BARRIERS TO OPTIMUM MANAGEMENT OF MALARIA AMONG CHILDREN UNDER FIVE YEARS OF AGE IN GARISSA PROVINCIAL HOSPITAL.

A research proposal in partial fulfillment of the degree of Masters of Medicine (Paediatrics and Child Health), University of Nairobi

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DECLARATION

This research proposal is my original work and has not been presented for the award of a degree in any other university.

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ABBREVIATIONS

PGH	Provincial General Hospital
WHO	World Health Organization
RDT	Rapid diagnostic test
ACT	Artemisinin-based Combination Therapy
CQ	Chloroquine
DHA-PPQ	Dihydroartemisinin-piperaquine
Hb	Haemoglobin
HCW	Health care workers
IM	Intramuscular
IMCI	Integrated management of childhood illnesses
IV	Intravenous
kg	kilogram
LOS	length of stay
mg	milligram
ml	millilitre
SP	Sulphadoxine or Sulphalene/pyrimethamine
WBC	White blood cell

DEFINITIONS

Artemisinin-based combination therapy (ACT) - A combination of artemisinin or one of its derivatives with an antimalarial or antimalarials of a different class

Cerebral malaria - Severe P. falciparum malaria with cerebral manifestations, usually including coma

Combination treatment - A combination of two or more different classes of antimalarial medicines with unrelated mechanisms of action.

Cure - Elimination of the symptoms and asexual blood stages of the malaria parasite that caused the child to seek treatment.

Drug resistance - The ability of a parasite strain to survive and/or to multiply despite the administration and absorption of a medicine given in doses equal to or higher than those usually recommended but within the tolerance of the subject, provided drug exposure at the site of action is adequate. Resistance to antimalarials arises because of the selection of parasites with genetic mutations or gene amplifications that confer reduced susceptibility.

Endemic - Occurring frequently in a particular region or population

Fever - An increase in body temperature above the normal temperature i.e. above an oral temperature of 37.5°C.

Monotherapy - Antimalarial treatment with a single medicine (either a single active compound or a synergistic combination of two compounds with related mechanism of action).

Parenteral - The provision of medication into the body by any means other than through the alimentary canal (oral route or rectal), such as by subcutaneous, intramuscular or intravenous injection.

Plasmodium - A genus of protozoan vertebrate blood parasites that includes the causal agents of malaria. *Plasmodium falciparum, P. malariae, P. ovale* and *P. vivax* cause malaria in humans.

Radical cure - In *P. vivax* and *P. ovale* infections only, this comprises elimination of the symptoms and the asexual blood stages of the malaria parasite plus prevention of relapses by killing hypnozoites.

Rapid Diagnostic Test (RDT) - An antigen-based stick, cassette or card test for malaria in which a coloured line indicates that plasmodial antigens have been detected.

Relapse - The recurrence of asexual parasitaemia in *P. vivax* and *P. ovale* malaria deriving from persisting liver stages.

Severe anaemia - Haemoglobin concentration of $< 5g/100$ ml (haematocrit $< 15\%$).

Severe falciparum malaria - Acute falciparum malaria with signs of severity and/or evidence of vital organ dysfunction.

Treatment failure - A failure to achieve the desired therapeutic response after the initiation of therapy.

Uncomplicated malaria - Symptomatic infection with malaria parasitaemia without signs of severity and/or evidence of vital organ dysfunction.

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ABSTRACT

Background:

Malaria continues to be a major killer accounting for 16% of under five deaths in Sub Saharan Africa. In Kenya 34,000 children die annually from malaria. Kenya's National Malaria guidelines have been adapted from WHO and rolled out as National Paediatric Protocols (clinical practice guidelines). The dissemination of these is ongoing through the ETAT+ course. The implementation of set guidelines into care has been shown to reduce malaria case fatality by 34%. The study set out to establish the proportion of children aged 2-59months managed as per the guidelines as well the barriers to guideline utilization.

Methods:

A retrospective cross sectional study at Garissa Provincial General Hospital. The methods employed were an audit of 95 clinical records of children aged 2-59 months and a self administered to health workers questionanaire.

Results:

Only 25.3% of patients were managed as per the guidelines. Prevalence of severe malaria among children without (35.5%) co morbidities is two fold higher than those with (15.8%) co morbidity (Fisher's exact, P=0.035). An appropriate anti malarial for malaria severity was administered at the correct dose in 28.4% (P=0.001) patients while the remaining patients with a correct dose received an inappropriate anti malarial for the severity of illness. Barriers to guideline utilization were poor documentation of clinical records, health care workers (HCW) were not motivated to use the guidelines despite their availability.

Conclusion: 25.3% of patients were managed as per the guidelines. Diseases severity was associated with better adherence. Health care workers knowledge was high but in practice adherence was low. The knowledge to practice gap

needs to be addressed to fully achieve the benefits of these guidelines. Motivation and Supervision of staff is a key pillar in utilization of guidelines

1. INTRODUCTION

Malaria is a devastating infection that annually affects over 300 million people worldwide, resulting in over 3000 paediatric deaths per day. In fact, malaria is the leading cause of mortality among children below 5 years of age in Africa and is the cause of about 20% of all-cause mortality in this age group [1, 2].

In Kenya it is one of the five leading causes of children under 5 years. Malaria continues to be a major killer accounting for 16% of deaths of children under-five years in Sub Saharan Africa.[2]

1.1 MALARIA IN KENYA

Kenya has four malaria epidemiological zones, with diversity in risk determined largely by altitude, rainfall patterns and temperature.

Seasonal transmission occurs in arid and semi-arid areas of northern and southeastern parts of the country, which experience short periods of intense malaria transmission during the rainfall seasons. Temperatures are usually high and water pools created during the rainy season provide breeding sites for the malaria vectors. These epidemic outbreaks result in high morbidity rates owing to the low immune status of the population. Garissa PGH and the study population for this study are situated in this region[2].

1.2 MALARIA CLASSIFICATION

Uncomplicated malaria - This is characterized by fever in the presence of peripheral parasitaemia. Other features may include chills, profuse sweating, muscle pains, joint pains, abdominal pain, diarrhoea, nausea, vomiting, irritability and refusal to feed. These features may occur singly or in combination[4, 5].

