ADHERENCE TO THE NATIONAL GUIDELINES FOR MANAGEMENT OF CHILDREN WITH PNEUMONIA AT GARRISA PROVINCIAL GENERAL HOSPITAL.

Dissertation presented in partial fulfillment of the degree of Master of Medicine (Pediatrics and Child Health), University of Nairobi.
DECLARATION:
This dissertation is my original work and has not been presented for the award of a degree in any other university.

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- To God almighty for always being by my side.
**ABBREVIATIONS**

AIDS    Acquired Immunodeficiency Syndrome
AVPU   Simple consciousness scale (Alert, responding to Voice responding to Pain, Unconscious)
CXR    Chest X ray
EPRP   External Peer Review Programme
ESR    Erythrocyte Sedimentation Rate
ETAT   Emergency Triage Assessment and Treatment
GoK    Government of Kenya
HIV    Human Immunodeficiency Virus.
IMCI   Integrated Management of Childhood Illnesses
LCWI   Lower Chest Wall In drawing
MDGs   Millennium Development Goals
MMED   Master of Medicine
MOH    Ministry of Health
NEP    North Eastern Province
NGO    Non- Governmental Organization
OPD    Out patient Department
PCP    Pneumocystis carinii pneumonia
PGH    Provincial General Hospital
QI     Quality improvement
QoC    Quality of Care
TB     Tuberculosis
TBC    Total Blood Count
TPB    Theory of Planned Behaviour
RR     Respiratory rate
UNICEF United Nations Children’s Fund
URTI   Upper Respiratory Tract Infection.
VAMC   Veterans Affairs Medical Centers
WHO    World Health Organization
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DEFINITIONS:

Guidelines are systematically developed evidence-based statements which assist providers, recipients and other stakeholders to make informed decisions about appropriate health interventions.

Clinical practice guidelines - Systematically developed statements that assist health care professionals and patients make decisions about screening, prevention or treatment of specific health conditions.

Adherence

- The act or state of being consistent;
- The extent to which a person’s behaviour coincides with set regulations.

Guideline adherence – conformity in fulfilling or following official recognised or institutional requirements, guidelines, recommendations, protocols, pathways or other standards.

Pneumonia – It is a form of acute respiratory infection affecting the lungs.

- Clinical definitions by the World Health Organisation (WHO) - fast breathing or lower chest wall in drawing in a child presenting with cough or difficult breathing.
- Radiological definition used in epidemiologic studies and vaccine trials – a chest radiograph that demonstrates significant amount of alveolar type consolidation, or shows more minor degrees of consolidation accompanied by pleural effusion.

Quality improvement - The systematic approach of elimination of waste, rework, and losses in production process. It is a continuous process of evaluating processes, procedures and support functions in healthcare delivery and seeking improvements in efficiency, cost-effective care and patient satisfaction.

Theory of planned behaviour - A psychological concept that explains the link between beliefs and behaviour.
ABSTRACT:

Background: Clinical Practice Guidelines for childhood illnesses including pneumonia in Kenya are contained in the basic paediatric protocols. These have been disseminated through the ETAT + course since 2007. Implementation of guidelines into care has been shown to reduce case fatality from pneumonia by 36%.

Objectives: The study set to establish the level of and factors associated with adherence to the National guidelines on management of pneumonia in children aged 2 – 59 months.

Design: Hospital based cross sectional study.

Setting: The paediatric department of Garissa Provincial General Hospital (PGH) in Kenya.

Subjects: Clinical records of patients aged 2- 59 months diagnosed with pneumonia from January to June 2012 were reviewed. Health workers who participated in the care of these patients completed a self administered structured questionnaire.

Results: Guideline adherence was assessed at three levels; assessment of clinical signs and symptoms found to be 42.9% (SD ±17.3), correct classification of disease severity was 56.6% and recommended treatment of pneumonia was 27.7%. The presence of a co-morbidity and severe disease was associated with better adherence to the assessment tasks (p = 0.033 and p =0.021 respectively). Disease severity was associated with better adherence to the disease classification task (p = <0.001) and treatment task (p = 0.02).

Health workers who participated in the study (n = 27) felt confident and equipped to use the guidelines.

Conclusion: The levels of adherence were low. Diseases severity was associated with better adherence at all levels. Assessment of pneumonia was improved in the presence of co morbidity.
1. BACKGROUND AND LITERATURE REVIEW.

1.1 Introduction.
The practice of evidence based medicine ensures quality health provision. Clinical practice guidelines (CPGs) aid in the provision of quality health care which plays a major role in child survival. Clinical practice guidelines are quality improvement strategies that bring to the bedside the benefits of evidence based medicine. In the quality of care framework CPGs are linked to the process pillar. The other two pillars are structure and outcome. \(^{(1,2)}\)

Pneumonia is the number one killer of children under the age of 5 years (under 5). It accounts for 18% and 20% of deaths in this age group globally and in Kenya respectively. \(^{(3,4,5)}\)

Clinical practice guidelines for management of childhood pneumonia have existed since 1992. Adherence to the guidelines has been shown to reduce the case fatality rate due to pneumonia by 36% and in the aggregate improve quality of care for children with pneumonia. \(^{(6,7)}\)

1.2. Disease Burden.
Annually there are an estimated 150 million episodes of pneumonia in children aged 5 years and below globally. \(^{(3,4)}\) It is approximated that 2 million deaths in this age group are due to pneumonia worldwide. In sub-Saharan Africa 18% of the under five mortality is due to pneumonia. The mortality rate in this region is 121 per 1000 which translates to approximately 22 child deaths for every 1000 are due to pneumonia. \(^{(5)}\)

In Kenya the average under 5 mortality rate is 74 per 1000 while that of North Eastern Province where Garissa PGH lies is 80 per 1000 which is higher than the national average. Pneumonia accounts for 20% of the under 5 mortality in Kenya, therefore in the province approximately 15 per 1000 children die due to pneumonia before their fifth birthday. This is an unacceptable magnitude for a preventable and treatable ailment. \(^{(5)}\)
1.3 Quality of Health Care.
Quality of health care in a facility can only be assessed if the population which it serves accesses its services. The health seeking behaviours of the people in Kenya has improved from 46% in 2003 to 56 % in 2008 – 09 for children with symptoms of acute respiratory infection (fast breathing and /or cough).\(^5\)

Vaccination and case management have been identified as the most effective interventions for prevention and control of pneumonia.\(^8\) The immunization coverage in Kenya has increased from 57% in 2003 to 77% in 2008 – 09. In NEP the improvement was more than fivefold from 9% to 48% in the same time period. The province has the lowest immunisation coverage.\(^5\) In 2012 the pneumococcal vaccine was introduced into the national immunisation schedule. It is hoped that this will further reduce the incidence of pneumonia.

In 1992, the WHO developed the Integrated Management of Childhood Illness (IMCI) strategy to address the rising and persistent status of childhood illnesses and deaths. The IMCI sets the standard care of a child with pneumonia besides diarrhoea, malaria, HIV, malnutrition and immunizable diseases. The Kenyan Basic Paediatric Protocols are an adaptation of international best practice as found in the WHO IMCI book “A Pocket Book of Hospital Care for Children “. To disseminate the protocols a five day Emergency Triage And Treatment Plus (ETAT +) course was developed. The training is offered to all cadres of health care providers as in service or pre – service training for medical officers and paediatricians.\(^9, 10, 11, 12\)

The quality of care in seven less developed countries was described as poor and the biggest gap in the process pillar was knowledge. To improve on the knowledge of guidelines the ETAT+ course was introduced in the pre-service training of clinical officers, medical officer and post graduate training of paediatricians. The training is also done within hospitals.\(^2, 11, 13\)
1.4 Adherence to Clinical Practice Guidelines.
The failure to implement guidelines into practice contributes to poor health outcomes. When applied clinical practice guidelines result in a 36% reduction in mortality due to pneumonia. (6)

In the United States of America, guideline adherence in Veterans Affairs Medical Centres (VAMC) is measured by external chart review audits. This is done by the External Peer Review Programme (EPRP). Random chart abstraction process is conducted by an external contractor. Numerous quality of care indicators are reviewed including those related to guideline adherence. A descriptive qualitative study was carried out in six VAMCs where adherence was high and in six where it was low. The study population consisted of employees of the facilities. Non-punitive and timely feedback was associated with high adherence. (14)

In Tanzania a study using data from clinical records showed that 86 patients were diagnosed with pneumonia and all of them received antibiotics. The Referral Care Manual (RMC) in Tanzania is adopted as was the Kenyan paediatric protocols from the IMCI. In 13 Tanzanian hospitals, pneumonia accounted for 22% of the admissions. Data on guideline adherence was collected by observation and data extraction from clinical records. The assessment for pneumonia was observed in 657 cases. During assessment for pneumonia, it was observed that the patient’s chest were exposed on 183 (28%) occasions, respiratory rate was counted in 57 (9%) occasions, cyanosis was checked in 22 (3%) and a stethoscope used in 115(18%) of the cases. Data was extracted from 191 clinical records. In the revrecords 29 (15%) had a recorded respiratory rate, chest wall in drawing was recorded in 62 (32%), cyanosis 11(6%) and ability to drink was in 14(7%) of the records reviewed. This shows a discrepancy between the assessments done and those documented .From the records only one had all the four factors (respiratory rate, chest wall in drawing, cyanosis and ability to drink) required for diagnosis of pneumonia according to RMC recorded. (15) In the country, Tanzania guideline adherence was reportedly hindered by the discrepancy between the diagnosis required by the Ministry of Health reporting system and the IMCI. The health workers belief, that is, chloramphenical was unacceptably toxic and therefore though available was not prescribed also hindered adherence. (16)
The Management of the Sick Child (MSC) guidelines are modified version of the IMCI guidelines. Adherence to this guidelines was evaluated among community health workers in Siaya Kenya who had been trained on them. The clinical recordings of 125 CHWs were reviewed in comparison to a “gold standard” re-examination. The overall averaged guideline adherence was 79.8% (IQR 13.3 – 100%). Adherence was significantly higher for: Consultations with children aged 24 months and above or children with no danger signs; consultations in which health workers used a treatment card job aid; and consultations where the health worker thought they would receive benefits, for example money or community respect for their work. In conclusion it was clear that there are many factors that affected the health workers performance that were not knowledge related but rather the environment within which the health worker practiced. (17)

