‘correctly’.

3.8.3.2 Actions taken

According to the treatment failure definitions in the Basic Pediatric Protocols February 2016 edition (Appendix C), there are several actions that are required after assessment of a patient during the designated time points. These include prescription of additional antibiotics or changing to a different antibiotic .Other actions considered were continuation of antibiotics as prescribed at admission or stopping altogether. Data on the actions taken were extracted from the daily ward round notes and treatment sheet and entered into the data collection form. These actions were matched against the assessment documented and graded as either 'appropriate' or 'inappropriate'.

An appropriate action at 24 hours, 48 hours, 5^{th} or 7^{th} day was defined firstly by adherence in assessment (as defined above) at that period as this would provide basis. Secondly that the action matches the patient condition as per the treatment failure definitions and actions required (appendix C).

Complete adherence was indicated by adherence at admission (diagnosis classification, drug choice, dosage) and adherence during in-patient period (assessment, action)

Table 1: Summary of data collection procedure on adherence

Adherence timing	**Variable assessed**	**Source document**	**Reference document**
Admission	Diagnosis classification	PAR(Appendix A)	Pneumonia treatment guidelines (Appendix B)
	Drug choice	PAR(Appendix A) Treatment sheet	
	Drug dosage	Treatment sheet	
Inpatient period (24 hours 48 hours 5th day 7th day)	Clinical assessment (History Physical exam)	daily ward round notes	Treatment failure definitions (Appendix C)
	Clinical actions (Continuation, Change, addition or stopping antibiotic)	Daily ward round notes and treatment sheet	

3.8.4 Hospital outcomes

Outcome were lengths of stay, discharge or death. This was obtained from the patient notes and it was documented at the end of hospital stay.

3.9 Data Analysis

3.9.1 Data Management

Data were checked by the principal investigator for completeness and accuracy. It was then keyed into a prepared Stata database. Confidentiality was maintained by excluding any personally identifiable information from the keyed dataset. The database was password protected to prevent un-authorized access. Data were backed up in a remote hard disk and flash drive to safeguard against data loss.

3.9.2 Data Analysis and Presentation

Data were analyzed using STATA version 13 SE at 95% confidence interval Frequency listings and percentages were used for categorical data. For numerical data, median and inter quartile ranges were reported because Gaussian distribution was violated. Association among categorical variables was tested using chi square test and Fishers exact test. Logistic regression was employed to test for independent associations. P value of less than 0.05 was considered statistically significant. Results are presented in form of graphs, tables and text.

3.10 Ethical Considerations

Approval was sought from Institutional Research and Ethics Committee (IREC) of Moi University, College of Health Sciences/MTRH (Appendix D). Consent was waived by IREC. Permission to conduct the study was sought from Kitale County Hospital administration (Appendix E). Confidentiality was upheld throughout the study. Results obtained will be disseminated through an oral defense of thesis and thereafter may be presented at relevant scientific conferences and published in peer reviewed scientific journals. A written report shall be provided to the hospital management.

CHAPTER FOUR: RESULTS

4.1 Demographic and Clinical Characteristics

A total number of 380 patient files were reviewed. Demographic and clinical characteristics are shown in table 2 below.

The median age was 12 months (IQR 7, 24). Children below 12 months formed the majority (43.2%).

Majority had severe pneumonia (56%). Most were of normal nutritional status (56.6%) with adequate exclusive breastfeeding duration (53.4%) and immunization status (72. (%).

Table 2: Demographic and Clinical Characteristics (n=380)

Characteristic	Category	Frequency (%)
Sex	Female	182(47.9%)
	Male	198(52.1%)
Age	<12 months	164(43.2%)
	12 – 23 months	91(23.9%)
	24 – 59 months	125(32.9%)
Diagnosis severity	Pneumonia	167(43.9%)
	Severe pneumonia	213(56.0%)
Nutritional status	Normal	215(56.6%)
	Underweight	143(37.6%)
	Undocumented	22(5.8%)
Exclusive Breastfeeding duration	Adequate for age	203(53.4%)
	Inadequate for age	118(31.1%)
	Not documented	59(15.5%)
Immunization	Up-to date for age	277(72.9%)
	Not up-to date for age	29(7.6%)
	Not documented	74(19.5%)
Comorbidities	Cardiac disease	5(1.3%)
	HIV	7(1.8%)
	Asthma	5(1.3%)
	Underweight	143(37.6%)
	Others	14(3.7%)
	None	206(54.3%)

4.2 Adherence to the National Pneumonia Management guidelines

Complete adherence to the guidelines was in **2.1%** of the cases.

At admission, adherence to the guidelines was observed in **32.6**% of the patients while during in-patient period, **0.6%** were managed according to the guidelines.

4.2.1 Adherence to diagnosis classification, drug choice and dosage at admission

The diagnosis classification (53%), drug choice (56%) and dosages (71%) were correct in more than half of the patients at admission as shown in Figure 1 below.

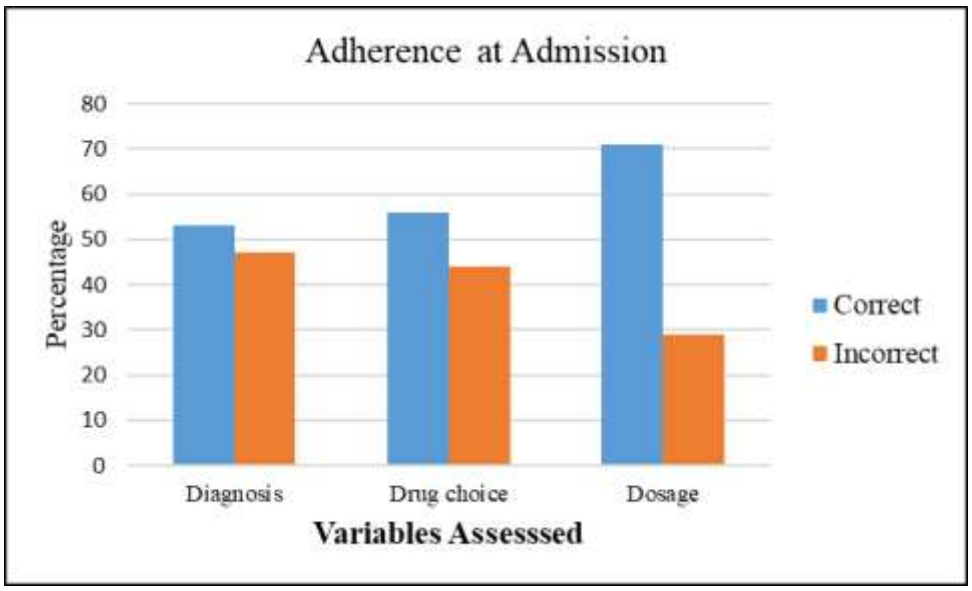

Fig.1.Graph showing adherence to diagnosis classification, drug choice and dosage at admission

4.2.2 Features assessed at different time points (24hours, 48 hours, 5th day, and 7th day)

All the features were assessed in 80% and above of the patients at admission, however in the subsequent reviews, all except cyanosis were mostly not assessed as shown in figure 2 below.