Severe malaria - This is a life threatening manifestation of malaria, and is defined as the detection of *P. falciparum* in the peripheral blood in the presence of any of one or more of the clinical or laboratory features listed below:

- Prostration which is the inability or difficulty to sit upright, stand or walk without support in a child normally able to do so, or inability to drink in children too young to sit
- Alteration in the level of consciousness (ranging from drowsiness to deep coma)
- Cerebral malaria (unarousable coma not attributable to any other cause in a patient with *falciparum* malaria)
- Respiratory distress (acidotic breathing)
- Multiple generalized convulsions (2 or more episodes within a 24 hour period)
- Shock (circulatory collapse, septicaemia)
- Pulmonary oedema
- Abnormal bleeding (Disseminated Intravascular coagulopathy)
- Jaundice
- Haemoglobinuria (black water fever)
- Acute renal failure - presenting as oliguria or anuria
- Severe anaemia (Haemoglobin < 5g/dl or Haematocrit < 15%)
- Hypoglycaemia (blood glucose level < 2.2.mmol/l)
- Hyperlactataemia

Figure 1:NATIONAL PAEDIATRIC MALARIA PROTOCOLS

Malaria Treatment in malaria endemic areas.

If a high quality blood slide is negative then only children with severe disease or those with severe anaemia should get presumptive treatment.

Severe = Fever + any of:
1. AVPU = 'V, P,U', or,
2. Unable to drink, or,
3. Respiratory distress with severe anaemia or acidotic breathing, or,
4. Hypoglycaemia (glucose ≤ 2.2mmols/l)

Yes →

Treat with iv or im Quinine:
1. Loading, 20mg/kg (im or iv over 4hrs) then,
2. 8 hrly doses 10mg/kg (im or iv over 2hrs).
3. Treat hypoglycaemia.
4. Maintenance fluids / feeds.
5. If weak pulse AND capillary refill >3secs give 20mls/kg Ringer's until pulse restored (use blood for resuscitation if Hb<5g/dl).
6. If Respiratory distress & Hb < 5 g/dl transfuse 20 mls/kg whole blood **urgently**, give over 4 hrs.

No ↓

Severe anaemia, Hb<5g/dl, alert (AVPU= 'A'), able to drink and breathing comfortable.

Yes →

Give AL (or oral second line if not available) and iron, **if Hb < 4g/dl**, transfuse 20 mls/kg whole blood over 4hrs **urgently**

No ↓

Fever, none of the severe signs above, able to drink / feed, AVPU = 'A' then follow **reliable malaria test result (BS or RDT):**

Test Negative →

Antimalarial **not** required, look for another cause of illness. Repeat test if concern remains.

Test Positive ↓

Treat with recommended 1st line oral antimalarial, or 2nd line if 1st line treatment has failed.

→

If Hb < 9g/dl treat with oral iron for 14 days initially. If respiratory distress develops and Hb < 5g/dl transfuse urgently.

Treatment failure:
1) Consider other causes of illness / co-morbidity
2) A child on oral antimalarials who develops signs of severe malaria (Unable to sit or drink, AVPU=U or P and / or respiratory distress) at any stage should be changed to iv quinine.
3) If a child on oral antimalarials has fever **and a positive blood slide** after 3 days (72 hours) then check compliance with therapy and if treatment failure proceed to second line treatment

1.3 STANDARD OF CARE IN MALARIA MANAGEMENT

All patients with fever or history of fever should be tested for malaria and only patients who test positive should be treated for malaria. The treatment policy and standard of care in malaria management has changed in the last 12 years due to failing therapeutic efficacy from chloroquine (CQ) to sulphadoxine-pyrimethamine (SP) in 1998 and subsequently to the currently recommended artemisinin-based combination therapies (ACTs) in 2004. ACTs are at present the best treatment for uncomplicated malaria and the efficacy of the treatments recommended in the National Guidelines for the Diagnosis, Treatment and Prevention of Malaria (2010) continue to be monitored regularly and information used to update policies and guidelines[4,5].

The National malaria guidelines have been formatted into the Basic Paediatric protocols in figure 1. They take into account malaria classification, treatment. The details on drug dosages are in appendix 2, for fist and second line treatment.

2. <u>LITERATURE REVIEW</u>

The practice of evidence based medicine ensures quality health provision. Clinical practice guidelines (CPGs) aid in the provision of quality health care by bringing to the bedside the benefits of evidence based medicine. This in turn has a huge impact on child survival. In the quality of care framework CPGs are linked to the process pillar. The other two pillars are structure and outcome[6,7]. 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, diarrhoea, malaria, HIV, malnutrition and immunizable diseases from level 1and 2 institutions. The Kenyan Basic Paediatric Protocols are an adaptation of international best practice as found in the WHO book "A Pocket Book of Hospital Care for Children ". [8,9,10]

Kenyan Clinical practice guidelines for malaria were coined from the WHO Malaria guidelines through the Paediatric Basic Protocols. These were roled out in 2006 and revised in 2010. Dissemination of these protocols is done through a five day Emergency Triage and Treatment Plus (ETAT +) course. It concentrates on the emergency care given for inpatient children within the first 24hours[11].

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 officers and post graduate training of paediatricians. The training is also conducted within hospitals.[11,12,13,14]

Studies indicate that adherence to clinical practice guidelines result in improved inpatient care and reduce mortality. A survey of 13 district hospitals in Kenya

observed specifically on malaria that recommended signs for classifying disease severity and choosing treatment were infrequently documented though this did not mean that they were not assessed. In this survey adherence to CPGs in management of malaria stood at 36%[12]. The recommendation from this was to have targeted improvements in district hospital based care might then benefit the entire country.

In Siaya, Kenya community health workers (CHWs) trained in the Management of the Sick Child (MSC) guidelines a modified version of the IMCI guideline adherence was evaluated. The clinical recordings of 125 CHWs were reviewed in comparison to a "gold standard" re-examination. The overall averaged guideline adherence was 79.8%. Adherence was significantly higher for: Consultations of 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[22].

3. STUDY JUSTIFICATION AND UTILITY

Health indicators in North Eastern province are far worse than the national average. Infant mortality rate 57/1000 live births and the under five mortality 80/1000 live births are higher than the national average of 52 and 74 respectively[16].

Investigating hindrances to health caregivers in implementing standard of care in malaria management and comparing these to the standard of care prescribed by WHO and national guidelines for the diagnosis, treatment and prevention of malaria in Kenya will help to assess the need for continuing education of health professionals and caregivers on achieving good management of the disease. In addition, identifying the factors affecting the quality of care in malaria management may also help to isolate significant constraints that health professionals face in achieving standard of care in malaria management in children.

Kenya has developed the Kenya National Malaria Strategy (2009-2017) with an aim to reduce malaria mortality by 30% and maintain it to 2017. The approaches include case management, vector control, management of malaria and anaemia in pregnancy, epidemic preparedness and response, information education communication and monitoring and evaluation[24]. This study looks into case management as well as monitoring and evaluation of guideline utlisation.