A study in Kenya involving 14 hospitals in 13 districts assessed quality of inpatient paediatric care using data extracted from clinical records and interviews of health workers and children’s care providers (parents/guardians). On adherence to the pneumonia guidelines it was noted that; recommended signs for classifying disease severity were infrequently documented; respiratory rates were documented in 41% of the pneumonia cases; and treatment was not in line with the set guidelines, for example correct frequency prescription of gentamycin as a once a day drug was done in only 1% of the cases. This reflected the persistence of the 1994 National guidelines recommendation of three times daily regimen. (18)

Knowledge Translation is a daunting task. It requires the filtering down of knowledge from academic circles to the health worker on the ground, and behaviour change in the health workers’ practice. The failure to bridge the know-do gap is responsible for poor health outcomes as well as inefficient and inequitable health provision. (19, 20, 21) Different strategies have been adopted to aid in the adherence to guidelines, for example use of job aids and timely non-punitive feedback with varied results. What has emerged from this is that, for quality improvement strategies to work they have to be modeled to the setting in which they are applied. (16, 17, 22)
1.5 Theoretical Framework.
The Theory of Planned Behaviour is a conceptual framework for understanding human social behaviour. One central determinant of behaviour is an intention to perform it. The strength of intention comprises of three kinds of latent components: the attitude towards behaviour composed of human beliefs about the consequences of the behaviour; the subjective norm composed of human normative beliefs and social pressure toward the behaviour; and the perceived behaviour control, composed of human beliefs concerning capability and controllability of performing the behaviour. This theory has been validated as suitable theoretical basis to evaluate the implementation of CPGs in healthcare practices.\(^{(23)}\)

**Figure 1: A framework of the theory of planned behaviour**

1.6 Conceptual framework.
The use of CPGs promotes rational use of antibiotics. Studies have shown that when CPGs are adhered to, morbidity and mortality due to disease are reduced. Overall there is good patient outcome and reduced costs in health care provision.\(^{(6,21)}\)
1.7 Pneumonia Case Management.
In aiding the process of care delivery CPGs co-relate a small set of symptoms and clinical signs to disease diagnosis and severity. According to the Kenyan guidelines on management of pneumonia for children aged 2 – 59 months cough and difficulty in breathing identify disease. The clinical signs used to classify disease severity are cyanosis, inability to drink/breast feed, grunting, level of consciousness using the AVPU scale, lower chest wall in drawing and respiratory rate. Streptococcus pneumonia is known to be the leading cause of severe pneumonia among children across the developing world.\(^{(24)}\). The Kenyan guidelines on management of pneumonia and the WHO guidelines from which they are adopted recommend antibiotic use for the treatment of pneumonia.\(^{(25)}\). Hypoxemia is associated with increased risk of mortality due to pneumonia. \(^{(25)}\). It occurs in approximately 20% of
children presenting to health facilities with pneumonia, although there are marked geographical differences in prevalence. In view of this evidence the guidelines recommend oxygen for very severe pneumonia. In the presence of a wheeze a bronchodilator and steroid are added to the management. Appendix 1 has the two protocols used in the management of pneumonia in children.

2. STUDY JUSTIFICATION AND UTILITY

In the former North Eastern Province of Kenya child mortality is higher than the National average. Twenty per cent of this can be attributed to pneumonia.

The evaluation of Pneumonia management in keeping with the Basic paediatric protocol by the Ministry of Health Government of Kenya guidelines at Garissa Provincial Hospital has not been documented in literature.

This study highlights the areas that require special emphasis during the dissemination of the guidelines on management of childhood pneumonia at Garissa PGH.
3. STUDY OBJECTIVES

1. To establish the level of adherence to the National guidelines in the management of pneumonia among children aged 2 – 59 months attended to at Garissa Provincial General Hospital.

2. To establish the factors associated with adherence to the National guidelines in management of pneumonia in children at Garissa Provincial General Hospital.
4. STUDY METHODOLOGY.

4.1 Study Design.
Hospital based retrospective cross sectional study.

4.2 Study Area.
Study setting.
The study was carried out within the Pediatric department of Garissa Provincial General Hospital (PGH). This is the referral hospital of the former North Eastern province (NEP) now subdivided into Garissa, Wajir and Mandera counties. It serves a population of 2,345,000 people, of whom seventy percent (70%) are nomads dispersed over a region of 126,000km².

In NEP the percentage of children fully vaccinated is low at 48% compared to the national average of 77%. The prevalence of acute respiratory illness symptoms (cough and short rapid breathing) in the province is 6.7%. In the region 60.9% of children with symptoms of acute respiratory infection seek medical advice; of these 49.4% receive antibiotics for their illness.\(^{(5)}\)

Garissa Provincial General Hospital (GPGH) has 248 beds: Of these 54 beds are dedicated to pediatric care. The bed occupancy rate is 90%. The hospital offers both curative and preventive pediatric services. Outpatient services are offered at the main casualty and at the Mother and Child Clinic by clinical officers and nurses on a daily basis. The outpatient pediatric clinic is held weekly on Thursdays and is run by medical officers and a pediatrician. This acts as a follow up clinic for both acute and chronic ailments. Inpatient services are offered at Ward Five of the hospital for infants and children while neonates are cared for within the Maternity Ward. Admissions and ward rounds are done daily.

In 2011 the total pediatric inpatient admissions were 2,278 of whom 497 (21%) had pneumonia, of the 497 patients with pneumonia 20 died, giving a case fatality rate of 4% (Data from the Hospital’s data clerk).
Study Population.
There were two sets of study populations: the first was the clinical records of children aged 2 – 59 months with an admission diagnosis of the different grades of pneumonia attended to during the study period from January 2012 to June 2012. From this data was extracted from their clinical records. Data extracted included demographic information, clinical signs and symptoms recorded at the time of admission, diagnosis classification made by the clinician, management given, re-evaluation done, clinical outcome in form of death and discharge from hospital and follow up if recommended. The clinical data abstraction tool is in appendix 3A.

The second study population was the health care providers at the Garissa PGH. The staff at the time of the study consisted of public servants posted by the Ministry of Medical Services. At the time of this study, the facility had one pediatrician who is assisted by two medical officers, two clinical officers, four medical officer interns, two clinical officer interns and varied number of nurses at any given time during the study period. There were two nurses stationed in the Mother and Child Clinic daily. These study population answered a self administered questionnaire. The health worker questionnaire is in appendix 3B.

4.3 Study Period.
The study was carried out over a six month period from January 2012 to June 2012.

4.4 Inclusion Criteria.
- Clinical records of children aged 2 – 59 months admitted with a diagnosis of the different grades of pneumonia over the study period.
- Health workers of all cadres who provided care to children 2 – 59 months during the study period and who gave voluntary informed consent.

4.5 Exclusion Criteria.
- Children 2 – 59 months with underlying chronic conditions, such as cardiac disease, cerebral palsy at admission.
- Children 2 – 59 months with a wheeze at admission.
4.6 Operational Definitions.
Pneumonia – a form of acute respiratory tract infection affecting the lungs.

Clinical practice guidelines - Systematically developed statements that assist health care professionals and patients make decisions about screening, prevention or treatment of specific health conditions.

Adherence - The extent to which a person's behaviour coincides with set regulations.

Guideline adherence – conformity in fulfilling or following official recognised or institutional requirements, guidelines, recommendations, protocols, pathways or other standards.

Adherence index – percentage of needed guideline tasks performed. The tasks assessed are;
- Assessment of disease
- Disease classification
- Treatment

4.7 Research Instruments.
A pre-tested clinical records data abstraction tool was used to collect data from the clinical records.
A pre-tested self-administered health worker questionnaire was used to obtain data from the health workers.
Both tools were pre-tested at Kenyatta National Hospital in March 2012 and the tools adjusted accordingly. The tools used are in appendix 3A and 3B.

4.8 Determination of the Study sample size.
a) Clinical records.
Sample size calculated using a formula without finite population correction \(^{(26)}\).
\[
n = z^2 p (1 - p) / d^2
\]
\[
n = 1.96^2 \times 0.37(1 - 0.37) / 0.01^2
\]
Where;
- \(n\) – Sample size
- \(z\) – Statistical level of confidence (95%)
p – Expected prevalence or proportion
d - Precision

In the English *et. al.* survey [18], review of clinical records for patient diagnosed with pneumonia revealed that recording of weight was 35%, respiratory rate 31%, Chest wall in - drawing 37% and cyanosis 27%. Chest wall in drawing documentation rate (p value of 37%) was picked from the study as it gives the largest proportion. Precision is set at 10% to enable the study achieve the required sample.

The envisaged data collection period of three months: April, May and June was extended by three (3) months to commence from January to June 2012 in order to achieve the sample size of ninety required.

b) Health workers
Sample size calculated with a formula with finite population correction (26).

\[
n^1 = N \frac{z^2 p (1 - p)}{d^2 (N - 1)} + z^2 (1 - p)
\]

\[
n = 26 \times 1.96^2 \times 0.58(1-0.58) / 0.01^2 \times 0.58 (1-0.58)
\]

Where;
- \(n^1\) - Sample size with finite population correction
- \(N\) – Population size
- \(z\) – Statistical level of confidence (95%)
- \(p\) – Expected proportion
- \(d\) – Precision

The study by Rowe *et. al.* [17] found that the appropriate guidelines were adhered to in 58% of ill children, thus the expected proportion was set at 0.58. The health workers at the facility who provide care to children in total is 186, however only 26 are at the pediatric service points. These are; one pediatrician, one medical officer, two medical officer interns, seven clinical officer interns and fifteen nurses. The population size of 21 was picked. Precision was set at 10%.
A total of twenty seven health workers were enrolled into the study with priority given to the clinicians in the pediatric department and the nurses at the Mother and Child Clinic.