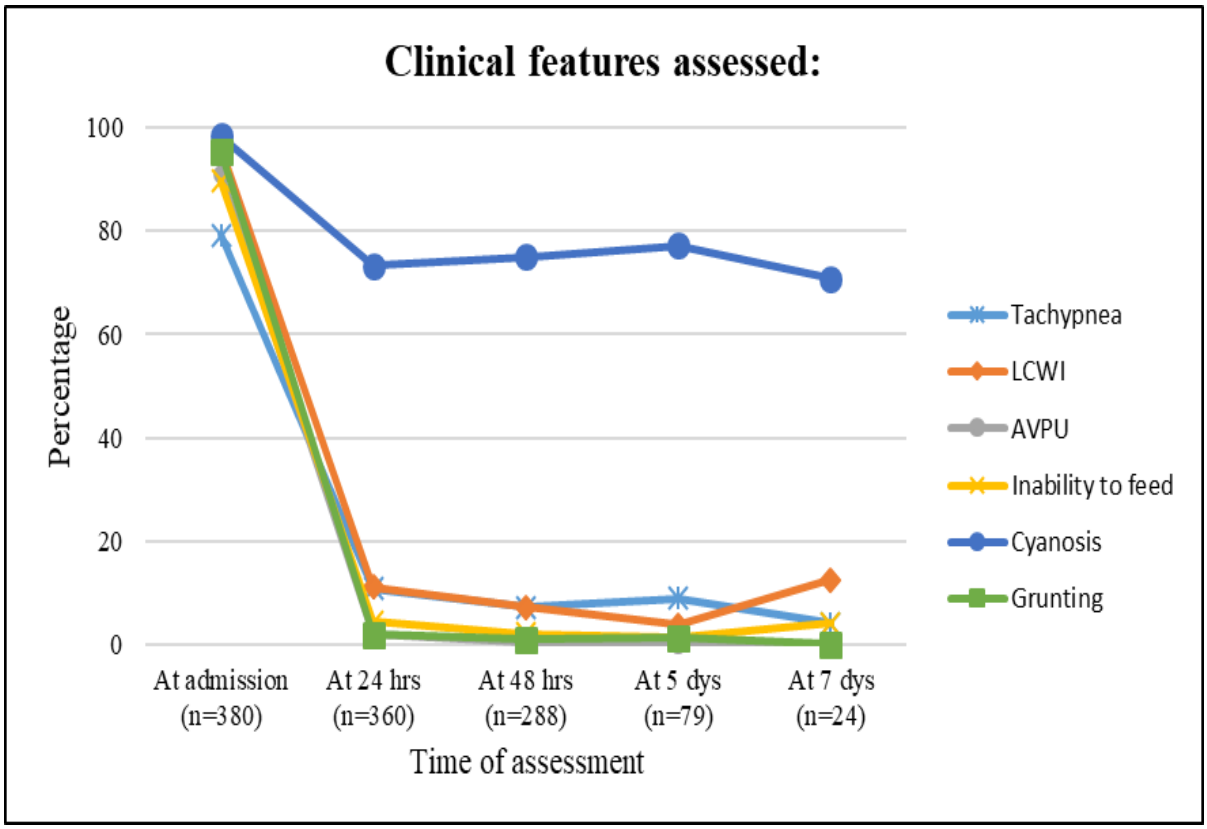

Fig.2 Line graph showing assessment of various clinical features during admission and in-patient period.

4.2.3 Adherence to treatment failure definitions during the in-patient period

4.2.3.1 Assessment of patients

The proportion of patients correctly assessed while in patient were 4.1% of the total and this declined to 3.7% at 48hours with a slight rise to 4% at 5th day and a marginal drop(0%) at 7th day as shown in figure 3 below

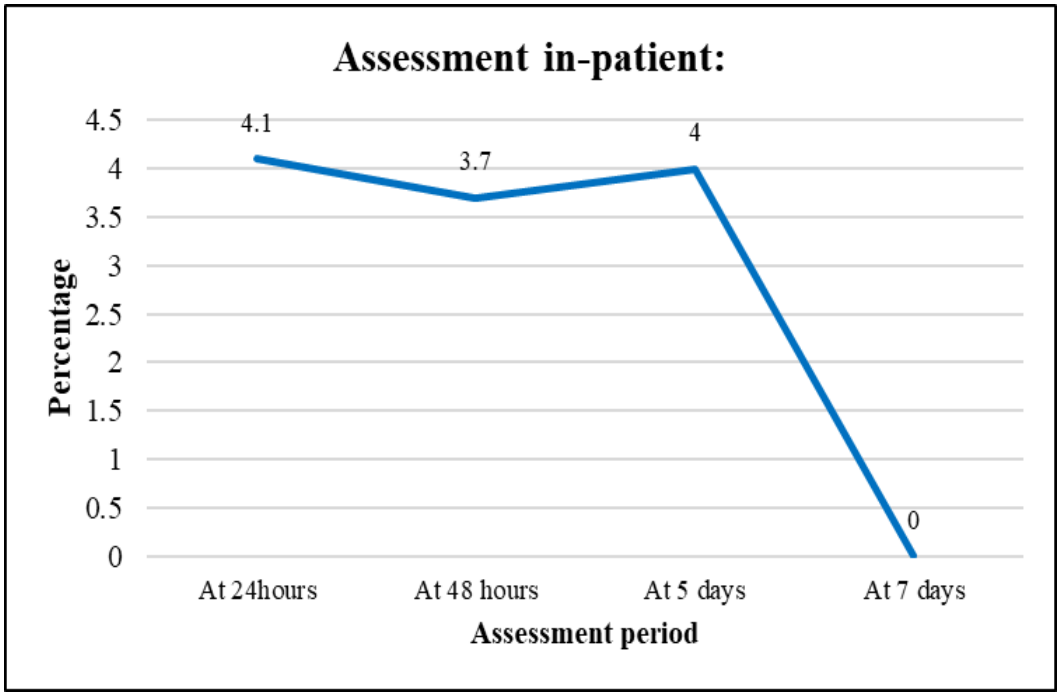

Fig.3. Line graph showing the proportion of correctly assessed in-patients

4.2.3.2 Clinical actions

The actions taken during the in-patient period were incorrect according to the guidelines and treatment failure definitions in the majority of case as shown in Figure 4 below. At 24 hours, only 1.4% of the actions taken were correct, with a slight rise to 1.7% at 48 hours. However much fewer actions were taken at 5th (1.3%) and 7th day (0%).