The studies on malaria which have been carried out in Kenya have been in malaria endemic regions like western Kenya, some parts of the coastal region and some parts of north rift. The North Eastern part of Kenya has seasonal

malaria. It will give more information on the pattern of care where malaria management is crucial as it occurs in higher numbers over a season[1]. Studies on the audit of utilization of GOK guidelines are few thus the need to bridge this knowledge gap.

Studies have shown that clinical outcome for specific conditions, including the risk of death, is correlated with quality of hospital care. Evidence also indicates that possible targets for strengthening of hospital care include triage, emergency care and follow up assessment, inpatient management and support services. This study will provide information on which pertinent factors affect malaria management and the extent to which they do this in our setting[17].

4. OBJECTIVES

i) To determine the proportion of children managed for malaria as per the National Malaria guidelines 2010 as per the Paediatric Protocol.

ii) To establish the barriers faced by health care workers in optimum management of malaria in children under five years at Garissa PGH.

5. METHODOLOGY

5.1 DESIGN

This was a retrospective cross sectional descriptive study at Garissa PGH where the target population are healthcare workers managing children under-five years as well as an audit of the medical records of children under-five years being managed for malaria during the study period.

5.2 LOCATION

The study was conducted at Garissa Provincial Hospital. This is the main public hospital in the former North Eastern Province now Garissa County. It serves a population of 2.35million most of whom are nomads. Among other services, the hospital provides curative and preventive services. This makes the hospital a suitable case for this study. The hospital has a paediatric inpatient capacity of 54 beds. The government is the main health care provider in the province (99%) with private facilities limited to major urban centres[16].

5.3 SOURCE POPULATION

The source population were the health care staff working in the Paediatric ward at Garissa Provincial Hospital. The staff include a Paediatrician, 2 medical officers, 4 medical officer interns, 13 nurses and 7 clinical officer interns.

It also included clinical records of children under-five managed for malaria during the study period.

5.4 POPULATION

The study population included the healthcare workers who work in the paediatric ward at Garissa PGH.

5.5 PERIOD

The study was conducted from January to July 2012.

5.6 INCLUSION CRITERIA

- Healthcare workers in the paediatric wards at Garissa PGH enrolled in the study with voluntary written informed consent.
- Clinical records of children under five years managed for malaria during the study period.

5.7 EXCLUSION CRITERIA

- Health care workers who declined to give consent.
- Records of children above five years.
- Records of children below five years who were not treated for malaria.
- Incomplete medical records.

5.8 SELECTION AND ENROLLMENT OF CASES

All health care staff managing children under five years for malaria at the Garissa PGH were eligible and enrolled into the study.

5.9 STUDY SIZE DETERMINATION

The sample size calculation:

- **Sample size using fisher's formula**

Precision (D) 10% (0.1)   Prevalence (p) 37%

$$\frac{1.96^2 \, (p \times (1-p)}{D^2}$$

Prevalence (p)

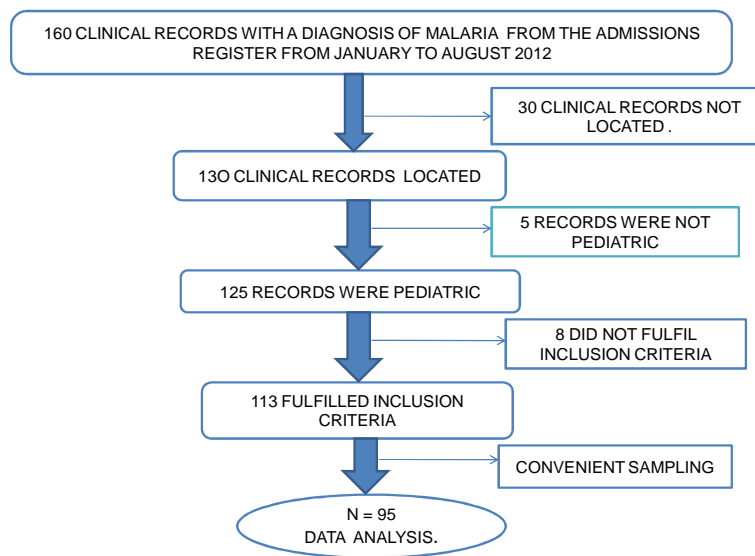Precision (D)

A total of **95** clinical records were reviewed.

A precision of 10%. The prevalence was calculated using study by English et al on utilization of evidence based guidelines[12].

6. STUDY PROCEDURES

Subject Recruitment Procedure

The investigator identified the health care workers and explained the purpose and methods of the study allowing the study participant to provide voluntary informed consent. The data was collected by means of a pre-tested questionnaire interview after the clinical audit of medical records of children under-five years managed for malaria.