4.9. Subject Enrollment and Data Collection.

Clinical records

All identification numbers of clinical records of patients admitted with a diagnosis of pneumonia within the study period were noted down from the admissions register in the Pediatric Ward. The list was given to the data clerk at the hospital registry to retrieve the records.

A total of 220 identification numbers of clinical records with a diagnosis of pneumonia were noted from the admissions register between January and June 2012. The clinical records clerk was able to locate 150 records. Nine of the records retrieved were non pediatric and 3 did not fulfill the inclusion criteria. Convenient sampling was then employed to achieve 91 clinical records. From these, using the data extraction form in Appendix 3A data was extracted. Missing data was recorded as missing.

Figure 3: Study procedure flow chart
Health workers
A total population sample was taken of all health workers who provide care in the paediatric department. Using the tool in Appendix 2, consent was sought from individual health workers for participation. After obtaining informed consent from each health worker, the questionnaires numbered one to twenty seven were handed to them randomly. The investigator was available for any clarifications needed. On return of the questionnaire it was examined for completeness and the health worker thanked for participation.

4.10 Data Management and Analysis.
4.10.1 Data Management.

Clinical Records
A total of 91 randomly selected clinical records bearing unique hospital inpatient numbers were recorded on a sheet of paper and each record assigned a unique study identification number (001 to 091) for the purposes of data management. Data were then extracted from each file with corresponding identification. The record linking hospital identification numbers and study identification number remained in the custody of the primary investigator. At the end of data extraction the clinical records remained at the hospital and the data extraction forms were retained by the investigator. Data were entered into a data base designed in Microsoft Access.

Health Workers.
Similarly, the health worker’s self administered questionnaires were numbered using unique study identification (001 to 027). After inspection for completeness the questionnaires were kept under lock and key by the primary investigator. A Microsoft Access data base was created and data was entered.

The hard copies of both data collection tools remain in the custody of the primary investigator.

4.10.2 Data Analysis.
The two sets of data were analysed separately. There were no attempts to link clinical records to individual health workers responsible for providing pneumonia
care. Thus no formal statistical inferences can be drawn between data from the clinical records and health worker attributes due to the study design.

**Clinical Records.**

The level of adherence to guideline recommended care was determined by an adherence index calculated for each child from documented pneumonia assessment disease classification and treatment. The calculation of the adherence index including eleven tasks in total – 9 assessment tasks, a single classification and a single treatment task- proceeded as outlined below:

1. **Assessment tasks (9)** - Each of the nine pneumonia assessment tasks conducted was awarded a point. Documentation of the presence or absence of a sign was considered “done” while failure to document a sign was considered as “not done”. These symptoms included history of cough or difficulty in breathing and the signs were respiratory rate, lower chest wall in drawing, conscious level (using the AVPU scale), grunting, ability to drink or breastfeed, cyanosis and wheeze.

2. **Disease classification tasks (1)** - Only one of the guideline classifications were expected i.e. URTI/ no pneumonia, pneumonia, severe pneumonia or very severe pneumonia. If the clinicians’ disease classification matched with the assessment, one point was awarded if it did not, no point was awarded.

3. **Treatment tasks (1)** - One point was awarded for recommended treatment according to classification given by the clinician (whether the classification was correct or in correct) if the prescription had correct treatment dose, route, units and frequency of the drugs and oxygen. The recommended treatments include oxygen for very severe pneumonia, penicillin and gentamycin, penicillin alone and amoxicillin or cotrimoxazole based on pneumonia severity.
### Table 1: Adherence index assessment.

<table>
<thead>
<tr>
<th>TASK</th>
<th>EXPECTED ACTION</th>
<th>AWARDED POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DOCUMENTED AS PRESENT/ABSENT</td>
<td>NOT DOCUMENTED</td>
</tr>
<tr>
<td><strong>Assessment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) History</td>
<td>Cough</td>
<td>1 0</td>
</tr>
<tr>
<td></td>
<td>Difficulty in breathing</td>
<td>1 0</td>
</tr>
<tr>
<td>(b) Clinical</td>
<td>Respiratory rate</td>
<td>1 0</td>
</tr>
<tr>
<td></td>
<td>Lower chest wall indrawing</td>
<td>1 0</td>
</tr>
<tr>
<td></td>
<td>Level of consciousness</td>
<td>1 0</td>
</tr>
<tr>
<td></td>
<td>Grunting</td>
<td>1 0</td>
</tr>
<tr>
<td></td>
<td>Inability to drink / breastfeed</td>
<td>1 0</td>
</tr>
<tr>
<td></td>
<td>Cyanosis</td>
<td>1 0</td>
</tr>
<tr>
<td></td>
<td>Wheeze</td>
<td>1 0</td>
</tr>
<tr>
<td><strong>Total points</strong></td>
<td></td>
<td>9 0</td>
</tr>
<tr>
<td><strong>Classification</strong></td>
<td>No pneumonia / URTI</td>
<td></td>
</tr>
<tr>
<td>Only one option is</td>
<td>Pneumonia</td>
<td>1 0</td>
</tr>
<tr>
<td>expected.</td>
<td>Severe pneumonia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very severe pneumonia</td>
<td></td>
</tr>
<tr>
<td><strong>Total points</strong></td>
<td></td>
<td>1 0</td>
</tr>
<tr>
<td><strong>Treatment</strong></td>
<td>Amoxicillin or Seprin</td>
<td>1 0</td>
</tr>
<tr>
<td>Only one option is</td>
<td>Penicillin</td>
<td></td>
</tr>
<tr>
<td>expected.</td>
<td>Penicillin, Gentamycin and Oxygen</td>
<td></td>
</tr>
<tr>
<td><strong>Total points</strong></td>
<td></td>
<td>1 0</td>
</tr>
<tr>
<td><strong>Cumulative total points</strong></td>
<td></td>
<td>11 0</td>
</tr>
</tbody>
</table>

Basic descriptive statistics including means and frequency distributions were calculated to summarise sample demographic characteristics and completion of each guideline recommended pneumonia management task. These analyses were presented using tables and figures. Next, the factors influencing the level of adherence to guideline recommendations were determined. Bivariate analysis comparing the adherence index for each of the three levels, to the patient’s age, sex, disease severity and co-morbidities was done.
Health Workers.

Categorical data was tabulated. The theory of planned behaviour framework was used to assess the intention to adhere to the guidelines (see page 6).

4.11 Control of error and bias.

To reduce bias;

- The questionnaires were pre-tested to ensure the questions were sensitive enough to detect what might be important differences in the variables being tested.
- The principal investigator assessed the responses given to the questionnaires administered to ensure completeness of data.
- The principal investigator assessed the data retrieval forms individually on site and before data entry to the data base.
- The primary investigator oversaw the data entry.

4.12 Ethical Consideration.

Study approval was obtained from the ethics committee of Kenyatta National Hospital and University of Nairobi. The written approval was presented to the Hospital Management Team (HMT) of Garissa PGH for permission to proceed with the research. Copies of the approvals are in Appendix five.

Individual participant consent was in written form. After providing information to the participants on the purpose and benefits of the study, time was given to answer any questions that the participants had. The consent was given on voluntary basis free from coercion. The health worker who gave consent signed two consent forms both were counter signed by the investigator. One copy was for the participant and the other was kept by the primary investigator. Confidentiality was maintained throughout this process. (See Appendix 2 for informed consent explanation and the consent form)
5. STUDY RESULTS

5.1 Results from the Clinical Records.
Ninety-one in patient clinical records were reviewed. All the patients in the study improved and were discharged. The median duration of hospitalisation was 4 days (IQR 3-6 days).

5.1.1 Description of the study participants.
Most of the children were infants (60.4%). The median age was 12 months (IQR 6-18 months). There were more boys than girls in the sample with a male to female ratio of 1.25:1. Forty-eight of the participants (52.8%) had severe pneumonia. These results are presented in Table 1 below.

Table 2: Description of the study population.

<table>
<thead>
<tr>
<th>Item</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age group</strong></td>
<td></td>
</tr>
<tr>
<td>2-12 months</td>
<td>55(60.4)</td>
</tr>
<tr>
<td>13-24 months</td>
<td>18(19.8)</td>
</tr>
<tr>
<td>25-59 months</td>
<td>16(17.6)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>50(54.9)</td>
</tr>
<tr>
<td>Female</td>
<td>40(44.0)</td>
</tr>
<tr>
<td><strong>Co – morbidity</strong></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>36(39.5)</td>
</tr>
<tr>
<td>Absent</td>
<td>55(60.5)</td>
</tr>
<tr>
<td><strong>Disease classification</strong></td>
<td></td>
</tr>
<tr>
<td>Very severe pneumonia</td>
<td>5 (5.5)</td>
</tr>
<tr>
<td>Severe pneumonia</td>
<td>48(52.8)</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>29(31.9)</td>
</tr>
<tr>
<td>No pneumonia</td>
<td>1(1.1)</td>
</tr>
<tr>
<td>No classification</td>
<td>8(8.8)</td>
</tr>
</tbody>
</table>

Forty per cent of the pneumonia patients presented with co-morbidity and of these 36, over 80% (30) had a single co – morbid illness. The most common co-morbidity
was malaria, 16 (18%) of these children. Figure 2 shows the distribution of the co-morbid illnesses. Of the three children presenting with other co-morbidities, two had anaemia with no cause specified and one had Downs’ syndrome.

Figure 4: Distribution of co-morbid illnesses among the participants.

5.1.2 Level of Adherence.

Adherence to Guidelines on Assessment of Clinical Signs and Symptoms of Pneumonia.