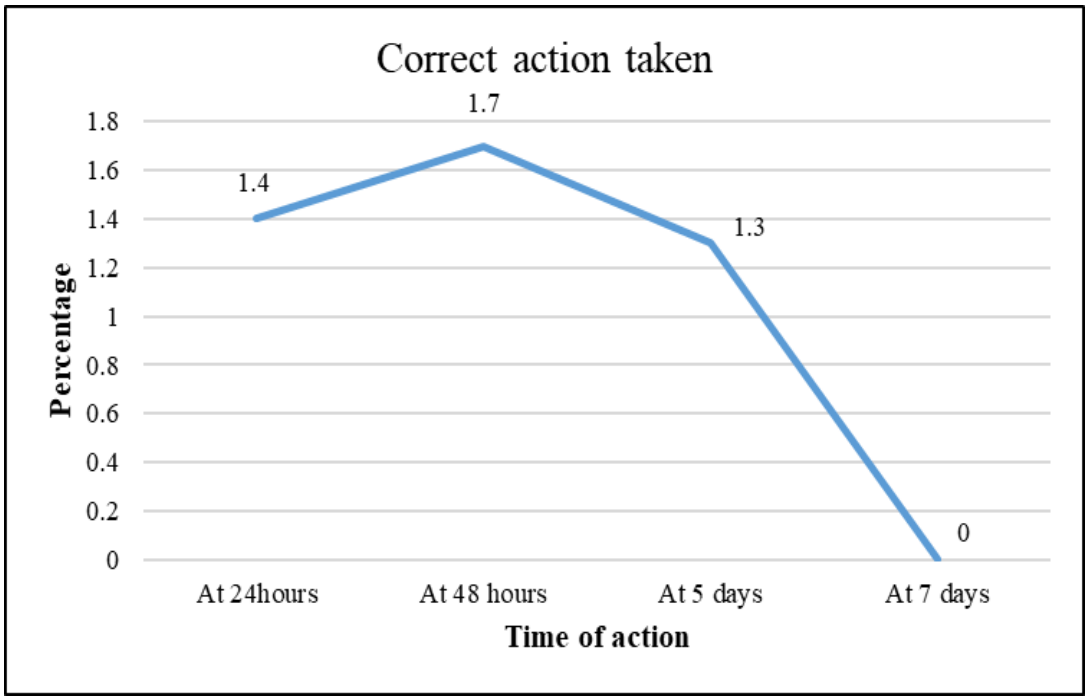

Fig.4. Line graph showing the proportion of correct actions taken after review of the patients during the in-patient period.

4.3. Factors associated with adherence to the guidelines

There was no significant association between adherence and either age, gender, diagnosis or admitting clinician as shown in table 3 below.

Table 3: Factors associated with complete adherence to the guidelines

Variable	Category	Non-Adherence	Adherence	p-value
Age	12-59 months	214(99.1%)	2(0.9%)	0.081
	<12months	158(96.3%)	6(3.7%)	
Diagnosis	Pneumonia	164(98.2%)	3(1.8%)	>0.999
	Severe pneumonia	208(97.7%)	5(2.3%)	
Gender	Female	180(98.9%)	2(1.1%)	0.287
	Male	192(97%)	6(3%)	
Length of stay	≤72 hours	231(97%)	8(3%)	_
	>72 hours	141(100%)	0(0%)	
Admitting clinician	Clinical officer	181(97.9%)	4(2.1%)	0.711
	Medical officer	105(97%)	3(3%)	

Fishers exact test

4.3 Hospital outcomes

The outcome measures considered were length of hospitalization and mortality

4.3.1Mortality

Case fatality rate was 8.2% where fifty five percent of the deaths occurred within 48 hours of hospitalization.

4.3.2 Length of hospitalization

The overall median length of stay was **3 days**

The median hospital days spent by those who were discharged alive was 3, while those who died was 2 days.

4.4 Factors associated with various outcomes

4.4.1 Factors associated with length of hospital stay

There was no significant association between length of hospital stay and age, sex, diagnosis classification, admitting clinician or nutritional status as shown in table 4 below.

Table 4: Factors associated with duration of hospital stay.

		Hospital stay		
Variables	**Categories**	**≤ 3 days**	**> 3 days**	**P-value**
Age	12-59 months	141(65%)	75(35%)	0.270
	<12 months	98(60%)	66(40%)	
Sex	Female	111(61%)	71(39%)	0.461
	Male	128(64.6%)	70(35.4%)	
Diagnosis classification	Pneumonia	118(70.7%)	49(29.3%)	0.006
	Severe pneumonia	121(56.8%)	92(43.2%)	
Admitting clinician	Clinical officer	114(62%)	71(38%)	0.931
	Medical officer	66(61%)	42(39%)	
Overall adherence	Non adherence	231(62%)	141(38%)	_
	Adherence	8(100%)	0(0%)	
Nutritional status	Well nourished	139(64.7%)	76(35.3%)	0.258
	Underweight	84(58.7%)	59(41.3%)	

**Chi square test*

4.4.2 Factors associated with mortality

Diagnosis classification (p=0.001) and complete adherence to the guidelines (p=<0.001) were significantly associated with mortality as shown in table 5 below