Figure 2: Study procedure flow chart

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┌─────────────────────────────────────────────────────┐
│ 160 CLINICAL RECORDS WITH A DIAGNOSIS OF MALARIA FROM│
│ THE ADMISSIONS REGISTER FROM JANUARY TO AUGUST 2012  │
└─────────────────────────────────────────────────────┘
        │                    ┌──────────────────────┐
        │ ──────────────────▶│ 30 CLINICAL RECORDS  │
        ▼                    │ NOT LOCATED .        │
┌──────────────────────┐    └──────────────────────┘
│ 13O CLINICAL RECORDS │
│ LOCATED              │
└──────────────────────┘
        │                    ┌──────────────────────┐
        │ ──────────────────▶│ 5 RECORDS WERE NOT   │
        ▼                    │ PEDIATRIC            │
┌──────────────────────┐    └──────────────────────┘
│ 125 RECORDS WERE     │
│ PEDIATRIC            │
└──────────────────────┘
        │                    ┌──────────────────────┐
        │ ──────────────────▶│ 8 DID NOT FULFIL     │
        ▼                    │ INCLUSION CRITERIA   │
┌──────────────────────┐    └──────────────────────┘
│ 113 FULFILLED        │
│ INCLUSION CRITERIA   │
└──────────────────────┘
        │                    ┌──────────────────────┐
        │ ──────────────────▶│ CONVENIENT SAMPLING  │
        ▼                    └──────────────────────┘
     ( N = 95
       DATA ANALYSIS. )
```

The consecutively sampled clinical records were audited using a data retrieval form daily until the sample size was achieved. Once collected the data was entered on the SPSS version 17 cleaned and analysed.

7. ETHICAL CONSIDERATIONS

Permission was sought from the Garissa Provincial Hospital to collect and analyze data collected in the study as part of the academic research study. The informed consent form and an authorization letter from the University of Nairobi was presented to the hospital for written approval prior to commencing the study.

The purpose of the study was carefully explained to the health providers with a view to obtaining written consent prior to enrolling in the study. Strict confidentiality was observed throughout the entire study period, held in trust by participating investigators, research staff and the study institution. The study participants were assigned study identification numbers and no personal identification data will be recorded. No information concerning the individual study findings was released to any unauthorized third party without prior written approval of Garissa PGH.

No experimental investigations or products were employed in this study. Benefits that participants were accrue from the study included receiving education regarding various components that constitute optimal management of malaria as well as factors that hinder the effective management of malaria in children. Better understanding of these aspects of malaria management is expected to sensitize health providers on the need for correct consistent use of medications, the difference between optimal and sub-optimal quality of care in malaria management.

The overall study findings will be availed to the clinicians and staff running the respective units in hope of disseminating the knowledge gained about barriers in implementing quality of care in paediatric malaria management in their facilities thereby contributing to the improvement of care delivered to this subset of

children. The study findings will also be presented to the University of Nairobi (UON) Department of Pediatrics and Child Health as per the requirements.

7.1 Consent

Consent was voluntary given in written form. The consent form provided described the purpose of the study, the study procedure to be followed as well as the potential benefits and risks of participating in the study. The investigator conducted the consent discussion and checked that the health worker comprehended the information provided on the consent form. Any pertinent questions regarding the study from the health worker were answered prior to signing the consent form.

Health workers who accepted to take part in the study signed the consent form which was then be countersigned by the investigator. A copy of the consent form was to the health worker who consented to the study. Records were kept regarding reasons for non-participation of eligible participants.

8. DATA COLLECTION

Following selection of study subjects, data was collected from the identified health care workers. This was carried out by administration of a pretested questionnaire which sought to establish the following details

- ✓ Awareness of national guidelines for malaria
- ✓ Availability of the national guidelines for malaria
- ✓ Adherence to the national guidelines for malaria
- ✓ Frequency of education given to the health care worker regarding malaria and its management
- ✓ Knowledge on the treatment of severe malaria
- ✓ Perceived barriers to implementation on the national guidelines on malaria

9. DATA MANAGEMENT AND ANALYSIS

9.1 Quantitative Data

Quantitative data was summarized as frequency distributions and tabulations. Continuous variables were summarized as means with standard deviations and medians. Categorical variables were calculated as a binary variable representing the children managed as per the guidelines. The level of adherence was assessed as an index from 0-100%.

Quantitative data analysis and computation was carried out by use of SPSS Version 17 software packages.

9.2 Qualitative Data

Barriers to provision of optimum care by the HCW were derived from the questions. The raw data was then reviewed and a thematic framework on the health provider's perceptions of barriers to implementation of quality of developed. Interpretations and associations between themes have been drawn from the analysis.

10.   CONTROL OF ERRORS AND BIASES

The following measures were taken to reduce bias.

1. The questionnaire was pretested to reduce insensitive measure bias and administered after the data has been collected.