The extent to which a clinical sign or symptom was assessed was determined by its documentation in the patients clinical record. Cough was the most commonly documented clinical symptom. It was documented in 87 of the 91 clinical records (95.6%). As shown in table 2 below, the danger signs were not recorded for most patients. This ranged from 72 % for level of consciousness to 92% for inability to drink/breastfeed. The health workers documented a minimum of 2 and a maximum of 6 clinical tasks. The mean adherence on clinical tasks documentations was 42.9% (SD±17.3).
Table 3: Clinical features of pneumonia as recorded in the patients’ clinical records.

<table>
<thead>
<tr>
<th>Pneumonia clinical signs and symptoms. N = 91</th>
<th>Recorded n (%)</th>
<th>Not recorded n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Symptoms</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficulty in breathing</td>
<td>68(74.7)</td>
<td>23(25.3)</td>
</tr>
<tr>
<td>Cough</td>
<td>87(95.6)</td>
<td>4(4.4)</td>
</tr>
<tr>
<td><strong>Signs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyanosis</td>
<td>21(23.1)</td>
<td>70(76.9)</td>
</tr>
<tr>
<td>Inability to drink/breast feed</td>
<td>7(7.7)</td>
<td>84(92.3)</td>
</tr>
<tr>
<td>Level of consciousness (AVPU scale)</td>
<td>25(27.5)</td>
<td>66(72.5)</td>
</tr>
<tr>
<td>Grunting</td>
<td>9(9.9)</td>
<td>82(90.1)</td>
</tr>
<tr>
<td>Chest indrawing</td>
<td>64(70.3)</td>
<td>27(29.7)</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>59(64.8)</td>
<td>32(35.2)</td>
</tr>
</tbody>
</table>

Adherence to Guidelines on Classification of Pneumonia.
Guideline prescribed disease severity classification was documented in 83 (91.2%). Of these 47/83 (56.6%) were correctly classified according to the clinical signs documented. The majority had severe pneumonia 38 (79.2%) as shown in Table 3 below.

Table 4: Disease classification accuracy as recorded in the patients’ clinical record.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Correct (%)</th>
<th>Incorrect (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very severe pneumonia</td>
<td>4(80)</td>
<td>1(20)</td>
<td>5</td>
</tr>
<tr>
<td>Severe pneumonia</td>
<td>38(79.2)</td>
<td>10(20.8)</td>
<td>48</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>5(17.4)</td>
<td>24(82.7)</td>
<td>29</td>
</tr>
<tr>
<td>No pneumonia /URTI</td>
<td>0(0)</td>
<td>1(100)</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>47(56.6)</td>
<td>36(43.4)</td>
<td>83(100)</td>
</tr>
</tbody>
</table>

Adherence to Guidelines on Treatment of Pneumonia.
Treatment in tandem with the national guidelines was prescribed for 23 (27.7%) of the 83 patients. A large number (72.3%) of prescriptions were in conflict with the national guidelines. Of these, (30%) had intravascular medication for pneumonia or no pneumonia/URTI instead of oral antibiotics and no antibiotics respectively; 23(27.7%) prescribed Gentamycin in the management of severe pneumonia instead of penicillin alone; 11(13.3%) had ceftriaxone prescribed as the first line drug and 1(2%) had very severe pneumonia and oxygen was not prescribed. This is shown in table 4 below.

Table 5: Treatment accuracy for different classifications of pneumonia.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Correct (%)</th>
<th>Incorrect (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very severe pneumonia</td>
<td>4(80)</td>
<td>1(20)</td>
<td>5</td>
</tr>
<tr>
<td>Severe pneumonia</td>
<td>14(29.2)</td>
<td>34(70.8)</td>
<td>48</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>5 (17.2)</td>
<td>24(82.8)</td>
<td>29</td>
</tr>
<tr>
<td>No Pneumonia /URTI</td>
<td>0(0)</td>
<td>1(100)</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>23(27.7)</td>
<td>60(72.3)</td>
<td>83</td>
</tr>
</tbody>
</table>

Amoxicillin, ceftriaxone, chloramphenicol and metronidazole were correctly prescribed in all the records. Penicillin was the most frequently prescribed drug at 81.3%, its dosage was wrong in 2 records and the route was wrong in one record, being prescribed as an intramuscular injection. The dosage of gentamycin was incorrect in two records while its frequency was incorrect three records. These results are shown in table 5 below.
Table 6: Accuracy of antibiotic and oxygen prescriptions as recorded in the patients’ clinical record.

<table>
<thead>
<tr>
<th>Drug</th>
<th>N (%)</th>
<th>Correct prescription of:</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Dose</td>
<td>Route</td>
<td>Units (IU/mg)</td>
<td>Frequency</td>
<td></td>
</tr>
<tr>
<td>Penicillin</td>
<td>74(81.3)</td>
<td>72(97.3)</td>
<td>73(98.7)</td>
<td>74(100)</td>
<td>74(100)</td>
<td></td>
</tr>
<tr>
<td>Gentamycin</td>
<td>56(61.4)</td>
<td>54(96.3)</td>
<td>56(100)</td>
<td>56(100)</td>
<td>53(94.6)</td>
<td></td>
</tr>
<tr>
<td>Amoxicillin</td>
<td>2(2.2)</td>
<td>2(100)</td>
<td>2(100)</td>
<td>2(100)</td>
<td>2(100)</td>
<td></td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>13(14.3)</td>
<td>13(100)</td>
<td>13(100)</td>
<td>13(100)</td>
<td>13(100)</td>
<td></td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>2(2.2)</td>
<td>2(100)</td>
<td>2(100)</td>
<td>2(100)</td>
<td>2(100)</td>
<td></td>
</tr>
<tr>
<td>Metronidazole</td>
<td>7(7.7)</td>
<td>7(100)</td>
<td>7(100)</td>
<td>7(100)</td>
<td>7(100)</td>
<td></td>
</tr>
<tr>
<td>Oxygen</td>
<td>24(26.4)</td>
<td>13(54)</td>
<td>16(66.7)</td>
<td>24(100)</td>
<td>24(100)</td>
<td></td>
</tr>
</tbody>
</table>
5.1.3 Factors associated with adherence.

Assessment task.
The presence of a co–morbidity and severe disease was associated with better adherence to the assessment tasks $p = 0.03$ and $p = 0.021$ respectively.

Table 7: Factors associated to pneumonia assessment task (chi–square test)

<table>
<thead>
<tr>
<th></th>
<th>Assessment task median (IQR)</th>
<th>n</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Disease severity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pneumonia</td>
<td>3 (2 -5)</td>
<td>29</td>
<td>0.021</td>
</tr>
<tr>
<td>Severe/very severe pneumonia</td>
<td>4 (3 -5)</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td><strong>Co-morbidity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>3(2 -4.5)</td>
<td>36</td>
<td>0.033</td>
</tr>
<tr>
<td>Absent</td>
<td>4 (3 -4)</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>4(3 -5)</td>
<td>50</td>
<td>0.19</td>
</tr>
<tr>
<td>Female</td>
<td>4(2-5)</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 – 12 months</td>
<td>4(3 -5)</td>
<td>55</td>
<td>0.19</td>
</tr>
<tr>
<td>13 – 24 months</td>
<td>4(2-5)</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>25 – 59 months</td>
<td>3.5(2 -5)</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>
Disease Classification.
As is shown in table 7 below disease severity was associated with better adherence to the disease classification task \((p = < 0.001)\). Co-morbidity like gender and age did not have an effect on the level of adherence to classification \((p = 0.9)\).

Table 8: Factors associated with pneumonia classification (chi – square test).

<table>
<thead>
<tr>
<th></th>
<th>Correct (%)</th>
<th>Incorrect (%)</th>
<th>OR (95%CI)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pneumonia classification</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumonia</td>
<td>5 (17.4)</td>
<td>24 (82.7)</td>
<td>1.0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Severe pneumonia</td>
<td>38 (79.2)</td>
<td>10 (20.8)</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.01-0.2)</td>
<td></td>
</tr>
<tr>
<td>Very severe pneumonia</td>
<td>4 (80)</td>
<td>1 (20)</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.001-0.7)</td>
<td></td>
</tr>
<tr>
<td><strong>Co-morbidity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>20 (55.5)</td>
<td>16 (44.4)</td>
<td>1.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Absent</td>
<td>30 (54.5)</td>
<td>20 (45.5)</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.3-2.2)</td>
<td></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>29 (58)</td>
<td>21 (42.1)</td>
<td>1.0</td>
<td>0.67</td>
</tr>
<tr>
<td>Female</td>
<td>21 (52)</td>
<td>19 (47.9)</td>
<td>1.2 (0.5-3.1)</td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 – 12 months</td>
<td>32 (58.1)</td>
<td>23 (41.8)</td>
<td>1.0</td>
<td>0.29</td>
</tr>
<tr>
<td>13 – 24 months</td>
<td>7 (38.9)</td>
<td>11 (61.1)</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.7-7.7)</td>
<td></td>
</tr>
<tr>
<td>25 – 59 months</td>
<td>10 (62.5)</td>
<td>6 (37.5)</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.2-3.0)</td>
<td></td>
</tr>
</tbody>
</table>
Treatment task.
As shown in table 8 in severe disease adherence to the guidelines was better
(p = 0.02) though the sample size of those with very severe disease was very small
(5 patients only). Co – morbidity had no significant relationship to treatment.