Table 5: Factors associated with mortality

		Treatment outcome		
Variables	**Categories**	**Alive**	**Died**	**P-value**
Age	12-59 months	203(94%)	13(6%)	0.080
	<12 months	146(89%)	18(11%)	
Sex	Female	167(91.8%)	15(8.2%)	0.954
	Male	182(92%)	16(8%)	
Diagnosis classification	Pneumonia	162(97%)	5(3%)	0.001
	Severe pneumonia	187(87.8%)	26(12.2%)	
Admitting clinician	Clinical officer	174(94%)	11(6%)	0.434
	Medical officer	99(91.7%)	9(8.3%)	
Complete adherence	Non adherence	347(93.3%)	25(6.7%)	<0.001*
	Adherence	2(25%)	6(75%)	
Nutritional status	Well nourished	201(93.5%)	14(6.5%)	0.177
	Malnourished	128(89.5%)	15(10.5%)	

**Fisher's Exact test*
Chi square test

Table 6: Logistic regression-Mortality

		Outcome = (0=alive, 1=died)		
Variable	**Outcome**	**Odds Ratio**	**p-value**	**95% C.I.**
Age group	12-59 months	1		
	<12 months	2.400759	0.071	0.926, 6.219
Diagnosis	Pneumonia	1		
	Severe pneumonia	6.364695	0.003	1.841, 22.000
Adherence	Non adherence	1		
	Adherence	1.778483	0.620	0.182, 17.345
Nutrition status	Well nourished	1		
	Underweight	1.661869	0.271	0.672, 4.106

Controlling for other variables, diagnosis classification was significantly associated with mortality Adjusting for age, adherence and nutritional status those with severe pneumonia were 6.3 times more likely to die compared to those diagnosed with pneumonia.

CHAPTER FIVE: DISCUSSION

This study demonstrated an adherence of 2.1% to the Kenya national pneumonia management guidelines at Kitale County Hospital. This finding is similar to a study in Tanzania, a low income country with high disease burden comparable to Kenya. In the Tanzania study, adherence to the Referral Care Manual for treatment of pneumonia which is similar to Kenya national pneumonia management guidelines was found to be at 1%. This study, like ours, assessed adherence at admission as well as during in-patient care (Reyburn *et al.*, 2008). There are studies that have found higher level of adherence to different pneumonia management guidelines both in Kenya and regionally. In a study in Khartoum, Sudan, the level of adherence to WHO pneumonia management guidelines at admission was at 18% (Salih *et al*., 2014) while in a Kenyan study at Garissa County Hospital, the level of adherence was at 43% (Mutinda *et al*., 2014) .These high adherence figures are due to the fact that both studies assessed adherence at admission only. In this study, adherence to the guidelines was higher at admission (32%) as compared to in-patient stay (0.6%). We assessed adherence for a longer period of time extending to the patients discharge, death or a maximum of seven days. We found that adherence decreased with longer patient stay in the ward.

The higher adherence at admission in this study could be attributed to the use of standardized pediatric admission record form (PAR) which was not in use in Garissa. A standardized pediatric admission record form has been shown in studies to improve documentation of patient care as well as management (Mwakyusa *et al*., 2006). Additionally, Irimu *et al.* (2012) while developing and introducing evidence based clinical practice guidelines at Kenyatta National Hospital, postulated that poor documentation is an explanation for many of observed omissions in patient

management. The higher level of adherence at admission could also be due to the fact that the patients were sicker at admission than during their inpatient stay. A study done in Tanzania demonstrated that clinicians are more likely to comply with clinical practice guidelines when caring for severely sick patients. Patients at admission are often more sick than during in-patient stay (Reyburn *et al*., 2008)

Overall, the level of assessment and documentation for most of the symptoms and signs at admission was above 80 %. This is higher than the finding of 47% at Garissa County Hospital and it can be attributed to the presence of a structured admission record during this study while there was none at Garissa (Mutinda *et al*., 2014). Data from Kitale County Hospital and the Clinical Information network, several months after our study indicates that documentation of clinical signs and symptoms at admission has now improved to 95% (KEMRI:Clinical Information Network, Kitale Report 2016) This is due to the ongoing feedback and audit sessions that are being conducted by KEMRI-KWTRP in conjunction with the Ministry of Health (Irimu *et al*.,2018)

The most recorded danger sign was cyanosis. This is higher than the finding at KNH of 75.1% after introduction of clinical practice guidelines at the institution (Irimu *et al*., 2012). At Garissa County Hospital, cyanosis was only reported in 18% and in Tanzania cyanosis was only assessed in 6% of patients that presented with cough or difficulty in breathing or had a diagnosis of pneumonia. The Tanzania study however used direct observations of clinicians as they assessed patients instead of chart reviews. Clinicians tend to perform better initially when observed but worsen thereafter (Mutinda *et al.*, 2014; Reyburn *et al*., 2008). In our study, we used documentation rather than observation and this may explain why Kitale has fared better.

There are few studies documenting adherence to pneumonia management guidelines during in-patient stay. This study documented an adherence of 0.6% during the inpatient period. Very few patients were assessed in accordance to the guidelines during reviews at 24 hours, 48 hours, and the fifth and seventh day in the ward. A Tanzania study has reported that clinical assessments of patients within 48 hours were few and uninformative (Reyburn *et al.,* 2008). The study reported that about eight minutes are required for a complete assessment of a patient in accordance with the Referral care Manual which is akin to our national pneumonia management guidelines. The time available for patient review in a typical outpatient set-up or ward of comparable patient load is only four minutes and this could explain why most features are not assessed or documented (Reyburn et al., 2008). In KNH, review of the patients with pneumonia while in the ward was at 4.3% and had the least improvement (0.1%) of all indicators assessed despite intensive training. It was found that adherence was generally higher for tasks that rely on individual clinicians' performance such as diagnostic formulation at admission as compared to tasks based on sustained team efforts like patient review during in patient stay and therefore educational targets on individuals may not achieve improvements in team tasks (Irimu *et al*., 2012; Puoane, Cuming, Sanders, & Ashworth, 2008). Additionally, Reyburn *et al* in Tanzania postulated that there is a tendency among clinicians to only record abnormal findings and leave out normal ones. This may give a false implication of not being assessed (Reyburn *et al*., 2008). As the normal findings increase as the patient continues to be in the ward, the level of documentation decreases and hence the observed reduced adherence.

The actions that were taken in the management of patients with pneumonia at all the assessed review points were considered in-appropriate in almost all the patients. These actions included change of antibiotics, continuation of the same regimen of antibiotics

or stoppage of medication. The wrong actions stemmed from wrong or incomplete assessment recorded which meant that there lacked an obvious clinical basis for the action taken. Similarly, Agweyu *et al.* (2014) and Webb *et al*. (2012) while describing treatment failure, found that in the majority of cases, the ward clinicians' decisions to revise treatment had no apparent supporting clinical evidence and therefore classified as treatment failure.