2. The principal investigator assessed the responses given to the questionnaires administered daily basis and oversaw data entry to ensure validity of collected data.

11. RESULTS

The data was retrieved from 95 medical files. These were randomly selected from the 160 medical files of children treated for malaria between January and August 2012. The medical case notes for a total of 95 children under five years admitted in the paediatric wards at Garissa PGH with malaria were analysed. The median age of the patients was 12 months (IQR 8 to 21 months).

Table 1: Demographic data

|	Frequency (%)
Sex	
Male	41 (43.2%)
Female	54 (56.8%)
Age category	
2 to 11 months	42 (45.2%)
12-24 months	28 (30.1%)
25 to 36 months	10 (10.8%)
36 months and above	13 14.9%)

Figure 3: Hospital stay
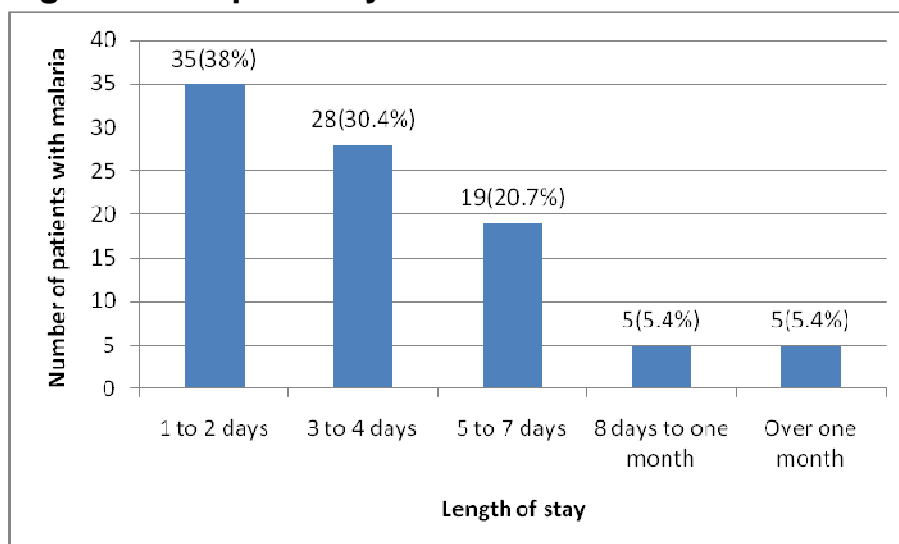
Eight of the 10 patients with LOS longer than a week had at least one co morbid illness most commonly gastroenteritis. The median length of stay of 3 days with an IQR of 2 to 5 days. The distribution of duration of stay in hospital is shown above in figure 3. Most (38%) patients stayed in hospital for a day or two, but 5.4% stayed for between one week to 1 month and a further 5.4% stayed for over a month.

Table 2: Documentation of signs and Laboratory Investigations

	Present	**Absent**	**Not recorded**
Fever	73(77.7%)	14(14.9%)	7(7.5%)
Ability to drink	21(22.6%)	27(29%)	45(48.4%)
Respiratory distress	27(28.4%)	59(62.1%)	9(9.5%)
Anaemia	14(14.7%)	58(61.1%)	23(24.2%)
Level of consciousness	91 (95.8%)	-	4(4.2%)
Hypoglycaemia	1(1.1%)	6(6.3%)	88(92.6%)
Haemoglobin	16(16.8%)	-	79(83.2%)
Malaria parasites microscopy	83(87.4%)	7(7.4%)	5(5.3%)
	Yes	**No**	
Elimination of other obvious causes of fever (Yes, No)	89(93.7%)	6(6.3%)	

Figure 4: Malaria Severity
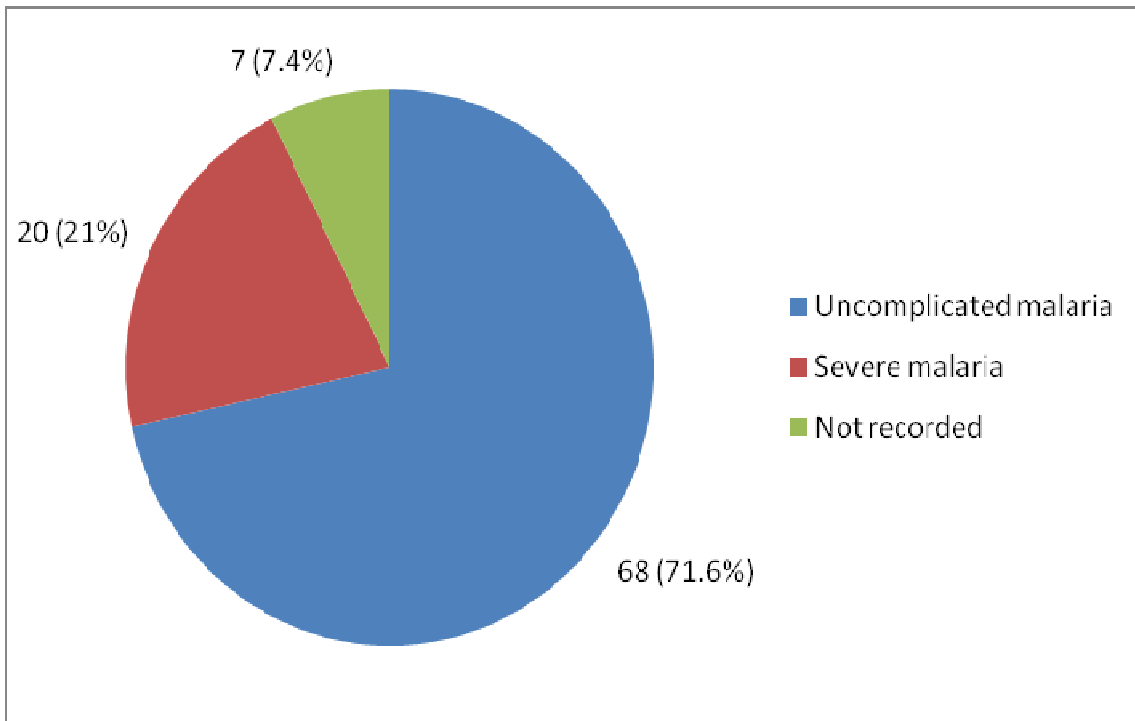
Malaria was determined by presence of fever, altered level of consciousness and a positive malaria parasite slide. Severe malaria was determined as level of consciousness below alert on the AVPU scale, respiratory distress, severe anemia. Malaria severity was not statistically significantly associated with either age of patients (Mann Whitney, P=0.70) or the length of hospital stay (Mann Whitney, P=0.15) .Prevalence of severe malaria among children without (35.5%) co morbidities was two fold higher than those with (15.8%) co morbidity (Fisher's exact, P=0.035). Malaria severity is as indicated in figure 4.

11.1 Malaria assessment and severity

Ability to drink and hypoglycemia were poorly documented as seen in table2. Haemoglobin levels were recorded only in 16(16.8%) of patients. Appropriate classification of severity was achieved in 88(92.6%) of cases, 7(7.4%) were not

indicated. Uncomplicated malaria constituted 68(71.6%) severe malaria 20(21%) and 7 (7.4%) unrecorded.

11.2 Treatment

Most 91 (95.8%) of the patients received the guideline recommended dosages for antimalarials. However, clinicians commonly prescribed severe malaria treatment for cases of uncomplicated malaria (table 4). An appropriate anti malarial for malaria severity was administered at the correct dose in 27 (28.4%) patients while the remaining patients with a correct dose received an inappropriate anti malarial for the severity of illness. Clinicians administered the correct dosage per body weight in 91(95.8%).

Quinine was the most commonly used malaria treatment and was administered in 81 (85.3%) patients. This was the case despite the observation that uncomplicated malaria cases predominated 68 (71.6%).

Table 3: Malaria treatment and follow up

	Frequency	Percent
Correct body weight dose for administered anti malarial	91	95.8%
Appropriate guideline recommended anti malarial		
No	68	71.6%
Yes	27	28.4%
Correct dose and appropriate anti malarial	27	28.4%
Follow up arrangements done	45	47.4%

Table 4: Malaria severity and administration of appropriate anti malarial

	Received appropriate anti malarial		P value
	Yes	No	
Uncomplicated malaria	7(10.3%)	69(89.7%)	< 0.001
Severe malaria	20(100%)	0	

11.3 Guideline adherence

Guideline adherence was a measure of malaria classification and severity, a positive test for malaria, correct treatment and dosing and follow up of patients after treatment. Malaria classification determined the treatment required to be administered. Adherence was good in classification of severity and performance of malaria parasite slide. Drug dosages were correct in 95.8% but an appropriate drug was only administered in 28.4% (table 3). This brought down guideline adherence to 25.3%. Poor documentation of signs and laboratory investigations left gaps in proper assessment.

Figure 5: Summarised adherence results.
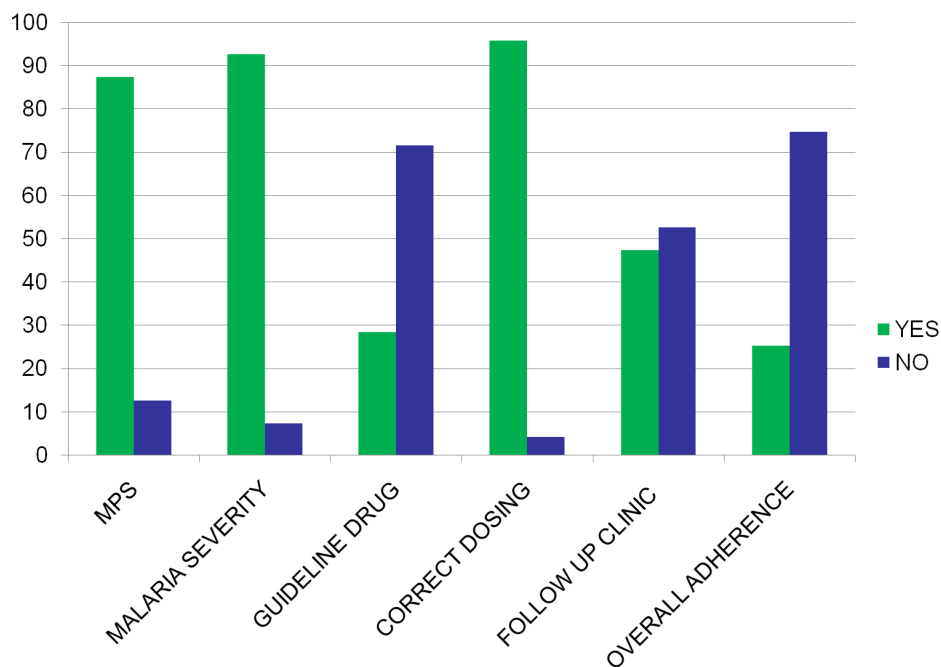
11.4 HCW reported barriers

A total of 17 health workers were interviewed to explore barrier to malaria guideline use. Majority 7(43.8%) were stationed in the paediatric ward. 9(52.9%) had received post basic training in paediatrics specifically ETAT+.. 9(52.9%) were nurses. Other healthcare workers were the paediatrician and medical officer interns as indicated in the table below.

Table 5: Health care worker characteristics

	Frequency	Percent
Paediatric ward	7	43.8
MCH clinic	5	31.3
OPD other	3	18.8
Other	1	6.3
Post basic training		
Yes	9	52.9
No	8	47.1
Training level		
Clinical Officer (CO)	2	11.8
Medical officer (MBChB)	3	17.7
Enrolled Nurse (KEN/KECHN)	4	23.5
Registered nurse (KRN/KRCHN)	5	29.4
Other	3	17.7

Table 6: Health care worker responses on guideline use

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Utilisation of GOK guidelines on malaria is: beneficial	1(11%)	2(22%)	5(56%)	1(11%)	0(0%)
Good	5(33%)	6(40%)	2(13%)	0(0%)	2(13%)
Mandatory	2(22%)	2(22%)	3(33%)	0(0%)	2(22%)
Optional	0(0%)	0(0%)	2(22%)	1(11%)	6(67%)
Satisfactory	1(11%)	4(44%)	4(44%)	0(0%)	0(0%)
Children under 5 years diagnosed with malaria are prescribed treatment consistent with the guidelines	1(6%)	12(71%)	1(6%)	1(6%)	2(12%)