Table 9: Factors associated with treatment (chi - -square test)

<table>
<thead>
<tr>
<th></th>
<th>Correct (%)</th>
<th>Incorrect (%)</th>
<th>OR (95%CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pneumonia classification</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumonia</td>
<td>5 (17.4)</td>
<td>24 (82.7)</td>
<td>1.0</td>
<td>0.02</td>
</tr>
<tr>
<td>Severe pneumonia</td>
<td>14 (29.2)</td>
<td>34 (70.3)</td>
<td>0.5</td>
<td>(0.1-1.8)</td>
</tr>
<tr>
<td>Very severe pneumonia</td>
<td>4 (80)</td>
<td>1 (20)</td>
<td>0.05</td>
<td>(0.001-0.7)</td>
</tr>
<tr>
<td><strong>Co – morbidity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>present</td>
<td>12 (33.3)</td>
<td>24 (66.7)</td>
<td>1.0</td>
<td>0.31</td>
</tr>
<tr>
<td>Absent</td>
<td>13 (23.6)</td>
<td>42 (76.4)</td>
<td>1.6</td>
<td>(0.6-4.5)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>15 (30)</td>
<td>35 (70)</td>
<td>1.0</td>
<td>0.64</td>
</tr>
<tr>
<td>Female</td>
<td>10 (25)</td>
<td>30 (75)</td>
<td>1.3</td>
<td>(0.5-3.7)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 – 12 months</td>
<td>16 (29.1)</td>
<td>39 (70.9)</td>
<td>1.0</td>
<td>0.33</td>
</tr>
<tr>
<td>13 -24 months</td>
<td>6 (33.3)</td>
<td>12 (66.6)</td>
<td>0.8</td>
<td>(0.2-3.2)</td>
</tr>
<tr>
<td>25 – 59 months</td>
<td>2 (12.5)</td>
<td>14 (87.5)</td>
<td>2.9</td>
<td>(0.6-28.6)</td>
</tr>
</tbody>
</table>
5.2 Results from the health workers questionnaires.
Description of the health workers in the Study Population.

Twenty-seven health workers providing paediatric care at Garissa PGH during the study period participated in the study. The majority of these health workers were males (63%) and Clinical Officer Interns and Medical Officer Interns formed the bulk of the clinicians who attended to the children (37% and 27% respectively). Only a small percentage (11.1%) had had post basic training though, 77.8% had had training in pneumonia guidelines. See table 9 below.

Table 10: Description of the health workers who participated in the study at Garissa PGH.

<table>
<thead>
<tr>
<th>Item</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>17(63)</td>
</tr>
<tr>
<td>Female</td>
<td>10(37)</td>
</tr>
<tr>
<td><strong>Health worker training on pneumonia guidelines</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>21(77.8)</td>
</tr>
<tr>
<td>No</td>
<td>6(22.2)</td>
</tr>
<tr>
<td><strong>Cadre</strong></td>
<td></td>
</tr>
<tr>
<td>Paediatrician</td>
<td>1(3.7)</td>
</tr>
<tr>
<td>Medical officer</td>
<td>2(7.1)</td>
</tr>
<tr>
<td>Medical officers intern</td>
<td>6(22.2)</td>
</tr>
<tr>
<td>Clinical officer</td>
<td>1(3.7)</td>
</tr>
<tr>
<td>Clinical officer intern</td>
<td>10(37)</td>
</tr>
<tr>
<td>Nurse</td>
<td>7(25.9)</td>
</tr>
</tbody>
</table>

Knowledge and practice

Twentytwo health workers 81.2% had been trained on clinical guidelines. The guidelines on which they were trained were: ETAT in which 12 health workers (44.4%) had been trained, Neonatal resuscitation 15 (55.6%) Advanced Life Support two (7.4%) and Advance Cardiac Support one (3.7%). Twenty one of the twenty two had been trained on pneumonia management guidelines.

Twenty five of the twenty seven participants (93%) were aware of the existence of the guideline. In the hospital the availability of the guidelines in form of booklets and flow charts was reported by 18 (67%) and 17 (63%) health workers respectively.
The intention to perform a task, in this case adhere to the guidelines, is determined by the attitude toward the task, the perceived behaviour control and the subjective norm. Items 4, 5, 6 and 12 in the health workers’ questionnaire assessed the subjective norm, that is, the human normative belief and social pressure toward the behaviour. On average 21 (77.8%) of the health workers reported that the hospital and their peers encouraged the use of the guidelines. On perceived behaviour control (items 7, 8, 9, and 12) the majority ranging from 17 to 25 health workers felt that they were in control in the use of the guidelines. The remaining items (10, 11 and 13) assessed the consequences of the use of guidelines. The majority (23 – 27) respondents felt that the guidelines could be used and they were useful. Table .10 shows a summary of the responses given by the participants to the various questions.
Table 11: Health workers responses to questions on guideline use at Garissa PGH.

<table>
<thead>
<tr>
<th></th>
<th>N = 27</th>
<th>Agree</th>
<th>Neutral /don’t know</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. National guidelines on management of pneumonia exist</td>
<td></td>
<td>25 (93%)</td>
<td>0</td>
<td>1 (4%)</td>
</tr>
<tr>
<td>2. In the hospital we have the national guidelines on management of pneumonia in form of flow charts</td>
<td></td>
<td>17 (63%)</td>
<td>2 (7%)</td>
<td>7 (26%)</td>
</tr>
<tr>
<td>3. In the hospital guideline booklets containing the national guidelines on management of pneumonia are available to us</td>
<td></td>
<td>18 (67%)</td>
<td>1 (4%)</td>
<td>7 (26%)</td>
</tr>
<tr>
<td>4. The hospital encourages the use of the national guidelines on management of pneumonia</td>
<td></td>
<td>25 (93%)</td>
<td>0</td>
<td>2 (7%)</td>
</tr>
<tr>
<td>5. My colleagues use the national guidelines on management of pneumonia</td>
<td></td>
<td>20 (74%)</td>
<td>1 (4%)</td>
<td>5 (19%)</td>
</tr>
<tr>
<td>6. My colleagues expect me to use the national guidelines on management of pneumonia</td>
<td></td>
<td>22 (82%)</td>
<td>1 (4%)</td>
<td>4 (15%)</td>
</tr>
<tr>
<td>7. I use the national guidelines on management of pneumonia</td>
<td></td>
<td>20 (74%)</td>
<td>3 (11%)</td>
<td>4 (15%)</td>
</tr>
<tr>
<td>8. I am confident I can use the national guidelines on management of pneumonia</td>
<td></td>
<td>22 (82%)</td>
<td>1 (4%)</td>
<td>3 (11%)</td>
</tr>
<tr>
<td>9. I do not have complete control over whether to use the national guidelines on the management of pneumonia</td>
<td></td>
<td>2 (7%)</td>
<td>4 (15%)</td>
<td>17 (63%)</td>
</tr>
<tr>
<td>10. Having the national guidelines on management of pneumonia guidelines at hand makes their use likely.</td>
<td></td>
<td>23 (85%)</td>
<td>1 (7%)</td>
<td>2 (7%)</td>
</tr>
<tr>
<td>11. Having the skills to identify and classify pneumonia makes the use of the national guidelines on management of pneumonia likely</td>
<td></td>
<td>27 (100%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>12. I am able to identify the signs required for pneumonia classification as per the national guidelines on management of pneumonia.</td>
<td></td>
<td>25 (93%)</td>
<td>1 (4%)</td>
<td>1 (4%)</td>
</tr>
<tr>
<td>13. The use of the national guidelines on management of pneumonia does not reduce mortality due to pneumonia.</td>
<td></td>
<td>1 (4%)</td>
<td>3 (11%)</td>
<td>23 (85%)</td>
</tr>
<tr>
<td>14. In regard to treatment of pneumonia, I consider the patients preferred mode of treatment</td>
<td></td>
<td>7 (26%)</td>
<td>3 (11%)</td>
<td>15 (56%)</td>
</tr>
</tbody>
</table>

Knowledge of disease severity classification and treatment among health workers was assessed using two multiple choice type of questions. On the treatment of a 10 kg child with severe pneumonia; 18 (67%) answered correctly (penicillin 500,000 IU qid), 5 (19%) the response was penicillin 500,000 IU qid and gentamycin 75mg OD and the rest 4 (15%) opted for penicillin 500,000IU and gentamycin 75mg TDS. None opted for ceftriaxone. The second question was a scenario in which the described child had very severe pneumonia and the correct treatment choice was penicillin with gentamycin. Twenty two (81%) of the participating health workers answered correctly. Four (15%) thought it was severe pneumonia requiring penicillin and one (4%) classified correctly as very severe pneumonia but opted for ceftriaxone for treatment.
6. DISCUSSION.

According to data from the Garissa PGH health records clerk the incidence of pneumonia in 2011 was 21%. This is lower than 29% reported in developing countries (4) and 32% in other district hospital in Kenya (18). The case fatality rate of 4% is also low compared to that of other Kenyan hospitals where it stands at of 6.5% (18). This data is however similar to that of in-patients in 13 hospitals in north – east Tanzania in 2004 (15). The admissions due to pneumonia were reported to be 22% of the total admissions while the case fatality rate was reported as 2.3%.

The most recorded presenting complaint was cough 87 /91 (97%). Chest wall indrawing was the most recorded clinical sign. It was recorded in 70% (64/91) of the cases. This finding is closer to Irimu’s findings post CPGs introduction at Kenyatta National Hospital of 81.2% than those pre CPGs of 18.5% for the clinical sign (29). The result is also consistent with English’s results that it was the most recorded pneumonia sign (18). This sign is a predictor of immediate death in this region and most clinicians concur in its identification. (29, 30) It’s commendable that the clinicians could pick it though it’s not clear whether it was more important to them in the young. On average, patients who had chest wall in-drawing documented were 8 months younger than those who did not (mean age = 12.7 months versus 20.7 months p = 0.01). Age as a factor influencing adherence to guidelines was also identified in Siaya by Rowe et al (17). In Tanzanian hospitals it was the most recorded sign for children with pneumonia 62 of the 191 (32%) (15).

Inability to drink and grunting were poorly documented (8% and 10 % respectively). WHO considers these two signs as danger signs and are predictors for immediate and early deaths (7, 27). The question that arises is whether this was assessed and not documented due to the culture of poor documentation or the health workers do not consider these as danger signs or are not able to recognise them. Their counterparts in Tanzania recording of inability to drink for a child with a diagnosis of pneumonia was also poor at 14/191 (7%) (15).