There has been a wide variation in the case fatality rate (CFR) reported in various studies due to differences in the population studied. This study showed a CFR of 8.2%. In a multicenter study in Kenya, the average CFR was 3.9% for all forms of pneumonia. The range was however wide ranging from 0.7% to 8.1% across seven Kenyan hospitals where the study was conducted... The highest CFR was at New Nyanza Provincial Hospital at 8.1% (Agweyu, 2015). There were higher odds of mortality in a patient with severe pneumonia. Our findings concur with Agweyu *et al* (2015) who found that mortality for hospitalized children with pneumonia was highest in those with severe forms of the disease. A published systematic review of studies done in low and middle income countries also had concurring results whereby they identified severity of pneumonia and comorbidities among the factors independently associated with mortality (Sonego *et al.*, 2015) .

The median length of stay in this study was 3 days. Those who died had a shorter duration of stay. These findings are consistent with Agweyu *et al* (2015) where the median length of stay was 3 days with a shorter duration for those who died. Those with severe pneumonia had six times odd of dying compared to those with a diagnosis of pneumonia.

STUDY LIMITATIONS

Adherence was based on documented management only and an assumption was made the documented management is what was received by the patient.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Adherence to national pneumonia management guidelines was low. The adherence decreased markedly from diagnosis to discharge or death.

The case fatality rate was higher than the global average while length of stay conforms to international recommendations.

There were higher odds of mortality in a patient with severe pneumonia.

6.2 Recommendations

Research looking into the factors affecting adherence among clinicians to national pneumonia management guidelines

Training for clinicians at Kitale County Hospital on the inpatient components of the national guidelines for management of pneumonia should be undertaken.

Introduction of structured forms for review of the pneumonia patient in the ward to improve documentation

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APPENDICES

Appendix A: Data Collection Form

Data Collection Form

SERIAL NO.	
DATE OF DATA COLLECTION	
TIME OF DATA COLLECTION	
COLLECTED BY(NAME)	
SIGNATURE OF PERSON COLLECTING DATA	

1. SOCIO DEMOGRAPHIC DATA

1.1 CHILDS DATA:

DATE OF BIRTH/AGE_____ GENDER F ☐ M ☐

1.2 NUTRITIONAL STATUS

CURRENT WEIGHT_____kgs

LENGTH/HEIGHT _____cm

MUAC _____ cm Z SCORE_____

WELL NOURISHED ☐ AT RISK ☐

MODERATE MALNUTRITION ☐ SEVERE MALNUTRITION ☐

NUTRITIONAL STATUS NOT DOCUMENTED ☐

1.3 COMORBIDITIES

MALNUTRITION ☐ ☐ HIV

CARDIAC DISEASE ☐ ☐ NEUROLOGICAL

DISEASE ☐

TUBERCULOSIS ☐ OTHERS SPECIFY

HERE_____

1.4 IMMUNIZATION HISTORY

PENTAVALENT YES ☐ NO ☐ PCV 1 YES ☐ NO ☐

PENTAVALENT 2 YES ☐ NO ☐ PCV 2 YES ☐ NO ☐

PENTAVALENT 3 YES ☐ NO ☐ PCV 3 YES ☐ NO ☐

MEASLES YES ☐ NO ☐

IMMUNIZATION INFORMATION NOT DOCUMENTED ☐

1.5 NUTRITIONAL HISTORY

EXCLUSIVE BREASTFEEDING

DURATION_____MONTHS

INFORMATION UNDOCUMENTED ☐

TOTAL BREASTFEEDING

DURATION_____MONTHS

INFORMATION UNDOCUMENTED ☐

CHECKLIST

1. ASESSMENT

1.1ADMITTING CLINICIAN (Tick one please)

CLINICAL OFFICER ☐ MEDICAL OFFICER ☐

PAEDICTRICIAN ☐ NOT INDICATED ☐

1.2. ASSESSMENT AT ADMISSION

CLINICAL SIGN	PRESENT	ABSENT	NOT INDICATED
COUGH			
DIFFICULTY IN BREATHING			
INABILITY TO FEED/BREASTFEED			
WHEEZE			
TACHYPNEA			
LOWER CHEST WALL INDRAWING			
CYANOSIS			
GRUNTING			
AVPU=V,P,U			
O_2 SAT^n<90%			

1.3 DIAGNOSIS ON THE CHART (Tick one

PNEUMONIA ☐

SEVERE PNEUMONIA ☐

VERY SEVERE PNEUMONIA ☐

1.4 ANTIBIOTIC TREATMENT (Based on dx above)

I.V BENZYLPENICILIN 50000I.U QID ☐ I.V AMPICILLIN 50mg/kg TID ☐

I.V GENTAMICIN 7.5mg/kg OD ☐ P.O AMOXICILIN 40mg/kg BD ☐

I.V CEFTRIAXONE 50mg/kg OD ☐ P OTHERS ☐

P.O COTRIMOXAZOLE 4mg/kg TMP,20mg/kg ☐

1.5. FOLLOW –UP

1.5.1 ASSESSMENT AT 24 HOURS

CLINICAL SIGN	ASSESSED	NOT ASSESSED	PRESENT	ABSENT
COUGH				
DIB				
INABILITY TO FEED				
TACHYPNEA				
LOWER CHEST WALL INDRAWING				
CYANOSIS				
GRUNTING				
AVPU=V,P,U				
O2SAT<90%				
CAVITATION/EFFUSION/EMPHYEMA ON CHEST X-RAY				

1.5.1 ACTION TAKEN **1.5.2 NEW ANTIBIOTICS PRESCRIBED**

TREATMENT CONTINUED ☐ a) _____

TREATMENT ADDED ☐ b) _____

TREATMENT CHANGED ☐ c) _____

TREATMENT STOPPED ☐ d) _____

1.6 ASSESMENT AT 48HOURS

CLINICAL FEATURE	**ASSESSED**	**NOT ASSESSED**	**PRESENT**	**ABSENT**
COUGH				
DIB				
INABILITY TO FEED				
TACHYPNEA				
LOWER CHEST WALL INDRAWING				
CYANOSIS				
GRUNTING				
AVPU=V,P,U				
O2SAT<90%				
FEVER				
CAVITATION/EMPHYEMA/ EFFUSION ON CHEST X-RAY				