I always have the guidelines at hand (flow charts, job aids).	1(6%)	7(41%)	4(24%)	2(12%)	3(18%)
I am confident i can use the GOK guidelines on the management of malaria	3(18%)	9(53%)	3(18%)	0(0%)	2(12%)
Most of my professional colleagues expect me to use the GOK guidelines on the management of malaria	2(12%)	6(35%)	4(24%)	1(6%)	4(24%)
Most of my professional colleagues use the GOK guidelines for malaria management	1(6%)	9(53%)	1(6%)	0(0%)	5(29%)
The GOK malaria guidelines are in use in the hospital	3(18%)	8(47%)	2(12%)	1(6%)	3(18%)
The hospital encourages the use of the GOK guidelines.	3(18%)	6(35%)	4(24%)	1(6%)	3(18%)
The use of GOK guidelines makes malaria management easier	3(18%)	9(53%)	4(24%)	0(0%)	1(6%)

As pertains the barriers to utilisation of guidelines, 54% didn't always have the guidelines at hand, though 71% were confident to use them. 78% disagree that the utilisation of guidelines should be optional. 78% agreed that all children should be managed as per the guidelines.

48% felt the hospital didn't encourage the use of guidelines.36% don't think that the guidelines are in use in the hospital. 54% of staff didn't expect their colleagues to use the guidelines in management of malaria.

The results indicate that the healthcare workers do not always have the job aids at hand in order to use them. A third of the healthcare workers do not think the guidelines are in use in the hospital. Furthermore the hospital doesn't encourage the use of the same. With 54% of the healthcare workers not expecting their colleagues to use the guidelines there is no sense of accountability in uniformity of care given.

12. DISCUSSION

 25.3% of children were managed as per the malaria guidelines. This is comparable to the figure of guideline adherence by English et al of 34%[11]. This figure was a constituent of the documentation of guideline recommended clinical signs, a positive malaria parasite slide, appropriate grading of severity, correct drug and dosage. The mean age of clinical cases of malaria has shifted from 2.9years in 1992 to 4.9 years in 2006. The average age at Garissa PGH was 12 months with an IQR of 8-21 months.[24]

 In the documentation of the recommended clinical signs, ability to drink was not recorded in 48.4% of the cases. Anaemia was present in 14.7%, absent in 61.1%, not recorded in 23%. Elimination of other obvious causes of fever was tabulated in 93.7%. The level of consciousness was tabulated in 95.8% of the cases with only 33.7% having an altered level of consciousness. Majority of patients (92.6%) were not tested for hypoglycaemia. This is due to the fact the one glucometer available within the hospital is stored in maternity. The malaria parasite slides were positive in 87.4% of patients, 7.4% tested as negative but were still treated for malaria.

Assessment of haemoglobin level was made in 16.8% of the population. The prevalence of anaemia was elicited in 14.7%. General knowledge in Kenya about malaria transmission is 95% but only 10% know that malaria causes anaemia, neonatal and maternal deaths[1]. There has been an increase in the incidence of anaemia in under 5years but a decrease in the malaria morbidity and mortality by 36% and 31% respectively.

In terms of severity of malaria, 71.6% of cases were uncomplicated malaria, 21% severe malaria. Malaria severity was not statistically significant with the length of hospital stay (P=0.15) or the age of the patients (P=0.70). Prevalence

of severe malaria was twofold higher in patients without co morbidity (35.5%) than those with (15.8%) co morbidity (Fisher's exact, P=0.035). Those with uncomplicated malaria had a higher incidence of gastroenteritis, pneumonia. Despite the appropriate severity being indicated, only 28.4% of patients received correct anti malarial for treatment.

Majority 81 (85.3%) of the patient received quinine for malaria treatment. This was the case despite the observation that uncomplicated malaria cases predominated 68 (71.6%). In contrast to the study by English et al, where only 3% received a loading dose of quinine, 95.8% in this study received a loading dose and correct dosing of drugs until recovery.[12]

A study on drug utilisation of antimalarials for treatment of hospitalised children under 5years in Nigeria indicated continued use of chloroquine for treatment of severe malaria despite an indication to switch to quinine and parenteral artemisinins as per the National Treatment Policy[18]. At Garissa, both severe and uncomplicated malaria were treated with quinine despite availability of ACTs. The ACTs are stored in the main hospital pharmacy .Uncomplicated malaria was treated with quinine in 59(88%) of cases. Only 7(10.5%) received the correct treatment of AL. A study done in Nigeria on prescription patterns of anti malarial drugs indicated that the overall use of artemisinin based drugs was only 18.2%, in addition the pattern of anti malarial drug prescription in most cases did not meet the recommended guidelines[18, 20]. At Garissa PGH the use of artesunate in treatment of severe malaria was only 2(10.4%) while Quinine was 15(88.4%). The lack of proper drug prescription may result in the emergence of quinine resistant strains.

Comparison of malarial severity vis a vi administration of proper anti malarial was significant with P=0.001.uncomlicated malaria was treated as severe in 69(89.7%) of cases. Severe malaria was treated as such in 20(100%). Majority 9(52.9%) of the health care workers (HCW) interviewed had received post basic training in paediatrics. They were mainly nurses 9(52.9%) stationed in the paediatric ward. The HCW were confident that they could utilise the guidelines with 78% of the opinion that children should be managed as per these guidelines. They also felt that the hospital did not advocate for the use of the said guidelines, yet a prior baseline survey indicated the display of charts outlining the guidelines within the service areas of the hospital. The results indicate that the HCW didn't always have the job aids at hand as such reducing their utility.