The child’s respiratory rate is starting point in the guideline for pneumonia classification (12). Respiratory rate was documented in 59/91 (65%) of the cases. This was better than 31% found in other Kenyan hospitals (18). On average, of the 9
clinical assessment tasks expected of the health workers, 4 were done, mean adherence on clinical tasks was 42.9%. To remedy the inconsistencies in documentation, admission record charts have been introduced with good results in different hospitals (31) and could be introduced in the hospital. The gap on clinical sign recognition has to be addressed in training and on an everyday basis at work.

A guideline recognised pneumonia classification was awarded to 83 of the 91 patients at admission (91%). This finding is better than that from Benin where correct classification was in only 7/141 (5%). (32) Eight records had lower respiratory tract infection as the disease classification. This may not be entirely wrong but it may interfere with the reporting systems that are in place thus poor data of the incidence of pneumonia reported. Of the 83 only 46 (56.6%) were correctly classified according to the clinical signs documented. Outpatient management is recommended for pneumonia and no pneumonia/URTI but 30 records that had the classification were managed as inpatients. It’s clear that the clinicians recognise the different guideline classifications. However a disconnect exists between disease severity classification and the clinical tasks recorded as well as the settings in which to manage the patients. On self report 22 of the 27 participating health workers (82%) answered correctly to a scenario testing pneumonia classification given a set of signs. Could it be that the clinician could not correctly classify pneumonia or was there poor documentation? During training this is an area that needs emphasis.

Thirty six patients (40%) presented with co-morbidities. Malaria was the most common co-morbidity 16 of the 36 (44%). Under nutrition was recorded in 12 (33%). This finding was expected as malnutrition increases the risk of getting pneumonia by reducing the child’s immunity. Children with malnutrition also have weakened respiratory muscles thus at a higher risk of getting pneumonia (3).

Clinicians in their basic training are taught how to compute dosages of the different antibiotics. The results are reflective of the same. Amoxicillin, ceftriaxone, chloramphenicol and metronidazole were correctly prescribed in dose, route, units and frequency. Penicillin was prescribed in a dose of 100,000IU on two occasions where meningitis was not in the diagnosis and as an intramuscular injection. Gentamycin on two occasions was prescribed in a 10mg dosage and three times a
day frequency. The same frequency was noted on self report by four health workers. English reported the same in the 13 district hospital assessment attributing it to the 1994 national guidelines which recommend the three times a day frequency (18).

Accurate treatment according to the disease classification given was documented in 23/83 (27.7%). Most clinicians had a tendency to over treat; 27 prescribed gentamycin in addition to penicillin in severe pneumonia, 19 prescribed intravascular medication for pneumonia while oral medication is what is recommended and 13 used ceftriaxone as first line and one did not get oxygen prescribed for very severe pneumonia. Experience based practice may not be the same as evidence based practice and it would be interesting to understand whether this trend is advised by their practice or it is indeed a knowledge gap. These needs to be explored as the health workers report that all the drugs they required were available at the hospital.

Secondary results from the health workers report, showed their intention to adhere to the guidelines was high. On self report, knowledge on classification and treatment of pneumonia was higher than that found in the clinical records. This could be because of poor documentation on the clinical record. This can be remedied by the use of structured admissions charts.

The quality of care frame-work has structure, process and outcome. As reported by the health workers, Garissa PGH had all the necessary equipment, drugs and laboratory support required for management of childhood pneumonia available. An important test for diagnosis of childhood tuberculosis, mantoux, was reported as unavailable by all but one of the health workers sampled.

The outcomes are good. No mortality was recorded in the study population. The process of health care delivery may lead to good outcomes not only due to correct care but in this study due to over treatment. This leads to loss of resources which in this setting are scarce. The environment where care is provided also affects the process of care provision. Health workers reported that the hospital facilitates (flow charts and protocol booklets) and encourages the use of the guidelines.
7. STUDY LIMITATIONS.

- The sample size has been calculated with a 10% precision thus reducing the power of the study.
- Due to a culture of poor documentation, tasks may be done and not documented thus the results on adherence may be affected.
- The study design did not allow any correlation to be done between practices of the different health workers.
- The sampling method reduces the power of the study.
- The missing records could have belonged to children who had died which could have provided important information.
8. CONCLUSION.

1. The level of adherence was low on all the three areas assessed.
   
   a. Assessment for pneumonia was 42.9\% (SD±17.3).
   b. Classification of pneumonia 56.6\%
   c. Treatment of pneumonia 27.7 \%

2. Severe disease was associated with better adherence at all levels while the presence of co morbidity improved the assessment of pneumonia.
9. RECOMMENDATIONS.
Garissa PGH staffs need training on the guidelines for management of childhood pneumonia. In the dissemination of the guidelines through training areas to concentrate on include:

- Teaching skills to recognize disease and classify disease severity.
- Reinforce that guideline recommended treatment is adequate.
- Inculcate a culture of documentation. This can be enhanced by introduction of a structure admissions form.

Create an enabling environment by introducing job aids such as flow charts and distributing pocket handbooks of the guidelines.
10. REFERENCES.


17. Rowe S., Kelly J., Olewe M. et al; Effect of multiple interventions on community health workers adherence to clinical guidelines in Siaya district, Kenya; Royal society of tropical Medicine and hygiene,2007;101;188 -202


21. Travis P., Bernnet S., Bhutta Z. Et al ; Overcoming health systems constraints to achieve the Millennium Development Goals; Lancet 2004;364:940 – 946


28. Balbon J., Adherence to the IMCI-ARI protocol by public health workers in zamboanga city. A research presented to the faculty of the Ateneo de Zamboanga University graduate school in partial fulfillment for the requirements for master in public health. 2009


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11. APPENDICES:

Appendix 1: Standard operation plans

1. **Pneumonia protocol for children aged 2 – 59 months not exposed to HIV.**

   - History of cough or difficult breathing, age > 60 days.
     - Y
     - Cyanosis, inability to drink / breast feed
       AVPU = ‘V, P or U’, or Grunting
       - Y
       - Very Severe Pneumonia
         - Oxygen, Penicillin AND Gentamicin.
     - N
     - Lower chest wall indrawing, AVPU=’A’
       - Y
       - Severe Pneumonia –
         Benzyl Penicillin ALONE
     - N
     - Age 2 – 11 months:
       Respiratory rate ≥ 50,
       Age ≥12 months:
       Respiratory rate ≥ 40
       - Y
       - Pneumonia –
         Cotrimoxazole or if previously had co-trimoxazole for this illness give Amoxicillin.
     - N
     - No pneumonia, probable URTI.
2. **Pneumonia guidelines for children 2 -59 months exposed to HIV.**

*Pneumonia* - All HIV exposed / infected children admitted with signs of severe / very severe pneumonia are treated with:
1. Penicillin and gentamicin first line, Ceftriaxone reserved as second line therapy
2. High dose cotrimoxazole if aged <5yrs (see below) - steroids are not recommended as additional treatment for Pneumocystis pneumonia

**Treat and prevent Pneumocystis pneumonia with Co-trimoxazole (CTZ)**

<table>
<thead>
<tr>
<th>Weight (kg)</th>
<th>CTX syrup 240mg/5mls</th>
<th>CTX Tabs 120mg/tab</th>
<th>CTX Tabs 480mg/tab</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4 kg</td>
<td>2.5 mls</td>
<td>1 tab</td>
<td>1/4</td>
<td>24hrly for prophylaxis, 6 hrly for 3wks for PCP treatment</td>
</tr>
<tr>
<td>5-8 kg</td>
<td>5 mls</td>
<td>2 tabs</td>
<td>1/2</td>
<td></td>
</tr>
<tr>
<td>9-16 kg</td>
<td>10 mls</td>
<td>-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>17-50 kg</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

3. **Intravenous / intramuscular antibiotic doses for children ages 7 days and older.**

<table>
<thead>
<tr>
<th>Weight (kg)</th>
<th>Penicillin* (50,000iu/kg) iv / im</th>
<th>Ampicillin or Flucloxacillin (50mg/kg) iv / im</th>
<th>Chloramphenicol (25mg/kg) 6hrly - meningitis</th>
<th>Gentamicin (7.5mg/kg) 3-5 mins</th>
<th>Ceftriaxone iv/im Max 60mg/kg 24hrly for neonates**</th>
<th>Metronidazole (7.5mg/kg) iv</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>150,000</td>
<td>150</td>
<td>75</td>
<td>20</td>
<td>150</td>
<td>12 hrly &lt; 1m, ≥ 1m 8 hrly</td>
</tr>
<tr>
<td>4.0</td>
<td>200,000</td>
<td>200</td>
<td>100</td>
<td>30</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>5.0</td>
<td>250,000</td>
<td>250</td>
<td>125</td>
<td>35</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>6.0</td>
<td>300,000</td>
<td>300</td>
<td>150</td>
<td>45</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>7.0</td>
<td>350,000</td>
<td>350</td>
<td>175</td>
<td>50</td>
<td>350</td>
<td></td>
</tr>
<tr>
<td>8.0</td>
<td>400,000</td>
<td>400</td>
<td>200</td>
<td>60</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>9.0</td>
<td>450,000</td>
<td>450</td>
<td>225</td>
<td>65</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>10.0</td>
<td>500,000</td>
<td>500</td>
<td>250</td>
<td>75</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>11.0</td>
<td>550,000</td>
<td>550</td>
<td>275</td>
<td>80</td>
<td>550</td>
<td></td>
</tr>
<tr>
<td>12.0</td>
<td>600,000</td>
<td>600</td>
<td>300</td>
<td>90</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>13.0</td>
<td>650,000</td>
<td>650</td>
<td>325</td>
<td>95</td>
<td>650</td>
<td></td>
</tr>
<tr>
<td>14.0</td>
<td>700,000</td>
<td>700</td>
<td>350</td>
<td>105</td>
<td>700</td>
<td></td>
</tr>
<tr>
<td>15.0</td>
<td>750,000</td>
<td>750</td>
<td>375</td>
<td>110</td>
<td>750</td>
<td></td>
</tr>
<tr>
<td>16.0</td>
<td>800,000</td>
<td>800</td>
<td>400</td>
<td>120</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td>17.0</td>
<td>850,000</td>
<td>850</td>
<td>425</td>
<td>125</td>
<td>850</td>
<td></td>
</tr>
<tr>
<td>18.0</td>
<td>900,000</td>
<td>900</td>
<td>450</td>
<td>135</td>
<td>900</td>
<td></td>
</tr>
<tr>
<td>19.0</td>
<td>950,000</td>
<td>950</td>
<td>475</td>
<td>140</td>
<td>950</td>
<td></td>
</tr>
<tr>
<td>20.0</td>
<td>1,000,000</td>
<td>1000</td>
<td>500</td>
<td>150</td>
<td>1000</td>
<td></td>
</tr>
</tbody>
</table>