1.6.1 ACTION TAKEN

TREATMENT CONTINUED ☐
TREATMENT ADDED ☐
TREATMENT CHANGED ☐
TREATMENT STOPPED ☐

1.6.2 NEW DRUGS PRESCRIBED

a) _____
b) _____
c) _____
d) _____

1.7 ASSESSMENT AT DAY 5

CLINICAL SIGN	ASSESSED	NOT ASSESSED	PRESENT	ABSENT
COUGH				
DIB				
INABILITY TO FEED				
TACHYPNEA				
LOWER CHEST WALL INDRAWING				
CYANOSIS				
GRUNTING				
AVPU=V,P,U				
O2SAT<90%				
FEVER				
CAVITATION/EMPHYEMA/EFFUSION ON CHEST X-RAY				

1.7.1ACTION TAKEN **1.7.2 NEW ANTIBIOTICS PRESCRIBED**

TREATMENT CONTINUED ☐ a) _____

TREATMENT ADDED ☐ b) _____

TREATMENT CHANGED ☐ c) _____

TREATMENT STOPPED ☐ d) _____

1.8ASSESSMENT AT DAY 7

CLINICAL SIGN	ASSESSED	NOT ASSESSED	PRESENT	ABSENT
COUGH				
DIB				
INABILITY TO FEED				
TACHYPNEA				
LOWER CHEST WALL INDRAWING				
CYANOSIS				
GRUNTING				
AVPU=V,P,U				
O2SAT<90%				
FEVER				
CAVITATION/EMPHYEMA/ EFFUSION ON CHEST X-RAY				

1.8.1 ACTION TAKEN 1.8.2 **NEW ANTIBIOTICS PRESCRIBED**

TREATMENT CONTINUED ☐ a) _____

TREATMENT ADDED ☐ b) _____

TREATMENT CHANGED ☐ c) _____

TREATMENT STOPPED ☐ d) _____

<u>PART 2(TO BE FILLED BY PRINCIPAL INVESTIGATOR ONLY</u>)

DIAGNISI/CLASSIFICATION (Based on clinical features)

CORRECTLY DONE ☐

INCORRECTLY DONE ☐

CORRECT DRUG(S)