The strengths of this study appropriate assessment of malaria and classification. Patients with a fever and altered level of consciousness had a malaria parasite slide done. The health care workers has apt knowledge on the drug dosages.

With 54% of the health care workers not expecting their colleagues to use the guidelines there is no sense of accountability in uniformity of care given. Wasunna et al found that despite introduction of efficacious artemisinin based combination therapy in the public health sector in Kenya having great potential it may not be realised if prescription practices do not conform to the recommended treatment guidelines[8]. They recommended high quality training, constant drug supply and supervision working synergistically to ensure appropriate case management and in turn improve the quality of care.'

13. STUDY LIMITATIONS

1. .Poor documentation in the medical files as the HCW didn't use a standard admission form as such clinical assessment details were left out. This affected the results on adherence.

2. The study was dependent on attainment of informed consent from the HCW.

14. CONCLUSION

1. Only 25.3% of patients were managed as per the guidelines. Guidelines were available but not utilised.

2. Barriers to optimum management of malaria.

- Lack of supervision on utilisation of guidelines.

- Poor documentation.

- A negative attitude with little motivation towards utilisation of guidelines by the staff.

15. RECOMMENDATIONS

1. Training of the HCW in ETAT+ to reinforce the malaria guidelines. During this course, pocket friendly job aids would be availed.

2. Teamwork and accountability among HCW on guideline utilization, allowing them own the successes of their work.

3. Support supervision by senior colleagues.

4. Adaptation of a standardized form for documentation of all signs and interventions made.

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24. Kenya National Malaria Strategy (2009-2017)

APPENDICE

Appendix 1: Study Schedule & Budget

Number	Activity	Estimated Time
1	Proposal Development and Presentation	Dec. 2011 to Jan 2012
2	Submission of proposal for ethical approval	Feb 2012
3	Pretesting and Seeking permissions	March 2012
4	Data Collection	March to May 2012
5	Data Analysis	June 2012
6	Thesis writing	July 2012
7	Thesis publication	August 2012

BUDGET

	Activity	Units	Unit Cost (KShs)	Total (KShs)
Proposal Development	Printing drafts	1000 pages	5	5,000
	Proposal Copies	8 copies	500	4,000
Data Collection	Stationery Packs (Pens, Paper and study Definitions)	10	100	1000
	Training research assistants	1 day	1000	1, 000
	Research assistants (2)	12 weeks	1000 X 2	24, 000
Data Analysis	Statistician	1		20,000
Thesis Write Up	Computer Services			5,000
	Printing drafts	1000 pages	5	5,000
	Printing Thesis	10 copies	500	5,000
Contingency funds				20,000
Total				**90,000**

Appendix 2:Malaria Treatment

Treatment of uncomplicated falciparum malaria

1.3.1 First line treatment in Children

Table 1: Dosing schedule for artemether-lumefantrine

Weight in kg	Age in years	Number of tablets per dose					
		Day 1		Day 2		Day 3	
		1st dose	8 hours	24 hours	36 hours	48 hours	60 hours
5 – 14	5 months ≤ 3years	1	1	1	1	1	1
15 – 24	3 - 7years	2	2	2	2	2	2
25 – 34	8 - 11years	3	3	3	3	3	3
above 34	≥ 12 years	4	4	4	4	4	4

1.3.2 Second line treatment in Children below 16 Years

The recommended second line treatment for uncomplicated malaria in Kenya is dihydroartemisinin-piperaquine (DHA-PPQ). This is currently available as a fixed-dose combination.

Age in years	Number of tablets to be administered on Day 1 at 0 hours	Number of tablets to be administered on Day 2 at 24 hours	Number of tablets to be administered on Day 3 at 48 hours
3 months < 3 years	1 paediatric tablet	1 paediatric tablet	1 paediatric tablet
3 - 5 years	2 paediatric tablets	2 paediatric tablets	2 paediatric tablets
6 - 11 years	1 adult tablet	1 adult tablet	1 adult tablet
12 - 16 years	2 adult tablets	2 adult tablets	2 adult tablets

Table 2: Dosing schedule for dihydroartemisinin-piperaquine

2.1 A dministration of Parenteral Artemisinins

Injectable artemisinins may also be used for management of severe malaria.

Artesunate

Artesunate is administered at 2.4 mg/kg stat by slow intravenous injection then 1.2 mg/kg/at 12 hrs and 24 hrs then 1.2mg/kg daily until the patient is able to tolerate oral medications. Artesunate can be given IM at the same dosage and intervals. Thereafter a complete course of artemether-lumefantrine (AL) is given.

Artemether

Artemether is administered by the intramuscular route at a loading dose of 3.2 mg/kg IM stat then 1.6 mg/kg/IM daily until the patient is able to tolerate oral medications. Thereafter a complete course of artemether-lumefantrine is given.

2.2 Supportive Treatment

Supportive treatment is crucial in reducing the high mortality associated with severe malaria.

2.3 Administration of Parenteral Artemisinins

A start dose of 3.2 mg/kg of artemether solution by the intramuscular route to the anterior thigh should be administered.

Artesunate is administered as a start dose of 2.4 mg/kg of by the intramuscular route to the anterior thigh.

Table 3: Rectal artesunate for pre-referral treatment in children

Weight (kg)	Age	Artesunate dose (mg)	Single dose regimen
5 - 8.9	0 - 12 months	50	One 50 mg suppository
9 – 19	13 - 42 months	100	One 100 mg suppository
20 – 29	43 - 60 months	200	Two 100 mg suppositories
30 – 39	6 - 13 years	300	Three 100 mg suppositories

Appendix 3: INFORMED CONSENT

I am Dr. Maureen Muriithi, a postgraduate student pursuing a Masters degree in Paediatrics and Child health at the University of Nairobi. I am carrying out a study as part of the requirements for my course. My objective is to determine the proportion of children being managed for malaria as per the National Malaria guidelines 2010.