*NB. Double Pen doses if treating Meningitis and age > 1 month** Not recommended if jaundiced
4. **Prescribing oxygen.**

<table>
<thead>
<tr>
<th>Oxygen Administration Device</th>
<th>Flow rate and inspired ( O_2 ) concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal prong or short nasal catheter</td>
<td><strong>Neonate</strong> – 0.5 L/min</td>
</tr>
<tr>
<td></td>
<td><strong>Infant / Child</strong> – 1 – 2 L/min</td>
</tr>
<tr>
<td></td>
<td><strong>( O_2 ) concentration</strong> – approx 30-35%</td>
</tr>
<tr>
<td>Naso-pharyngeal (long) catheter</td>
<td><strong>Neonate</strong> – not recommended</td>
</tr>
<tr>
<td></td>
<td><strong>Infant / Child</strong> – 1 – 2 L/min</td>
</tr>
<tr>
<td></td>
<td><strong>( O_2 ) concentration</strong> – approx 45%</td>
</tr>
<tr>
<td>Plain, good fitting oxygen face mask</td>
<td><strong>Neonate / Infant / Child</strong> – 5 – 6 L/min (check instructions for mask)</td>
</tr>
<tr>
<td></td>
<td><strong>( O_2 ) concentration</strong> – approx 40 - 60%</td>
</tr>
<tr>
<td>Oxygen face mask with reservoir bag</td>
<td><strong>Neonate / Infant / Child</strong> – 10 - 15 L/min</td>
</tr>
<tr>
<td></td>
<td><strong>( O_2 ) concentration</strong> – approx 80 - 90%</td>
</tr>
</tbody>
</table>
5. **Pneumonia treatment failure definitions.**

<table>
<thead>
<tr>
<th>Treatment failure definition</th>
<th>Action required</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Any time.</strong></td>
<td></td>
</tr>
<tr>
<td>Progression of severe pneumonia to very severe pneumonia (development of cyanosis or inability to drink in a child with pneumonia without these signs on admission)</td>
<td>Change treatment from Penicillin alone and add gentamicin.</td>
</tr>
<tr>
<td>Obvious cavitation on CXR</td>
<td>Treat with Cloxacillin and gentamicin IV for Staph. Aureus or Gram negative pneumonia.</td>
</tr>
<tr>
<td><strong>48 hours</strong></td>
<td></td>
</tr>
</tbody>
</table>
| 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 without 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°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 2: Consent

INFORMED CONSENT EXPLANATION

I am Dr. Catherine Mutinda, a postgraduate student registered for a Masters in Medicine (MMed)-Paediatrics, degree at the Department of Paediatrics and Child Health in the University of Nairobi. I am carrying out a study as part of the requirements for the MMed qualification. My objectives are to describe the proportion of children managed according to the National guidelines on management of pneumonia and to describe the healthcare workers barriers in the adherence to the National guidelines on management of pneumonia at Garissa PGH.

Study approval has been given by the Kenyatta National Hospital/ University of Nairobi ethics committee (KNH/UON-ERC). The committee can be contacted through;
Prof. A. N. Guantai,
Secretary, KNH/UON-ERC,
P. O. Box 20723,
Nairobi.
Email: uonknh_erc@uonbi.ac.ke

My Supervisors, both of whom are based at the Department of Paediatrics and Child Health at the University of Nairobi are:
1. Prof. F. Onyango
2. Prof. E. Obimbo
3. DR. R. Kumar

I am requesting your participation in this study as a health worker working at Garissa PGH. I would like to bring to your attention the following ethical considerations which will guide your enrolment as a study participant:
1. Participation in this study is voluntary
2. You may withdraw from the study at any time and there are no consequences for your decision to withdraw
3. After you read the explanation, please feel free to ask any questions that will allow you to understand clearly the nature of the study.
4. Any information you provide including details on your demographic characteristics will be treated as confidential.

5. The study protocol has been reviewed by an ethics committee. This protocol can be availed to you should you be interested in the study details. I will be available to answer any questions that will help you to understand the nature of the study. If you need to seek clarification you can contact me on telephone number 0737822129.

**Procedure:** A questionnaire will be provided. It should take approximately 10 to 15 minutes to complete answering the questions in it. I will be available to guide you through the questionnaire.

**Benefit:** There are no direct personal benefits for participating in this study. It is expected that study findings will help to improve the management of sick children diagnosed with pneumonia Garissa PGH.

**CONSENT FORM**

I, the undersigned, do hereby give consent to participate in this study. The nature and purpose of the study have been fully explained to me. I am aware that participation is voluntary and that there are no consequences to withdrawal from the study. I have been informed that all data provided will be used for study purposes only.

Signed…………………………                     Date……………………

I ____________________________________ declare that I have adequately explained to the participant the study purpose, procedures, risks and benefit. I have given the participant time to ask questions and seek clarifications regarding the study.

Signed .................................                     Date............................

---

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Appendix 3: Data Collection Tools.

A. PATIENT’S CLINICAL RECORDS DATA FORM:

Study identification number _______
Hospital identification number _______

Section 1: Patient demographics.

1. Date of consultations / admission

2. Patient’s age in months

3. Patient’s gender (tick appropriate)
   a. Male
   b. Female

4. Patient’s recorded weight

Section 2: Clinical data.

2.1 Assessment.

5. Assessment of pneumonia. (Y = yes, N = no)
   (a) History of;
   1. Cough _______
   2. Difficult breathing _______
   (b) Clinical assessment.
   (a = Recorded as Present, b = Recorded as Not Present, c = Not Recorded)
   1. (a) Respiratory rate ___________
      (b) If recorded how many breaths per minute ___________
   2. Lower chest wall indrawing ___________
   3. (a) AVPU ___________
      (b) If recorded, what is recorded? _______________
   4. Grunting _______
   5. Inability to drink / breastfeed ___________
   6. Cyanosis ___________
   7. Wheeze ___________
2.2 Diagnosis / Classification

6. If wheeze is not present

a. Clinical diagnosis given by the clinician (tick appropriate answer)
   
   a. No pneumonia / URTI  
   b. Pneumonia  
   c. Severe pneumonia  
   d. Very severe pneumonia  
   e. No classification recorded

b. According to history given is the clinical diagnosis given by the clinician in accordance with the national guidelines. (Y = yes, N = no) __________

7. If wheeze is present

a. Clinical diagnosis is given by the clinician. (Tick appropriate answer)
   
   a. Mild asthmatic attack  
   b. Severe asthmatic attack  
   c. Very severe asthmatic attack  
   d. No classification recorded

b. According to history given is the clinical diagnosis given by the clinician in accordance with the national guidelines. (Y = yes, N = no) __________

8. Co – morbidities recorded by clinician

1. ______________________
2. ______________________
3. ______________________
4. ______________________
5. ______________________

2.3 Treatment given

8. a. Antibiotic (s) given (Y =yes, N= No)
   1. Penicillin __________
   2. Gentamycin __________
   3. Amoxicillin __________
   4. Ceftriaxone __________
   5. Chloramphenicol __________
   6. Metronidazole __________
   7. Other ________________
b. For the drug prescribed is the dose correct (Y = Yes, N = No)
   1. Penicillin _________
   2. Gentamycin _________
   3. Amoxicillin _________
   4. Ceftriaxone _________
   5. Chloramphenicol _________
   6. Metronidazole _________
   7. Other ______________

c. For the drug prescribed is the route correct (Y = Yes, N = No)
   1. Penicillin _________
   2. Gentamycin _________
   3. Amoxicillin _________
   4. Ceftriaxone _________
   5. Chloramphenicol _________
   6. Metronidazole _________
   7. Other __________

d. For the drug prescribed are the units correct. (Y = Yes, N = No)
   1. Penicillin _________
   2. Gentamycin _________
   3. Amoxicillin _________
   4. Ceftriaxone _________
   5. Chloramphenicol _________
   6. Metronidazole _________
   7. Other __________

e. For the drug prescribed is the frequency correct (Y = Yes, N = No)
   1. Penicillin _________
   2. Gentamycin _________
   3. Amoxicillin _________
   4. Ceftriaxone _________
   5. Chloramphenicol _________
   6. Metronidazole _________
   7. Other __________
9. If a wheeze is present
   a. Was a bronchodilators prescribed (Y = Yes, N = No) ____________________
   b. If prescribed, which one (list)
      1. ___________________
      2. ___________________
      3. ___________________
      4. ___________________
   c. Was the prescription correct dosage(Y = Yes, N = No) ________________
   d. Was the route of administration for the bronchodilator correct?
      (Y = Yes, N = No) ______________

10. Supportive treatment
    a. Was oxygen prescribed (Y = Yes, N = No) ______________
    b. If yes (tick recorded administration device)
       a. Nasal catheter.
       b. Nasal prone.
       c. Plain Mask.
       d. Non re-breather mask.
       e. Not recorded.
    c. Was the flow rate recorded (Y = Yes, N = No) ______________
    d. If yes, was the flow rate appropriate for the device used (Y = Yes, N = No)
       ________________

11. Is the treatment given appropriate according to the diagnosis given by the
    clinician and the National guidelines? (Y = Yes, N = No) _______________