YES ☐

NO ☐

CORRECT DOSAGE

YES ☐

NO ☐

ASSESSMENT AT 24HOURS

NOT DONE (Death/discharge) ☐

DONE CORRECTLY ☐

DONE INCORRECTLY ☐

NOT DONE ☐

ACTION AT 24 HOURS

CORRECT ☐

INCORRECT ☐

ASSESSMENT AT 48HOURS

NOT DONE (Death/discharge) ☐

DONE CORRECTLY ☐

DONE INCORRECTLY ☐

NOT DONE ☐

ACTION AT 48HOURS

CORRECT ☐

INCORRECT ☐

ASSESSMENT AT DAY 5

NOT DONE (Death/discharge) ☐

DONE CORRECTLY ☐

DONE INCORRECTLY ☐

NOT DONE ☐

ACTION AT DAY 5

CORRECT ☐

INCORRECT ☐

ASSESSMENT AT DAY 7

NOT DONE (Discharge/dead) ☐

DONE CORRECTLY ☐

DONE INCORRECTLY ☐

NOT DONE ☐

ACTION AT DAY 7

CORRECT ☐

INCORRECT ☐

MANAGEMENT ADHERENT TO NATIONAL TREATMENT GUIDELINES

YES ☐ NO ☐

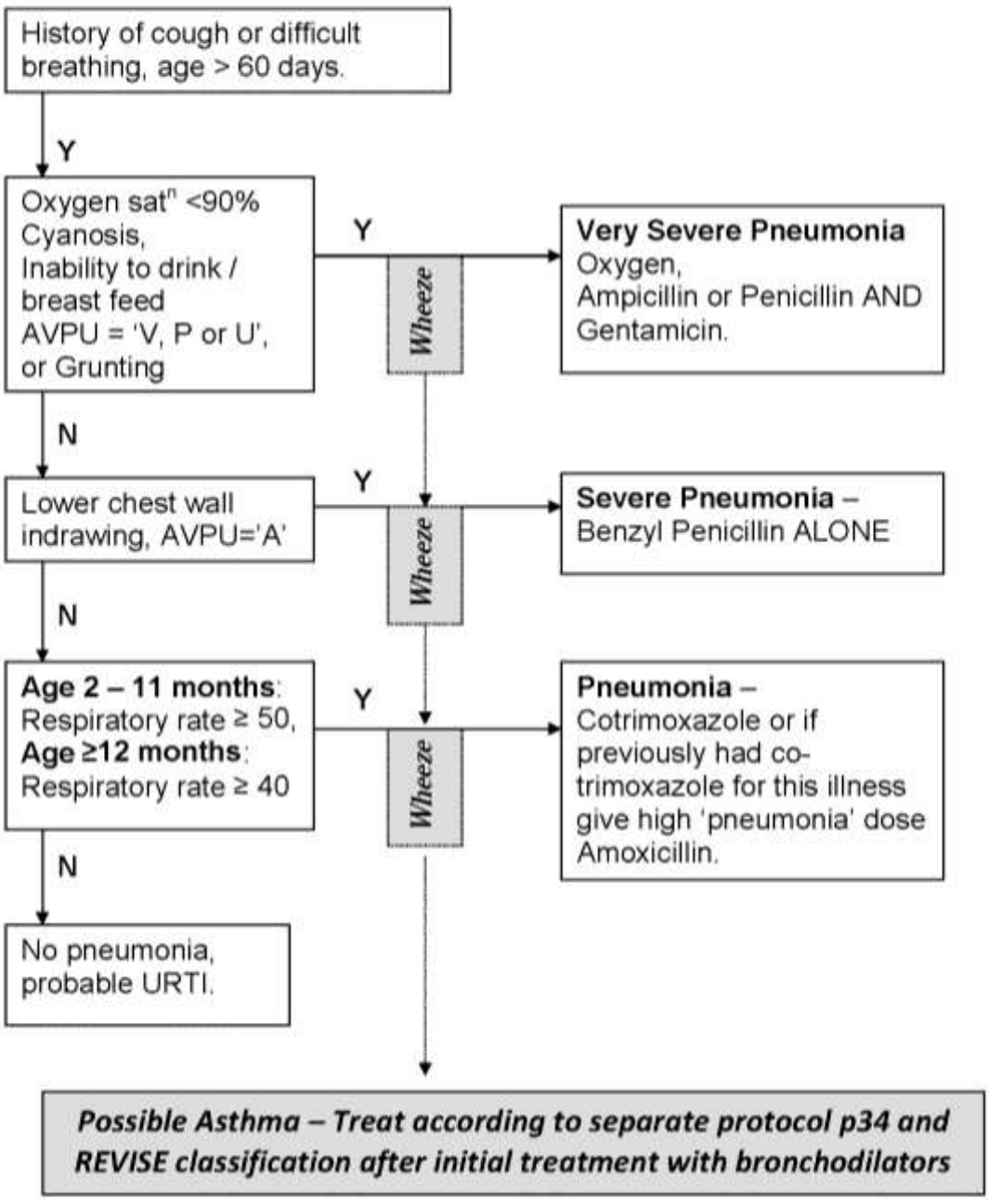
OUTCOME OF TREATMENT

LENGTH OF HOSPITAL STAY_____ DAYS

DISCHARGE ☐

DEATH ☐

Appendix B: Basic Pediatric Protocols – Pneumonia Management



Appendix C: Pneumonia treatment failure definitions

Pneumonia treatment failure definitions.

HIV infection or TB may underlie treatment failure – testing helps the child.

See HIV page for PCP treatment (p 36); see TB page for PTB (p 35).

Treatment failure definition	Action required
Any time.	
Progression of severe pneumonia to very severe peumonia (development of cyanosis or inability to drink in a child with pneumonia without these signs on admission)	Change treatment from Penicillin alone and add gentamicin.
Obvious cavitation on CXR	Treat with Cloxacillin and gentamicin iv for Staph. Aureus or Gram negative pneumonia.
48 hours	
Very severe pneumonia child getting worse, re-assess thoroughly, get chest X ray if not already done (looking for empyema / effusion, cavitation etc).	Switch to Ceftriaxone unless suspect Staphylococcal pneumonia when use pen, flucloxacillin and gent. Suspect PCP especially if <12m, an HIV test **must** be done - treat for Pneumocystis if HIV positive
Severe pneumonia <u>without</u> improvement in at least **one** of: ✓ Respiratory rate, ✓ Severity of indrawing, ✓ Fever, ✓ Eating / drinking.	Change treatment from Penicillin alone and **add** gentamicin.
Day 5.	
At least 3 of: ✓ Fever, temp >38^{0}C ✓ Respiratory rate >60 bpm ✓ Still cyanosed or saturation <90% and no better than admission ✓ Chest indrawing persistent ✓ Worsening CXR	a) If only on penicillin change to Penicillin / Gentamicin b) If on Pen & Gent change to ceftriaxone. c) Suspect PCP, an HIV test **must** be done - treat for Pneumocystis if HIV positive.
After 1 week.	
Persistent fever and respiratory distress.	Consider TB, perform mantoux and check TB treatment guidelines.

Appendix D: IREC Approval

INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)

MOI TEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 33471/2/3

MOI UNIVERSITY
SCHOOL OF MEDICINE
P.O. BOX 4606
ELDORET

Reference: IREC/2015/132
Approval Number. 0001458.

10th August, 2015

Dr. Christine Marete,
Moi University,
School of Medicine,
P.O. Box 4606-30100,
ELDORET-KENYA.

INSTITUTIONAL RESEARCH & ETHICS COMMITTEE
10 AUG 2015
APPROVED
P.O. Box 4606-30100 ELDORET

Dear. Dr. Marete,

RE: FORMAL APPROVAL

The Institutional Research and Ethics Committee has reviewed your research proposal titled:-

"Clinicians Adherence to National Pneumonia Management Guidelines and Outcomes of Treatment in Children under Five Years Admitted at Kitale County Hospital, Kenya.

Your proposal has been granted a Formal Approval Number: ***FAN: IREC 1458*** on 10th August, 2015. You are therefore permitted to begin your investigations.

Note that this approval is for 1 year; it will thus expire on 9th August, 2016. If it is necessary to continue with this research beyond the expiry date, a request for continuation should be made in writing to IREC Secretariat two months prior to the expiry date.

You are required to submit progress report(s) regularly as dictated by your proposal. Furthermore, you must notify the Committee of any proposal change (s) or amendment (s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. The Committee expects to receive a final report at the end of the study.

Sincerely,

For

PROF. E. WERE
CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

cc Director - MTRH Dean - SOP Dean - SOM
Principal - CHS Dean - SON Dean - SOD

Appendix E: Hospital Approval

REPUBLIC OF KENYA
MINISTRY OF HEALTH
COUNTY GOVERNMENT OF TRANSNZOIA

Telephone: 05431551
Fax: 31551
Email: medsupkitale@yahoo.com
Ref: KIT/MOH/ADMIN/48/2015
TO:

KITALE COUNTY AND REFERRAL HOSPITAL,
P.O BOX 98 – 30200, KITALE

Dr: Christine Marete

Moi University

Department of Childhealth and Pediatrics

Dear Madam,

REF: PERMISSION TO CARRY OUT RESEARCH AT KITALE COUNTY AND REFERRAL HOSPITAL

Thank you for your interest in carrying out research at our facility. This is to notify you that your request to carry our research on 'Clinicians adherence to national pneumonia management guidelines and treatment outcomes in children under five years admitted at Kitale County Hospital, Kenya' has been granted.

However you will be required to:

- Share your findings with the facility
- You cannot change the topic without notifying the facility
- You must carry out the research within the stipulated period
- Patient confidentiality will not be violated.

Thank you and in case you need assistance kindly don't hesitate to contact us.

Yours faithfully

Dr. Musabi S Melab
Training Coordinator, Kitale County and Referral Hospital.