My Supervisors, lecturers at the Department of Paediatrics and Child Health at the University of Nairobi are**:**

1. Professor E. Wafula
2. Dr. A. Laving

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 that will guide your enrolment as a study participant:

1. Participation in this study is voluntary, you may withdraw from the study at any time with no consequences for your decision to withdraw.
2. Any information you provide will be treated as confidential.
3. The study protocol has been reviewed and approved by Kenyatta National Hospital/University Of Nairobi Ethics Research Committee. This protocol can be availed to you should you be interested in the study details.
4. I will be available to answer any questions that will help you to understand the nature of the study.

Procedure: I will inform you of the study being performed and seek an informed conscent. Once granted I will administer a questionnaire and ask you to complete it. This should take approximately 10 to 15 minutes to complete. I will be available to guide you through the questionnaire.

Benefit: There are no direct personal benefits for participating in this study. At the end of this study I will provide you with a copy of the GOK Paediatric

Protocols. I will also avail to you the findings of the study to allow you to improve the quality of care at Garissa PGH.

If you need to seek clarification,you can contact me,

Dr. Maureen Muriithi TEL: 0721783308.

My supervisors can be contacted at the following address:

Prof. E. Wafula TEL: 020-2711819, 2711906

Dr. A. Laving TEL: 020 – 2378994

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CONSENT FORM:PARTICIPANT'S STATEMENT

I _____ having received adequate information regarding the study research, risks, benefits hereby AGREE / DISAGREE (Cross out as appropriate) to participate in the study. I understand that my participation is fully voluntary and that I am free to withdraw at any time. I have been given adequate opportunity to ask questions and seek clarification on the study and these have been addressed satisfactorily.

Health provider's Signature:_____Date_____

I _____ declare that I have adequately explained to the above participant, the study procedure, risks, benefits and given him / her time to ask questions and seek clarification regarding the study. I have answered all the questions raised to the best of my ability.

Interviewers Signature_____Date_____

Appendix 4: Questionnaire & Data Retrieval Form

1. In which department do you provide health services?

   a. Paediatric ward   **b. Paediatric Clinic**

   c. MCH clinic   **d. OPD other**

2. What level of medical training have you undergone?

   ❑ **Clinical officer (CO)**

   ❑ **Medical officer (MBChB)**

   ❑ **Enrolled nurse (KEN/KECHN)**

   ❑ **Registered nurse (KRN/KRCHN)**

   ❑ **Other _____specify.**

3. Have you undergone any other post basic training?

a. Yes   b. No   c. Unsure

If yes, which one?

a. Advanced Diploma   b. ETAT +

c. Masters in Medicine   d. Short courses specify……………

4. Have you received any education regarding management of malaria over the last one year?

   a. **Yes   b. No   c. Unsure**

5. Are you aware of the National GOK Malaria guidelines 2010?

   a. Yes   b. No   c. Unsure

6. Have you had any training on the GOK Malaria Paediatric guidelines?

   a. **Yes   b. No**

7. Do you use charts or job aids on the GOK Malaria guidelines availed in the hospital?

   a. **Yes   b. No**

8. Have you managed a child with malaria under five years?

   a. **Yes   b. No   c. Unsure**

9. When treating a 10kg child with very severe malaria first line treatment according to the GOK paediatric protocol would be?

a. **Quinine loading at 20mg/kg then 10mg/kg 8 hourly**

b. **AL one tablet twice a day for 3 days**

c. **Quinine at 10mg/kg 8 hourly**

d.**Metakelfin one tablet 12 hourly**

Please fill in appropriate response: 1. Strongly Agree   2. Agree

3. Neutral/ not sure   4. Disagree   5. Strongly Disagree

		5	4	3	2	1
10.	**I manage malaria according to the set GOK guidelines.**					
11.	**Utilisation of GOK guidelines on malaria is;** **Good** **Satisfactory** **Beneficial** **Mandatory** **Optional**					
12.	**Most of my professional colleagues use the GOK guidelines for malaria management.**					
13.	**Most of my professional colleagues expect me to use the GOK guidelines on the management of malaria.**					
14..	**Children under five years diagnosed with malaria are prescribed treatment consistent with the guidelines**					
15.	**I am confident I can use the GOK guidelines on the management of malaria**					

16.	The use of GOK guidelines makes malaria management easier.					
17.	The GOK malaria guidelines are in use in the hospital					
18.	The hospital encourages the use of the GoK guidelines.					
19.	I always have the guidelines at hand (flow charts, job aids).					

20. Do you always use the malaria GOK guidelines? If no, why?

DATA RETRIVAL FORM

Study identification no:.........................Department.....................

Age of the child...........yrs   **Weight...........kg**

M......F......

Diagnosis...

Hospital stay.........................Date of admission.......................

Outcome: date of discharge.......................date of death............................

Clinical Assesment

- **Fever (Temp above 37.5C)**

     A. Yes   B. No

- **Conscious level (circle appropriate response)**

         A   V   P   U

- **Able to drink**   **A. Yes   B. No**
- **Respiratory Distress**   **A. Yes   B. No**
- **Anaemia**   **A. Present   B. Absent**
- **Other obvious causes of fever eliminated   A. Yes   B. No**
- **Hypoglycemia   A. Yes   B. No**
- **MPS/RDT   A. Positive   B. Negative**
- **Haemoglobin level   ....g/dl**
- **Severity of malaria**

  A. Uncomplicated Malaria   B. Severe Malaria   C. Not recorded

- **Treatment instituted:..**

..

- **Correct dosage   A. Yes   B. No**
- **Follow up   A. Yes   B. No**