2.4 Monitoring

12. Was there a vital signs chart? (Y = Yes, N = No) ________________

13. What parameters are recorded? (Y = Yes, N = No)
    1. Temperature __________
    2. Respiratory rate __________
    3. Pulse rate __________

14. Number of times documented (tick appropriately)
    a. <=12hrs
    b. 13 - 24hrs
    c. 25 - 36hrs
    d. 35 - 48hrs
15. Re-evaluation
   a. Was there a recorded clinical improvement. (Y = Yes, N = No) 
   
   b. If no clinical improvement recorded (Y = yes, N = no)
      1) Investigations
         a. CXR __________
         b. TBC __________
         c. HIV / AIDS rapid test __________
         d. Other specify __________
      2) (a) Drug re-evaluation (Y = yes, N = no) __________
         (b) If yes which drugs was given (name, dose, route and frequency)
            1. __________
            2. __________
            3. __________
            4. __________
            (c) Is the drug prescribed a recommended second line in the National
guidelines? (Y = Yes, N = No) __________

2.5 Evaluation for tuberculosis

16. Cough duration > 30 days, investigations done, (Y = Yes, N = No)
   1. CXR __________
   2. TBC __________
   3. ESR __________
   4. HIV / AIDS Rapid test __________
   5. Mantoux test __________
   6. Other specify __________

2.6 Discharge / Follow up

17. Outcome (tick appropriately)
   a. Discharge
   b. Death
   c. Referral

18. Date of discharge / death/ referral __________

19. Duration of stay (in days) __________

20. Was the patient discharged on oral antibiotics? (Y = Yes, N = No)

21. For a diagnosis of asthma
   a. Was the patient discharged on an inhaler? (Y = Yes, N = No) __________
   b. Was the patient given a follow up clinic date? (Y = Yes, N = No) __________

22. For a diagnosis of tuberculosis
   a. Was the patient discharged on anti-tuberculosis (Y = Yes, N = No) ______
   b. Was the patient given a follow up clinic date? (Y = Yes, N = No) ________
B. HEALTH WORKER QUESTIONNAIRE.

Study identification number ______________
Date of survey ___________
Initials ______

SECTION 1: General information.

1. Health worker type. (tick appropriate)
   a. Paediatrician
   b. Medical officer
   c. Medical officer intern
   d. Registered clinical officer – paediatrics
   e. Clinical officer
   f. Clinical officer intern
   g. Nurse
   h. Other specify _________________

2. Gender
   a. Male
   b. Female

3. Where is your health service provision point?
   a. Paediatric ward
   b. Paediatric outpatient clinic
   c. Casualty
   d. Mother and child health clinic
   e. Other specify_______________

4. How long have you worked at Garissa Provincial General Hospital.____________________

5. (i) What is your basic training level.
   a. Clinical officer
   b. Medical officer (MBChB)
   c. Enrolled nurse (KEN/KECHN)
   d. Registered nurse (KEN/KRCHN)
   e. Other specify ____________________

   (ii) Year of completion___________________
6. (i) Have you undergone any major post basic training?
   
   a. Yes
   b. No

   (ii) If yes which one
   
   a. Advanced diploma
   b. MMed paediatrics
   c. MPH
   d. Other specify ___________________

   (iii) Year of completion _____________________

7. Have you managed a child with pneumonia aged 2 – 59 months?
   
   a. Yes
   b. No

SECTION 2: KNOWLEDGE AND PRACTICE.

8. (i) Have you had training on any guidelines?
   
   a. Yes
   b. No

   (ii) If yes which training
   
   a. ETAT +
   b. ACLS
   c. APLS
   d. HBB (Helping Babies Breath)
   e. Neonatal resuscitation
   f. Others __________

   (iii) Year of training for each ticked training
   
   a.__________
   b.__________
   c.__________
   d.__________
   e.__________
   f.__________

9. Have you had training on any guidelines for the management of pneumonia?
   
   a. Yes
   b. No
10. I regard to pneumonia guidelines please tick within the box with which you identify with,
   1. Strongly agree
   2. Agree
   3. Neutral/ don't know
   4. Disagree
   5. Strongly disagree

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>15. National guidelines on management of pneumonia exist</td>
<td></td>
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<tr>
<td>2. In the hospital we have the national guidelines on management of pneumonia in form of flow charts</td>
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<tr>
<td>3. In the hospital guideline booklets containing the national guidelines on management of pneumonia are available to us</td>
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<td>4. The hospital encourages the use of the national guidelines on management of pneumonia</td>
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<td>5. My colleagues use the national guidelines on management of pneumonia</td>
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<tr>
<td>6. My colleagues expect me to use the national guidelines on management of pneumonia</td>
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<tr>
<td>7. I use the national guidelines on management of pneumonia</td>
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<tr>
<td>8. I am confident I can use the national guidelines on management of pneumonia</td>
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<tr>
<td>9. I do not have complete control over whether to use the national guidelines on the management of pneumonia</td>
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<tr>
<td>10. Having the national guidelines on management of pneumonia guidelines at hand makes their use likely.</td>
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<tr>
<td>11. Having the skills to identify and classify pneumonia makes the use of the national guidelines on management of pneumonia likely.</td>
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<td>12. I am able to identify the signs required for pneumonia classification as per the national guidelines on management of pneumonia.</td>
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<td>13. The use of the national guidelines on management of pneumonia does not reduce mortality due to pneumonia.</td>
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</table>
11. When treating a 10kg child with severe pneumonia first line treatment according to the National paediatric protocol would be?

a. Penicillin 500,000iu qid & gentamicin 75mg od
b. Ceftiaxone 500mg od
c. Penicillin 500,000iu qid & gentamicin 75mg tds
d. Penicillin 500,000iu qid

12. Maria 1 year old presents with a history of difficulty in breathing and cough for 3days. She is not able to eat or breast feed. Her respiratory rate of 50/min, has chest wall indrawing. What is the correct classification and treatment for her?

a. Very severe pneumonia; penicillin and gentamycin
b. Very severe pneumonia; ceftiaxone
c. Severe pneumonia; penicillin alone
d. Pneumonia ; amoxyl

SECTION 3: STRUCTURES.

13. For drug administration the hospital always has
(Y= yes, N = No)

i. IV-giving sets with chambers for paediatric use? ________

ii. Butterflies and/or cannulas of paediatric size? _________

15. The hospital always has,
(Y= yes, N = No)

i. The first line antibiotics for treatment of pneumonia
   a. Crystalline penicillin ________
   b. Gentamycin ________
   c. Amoxicillin ________
   d. Cotrimoxazole ______

ii. The second line antibiotics for treatment of pneumonia
   a. Ceftraixone ________
   b. Cloxacillin ________
   c. Flocloxacillin ________
16. Concerning oxygen
(Y= yes, N = No)

i. It is always available in the hospital _______

iii. To administer oxygen the following are available

   a. Nasal prones ______
   b. Nasal catheters _______
   c. Naso – pharyngeal catheter _______
   d. Plain face mask ___________
   e. Face mask with reservoir ___________

17. For the management of a child with a wheeze the hospital has,
(Y= yes, N = No)

i. Salbutamol always available _______

ii. Prednisolone always available _______

iii. Nebulisers for administrations of salbutamol _______

iv. Spacers with masks for administration of metered
doses (spray) of salbutamol? ___________

18. The following investigations I need in the management of pneumonia
are always available. (Y= yes, N = No)

i. TBC _______

ii. ESR_______

iii. CXR_______

iv. Mantoux _______

v. HIV testing _______
## Appendix 4: Study Budget

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<th>Category</th>
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Source of funding:
PRIME Kenya in Collaboration with University of Nairobi.
Appendix 5: Approvals

A. Kenyatta National Hospital Ethics and Research Committee.

Research proposal: “Adherence to National guidelines for Management of Children with Pneumonia at Garissa provincial General Hospital” (P45822/2012)

This is to inform you that the KNH/UoN-Ethics & Research Committee (ERC) has reviewed and approved your above revised research proposal. The approval periods are 30th May 2012 to 29th May 2013.

This approval is subject to compliance with the following requirements:

a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.
c) Death and life threatening problems and severe adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN ERC within 72 hours of notification.
d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH/UoN ERC within 72 hours.
e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (Attach a comprehensive progress report to support the renewal).
f) Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
g) Submission of an executive summary report within 50 days upon completion of the study

This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

For more details consult the KNH/UoN ERC website www.uonbi.ac.ke/activities/KNHUoN

"Protect to Discover"
Yours sincerely

[Signature]

PROF. A.N. GUANTAI
SECRETARY, KNUHUON-ERC

c.c. The Deputy Director CS, KNH
The Principal, College of Health Sciences, UoN
The Dean, School of Medicine, UoN
The Chairman, Dept. of Paediatrics & Child Health, UoN
The HoD, Records, KNH
Supervisors: Prof. Francis e. Oryango, Dept.of Paediatrics and Child health, UoN
Prof. Elizabeth Maleche Obimbo, Dept.of Paediatrics and Child Health, UoN
Dr. Rashmi Kumar, Dept.of Paediatrics & Child Health, UoN

"Protect to Discover"
B. Approval for the Garissa Provincial General Hospital Management.

Dr. Mutinda Catherine  
Department of Pediatrics and child health,  
School of Medicine,  
University of Nairobi,  
31st July 2012,

The Medical Superintendent,  
Garissa Provincial General Hospital.  
P.O Box 29 - 70100,  
Garissa.

Dear Sir,

RE: RESEARCH AUTHORIZATION REQUEST

I am a second year post graduate student pursuing Masters of Medicine in Pediatrics and Child Health. I kindly request authorization to carry out my research study on the adherence to the National guideline for management of children with pneumonia at Garissa Provincial General Hospital. Please find attached the Kenyatta National Hospital Ethics Committee approval letter.

Thank you.

Yours faithfully,  
Dr. Mutinda Catherine.