MEDICAL SUPERINTENDENT
KITALE DISTRICT HOSPITAL
12 FEB 2016
MINISTRY OF MEDICAL SERVICES
P.O. BOX 98-30200
KITALE

Appendix F: Pediatric Admission Record

Paediatric Admission Record – Paediatric Ward

Name		**IP No.**		**Ward**			
Contact (Tel)		**Relation**		**DOB**	dd/mm/yyyy		
Admission Date	dd /mm / yyyy	**Sex**	M ☐ / F☐	**Age**	years	months	days
Referred to hospital?	Y☐N☐	***If yes from facility (name):***		**Re-admission to this hospital?**	Y☐N ☐	**Discharged <1 month ago**	Y☐N☐
Presenting Complaints							

History & Examination

Weight	Kg	**Height / Length**	cm	*WHZ score*		MUAC (cm)		**Head Circum** (cm)	

	days	
Length of illness		
Fever – No. of days =	Y☐	N☐
Cough– No. of days =	Y☐	N☐
Cough > 2 weeks	Y☐	N☐
Contact with TB /Chronic cough (last 12 months)	Y☐	N☐
Difficulty breathing	Y☐	N☐
Diarrhoea No. of days =	Y☐	N☐
Diarrhoea > 14d	Y☐	N☐
Diarrhoea bloody	Y☐	N☐
Vomiting, No / 24hrs =	Y☐	N☐
Vomits everything	Y☐	N☐
Difficulty feeding	Y☐	N☐
Convulsions Number in last 24hrs = ____	Y☐	N☐
Partial / focal fits?	Y☐	N☐

Additional history of presenting illness

Immunization

Vaccine	BCG	OPV	IPV	Penta	Pneumo	Rota	Measles
No of doses							

Birth History

Maternal PMTCT status: ☐ Positive ☐ Negative ☐ Unknown

Growth and Development

Nutritional history

Treatment History

Review of Systems:
Respiratory including ENT

Cardiovascular

Gastro-intestinal / Genitourinary

CNS

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Examination

Vital Signs	Temp	°C	Resp Rate	bpm	HR	/min	O2 Sat	%	BP	mmHg

General Examination

Oral thrush Y☐ N☐ Lymph N > 1cm Y☐ N☐

Finger Clubbing Y☐ N☐

Jaundice	0	+	+++
Oedema	☐None	☐Foot ☐Knee	☐Face

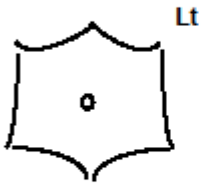
A	Stridor	Y☐	N☐
B	Central Cyanosis	Y☐	N☐
	Indrawing	Y☐	N☐
	Grunting	Y☐	N☐
	Acidotic breathing	Y☐	N☐
	Wheeze	Y☐	N☐
	Crackles	Y☐	N☐

Circ & Dehydr'n	Peripheral Pulse	☐Normal	☐ Weak	
	Cap Refill	secs	*X = not possible*	
	Pallor / Anaemia	0	+	+++
	Skin warm at:	☐ Hand	☐ Elbow	☐ Shoulder
	Sunken eyes	Y☐	N☐	
	Skin pinch (sec)	0	1	≥ 2

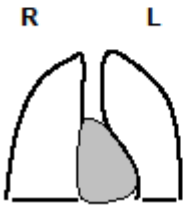
D	**AVPU**	**A**	**V**	**P**	**U**
	Can drink / breastfeed?		Y☐	N☐	
	Stiff neck		Y☐	N☐	
	Bulging fontanelle		Y☐	N☐	
Infant < 2m	Irritable		Y☐	N☐	
	Reduced movement / tone		Y☐	N☐	

New-born	Umbilicus	Normal ☐	Pus ☐	Pus & red skin ☐

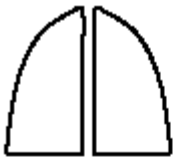
Abdomen



Chest



Front



Back

CVS

Bones & Joints

Wrist / Rib signs Rickets Y☐ N ☐

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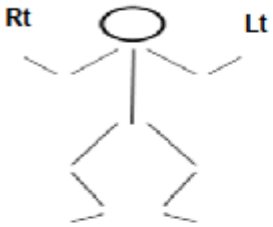
ENT exam	Neurological Examination
Rt Ear Lt Ear Nose Throat	

Investigations Ordered (record subsequent tests and all results in medical record)

Malaria	☐ Blood slide ☐ Rapid Test	***Glucose***	☐ Stick test ☐ Laboratory
Haematology	☐ Hb ☐ HCT ☐ Full haemogram	***Chemistry***	☐ Na + K ☐ U&C ☐ Ca ☐ Alb ☐ LFT
Microbiology	☐ Lumbar Puncture ☐ Blood Culture	***HIV***	☐ Rapid test ☐ PCR
X-Ray	☐ CXR ☐Wrist Other =	***Urine***	☐ Urinalysis ☐ Micro & culture
TB Test	☐ Microscopy for AAFBs ☐ Xpert MTB/RIF ☐ *Myco. TB* culture	***Other 1*** ***Other 2***	

Summary of presentation & problems

Admission Diagnoses – Select ONE *primary diagnosis (tick box indicating "1") and ANY secondary diagnoses (tick box indicating "2"), then indicate level of severity or type of disease if required*

Malaria	1 ☐ 2 ☐	☐ Severe ☐ Non-severe	***Anaemia***	1 ☐ 2 ☐	☐ Severe ☐ Non-severe
Pneumonia	1 ☐ 2 ☐	☐ Severe ☐ Non-severe	***Sickle cell disease***		1 ☐ 2 ☐
Diarrhoea	1 ☐ 2 ☐	☐ Non-bloody ☐ Bloody (dysentery)	***Meningitis***		1 ☐ 2 ☐
Dehydration	1 ☐ 2 ☐	☐ Shock ☐ Severe ☐ Some	***Rickets***		1 ☐ 2 ☐
HIV	1 ☐ 2 ☐	☐ Positive ☐ Exposed /PMTCT + ☐ Negative ☐ Declined test	***Asthma***	1☐ 2☐	☐ Severe ☐ Mild/moderate
Malnutrition	1 ☐ 2 ☐	☐ Kwash ☐ Marasm ☐ M. Kwash ☐ Moderate malnutrition	***Suspected TB*** ***Prematurity / LBW***		1 ☐ 2 ☐ 1 ☐ 2 ☐
Other 1	1 ☐ 2 ☐		***Neonatal sepsis***		1 ☐ 2 ☐
Other 2	1 ☐ 2 ☐				

Treatment Supportive care & Observations – indicate what care is needed

Keep warm	☐	Oxygen	☐	**Clinician Name & Sign**
IV / oral fluids plan	☐	Blood transfusion	☐	....
Vitamin A	☐	Nutrition / Feeds plan	☐	
Review status	☐ Medical <6hrs ☐ Priority Nursing Observations			Date... /...../..... Time ..... dd/mm/yyyy am / pm

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