THE BURDEN, CLINICAL CHARACTERISTICS AND OUTCOMES OF CHILDREN READMITTED TO THE PAEDIATRIC WARDS AT MOI TEACHING AND REFERRAL HOSPITAL, ELDORET, KENYA.

Annah Nyaboke Gisira

SM/PGCHP/09/13

Thesis submitted to the School of Medicine in Partial Fulfilment for the Award of the degree of Masters of Medicine in Child Health and Paediatrics, Moi University.

2017

DECLARATION

Student's declaration

This thesis is my original work done in partial fulfillment of the requirements for the award of the degree of Masters of Medicine in Child Health and Paediatrics at Moi University.

Dr. Annah Nyaboke Gisira

SM/PGCHP/09/13

Sign…………………………….... Date…………………………………

<u>Supervisors' declaration</u>

This thesis has been submitted for examination with our approval as Moi University Supervisors.

Dr. Paul Kiptoon, MBCHB, MMed (Paeds)

Lecturer

Department of Child Health and Paediatrics

Moi University

Sign.. Date..

Dr Irene Marete, MBCHB, MMed (Paeds)

Senior Lecturer

Department of Child Health and Paediatrics

Moi University

Sign...Date..

DEDICATION

I dedicate this work to Stephanie and Stacy who have given me a reason to smile amid

life's tempest storms.

ABSTRACT

Background: Readmission rate has been used as a measure of the quality of service offered in hospitals during preceding admissions. Some countries have put up measures to reduce excess readmissions. Readmissions occurring too soon after discharge are more likely to be avoidable. It has been documented that savings could be made by reducing potentially avoidable readmissions. Congestion at the paediatric wards in Moi Teaching and Referral Hospital (MTRH) would be improved by reducing these readmissions. This study describes the characteristics of these children in an attempt to identify the group at risk of being readmitted.

Objectives: To determine the burden of readmission, clinical characteristics and outcomes of children readmitted to the paediatric wards at MTRH, Eldoret.

Methods: This was a census conducted in the paediatric wards at MTRH between May 2015 and January 2016. The study population included all the children readmitted within 30 days of discharge from MTRH paediatric wards. Children with planned admissions were excluded. Data on socio-demographics and clinical characteristics was collected using a structured data collection form and analysed using STATA version 13. Categorical variables were summarised as frequencies and percentages while continuous variables were summarised as mean or median and the corresponding inter quartile range. Kruskal Wallis Test was used to test for association between age, sex, insurance, duration from discharge and diagnosis at readmission with the length of hospital stay. A p value < 0.05 was considered statistically significant.

Results: During the study period 3067 children were discharged home and 130 of them were readmitted within 30 days of discharge making the readmission rate 4.2%. The females were 53.8%. Eighty seven percent of the children readmitted were in the age categories of less than 1 year and above 5 years. About 29% were readmitted within 7 days of discharge. Majority of the readmitted patients had pneumonia at 18.5%. Among the readmitted children below 5 years of age, 29.5% had severe acute malnutrition. Sixty seven percent of the readmitted children had an underlying chronic illness with congenital heart disease being the commonest at 16%. The median length of hospital stay was 7.5 (5-13) days. Mortality rate among the readmissions was 1.5%. Age, sex, medical insurance, duration from discharge and diagnosis at readmission was not significantly associated with the length of hospital stay.

Conclusion: The readmission and mortality rates are low among children readmitted in the paediatrics wards at MTRH. Majority of the readmitted children at MTRH had pneumonia and underlying chronic illness.

Recommendation: Children with pneumonia and those with chronic diseases should be followed up closely. We recommend a study to look at children who may die at home or are readmitted to other facilities after discharge from MTRH paediatric wards.

TABLE OF CONTENTS

LIST OF TABLES

LEGEND FOR FIGURES

ACKNOWLEDGEMENT

I thank the Almighty God for bringing me this far. I thank the dean School of medicine Moi University for the chance accorded to me to pursue this course. I am greatly indebted to my supervisors Dr. Kiptoon and Dr. Marete for their guidance and support through the whole process of proposal formulation, collection of data and thesis writing. I thank Dr Ann Mwangi for her guidance through data analysis and 1 acknowledge the faculty and staff in the Department of Child Health and Paediatrics for the knowledge imparted to me during my years of study. Special thanks to both my fellow registrars in the department of Paediatrics for their moral support and the study participants without whom this study would not have been possible. I finally thank the Ministry of Health for sponsoring my studies and giving me a paid study leave and my family for according me the moral support I needed through the period.

ABBREVIATIONS

BMI   Body Mass Index

CHD   Congenital Heart Defect

DM   Diabetes Mellitus

HIV   Human Immunodeficiency Syndrome

ICU   Intensive Care Unit

IREC   Institutional Research and Ethics Committee

KHHEUS   Kenya Household Health Expenditure and Utilisation Survey

LOS   Length of Hospital Stay

LRTI   Lower Respiratory Tract Infection

MUAC   Mid Upper Arm Circumference

MTRH   Moi Teaching and Referral Hospital

NHIF   National Hospital Insurance Fund

PI   Principal investigator

RHD   Rheumatic Heart Disease

RSV   Respiratory Syncytial Virus

SCD   Sickle Cell Disease

URTI   Upper Respiratory Tract Infection

OPERATIONAL DEFINITIONS

Readmission: Any child admitted in the first 30 days post-discharge from MTRH paediatric wards.

Previous admission: The immediate preceding admission in a child readmitted within 30 days of discharge from MTRH paediatric wards.

Planned readmission: This is when on discharge, a patient is given a set date for readmission to hospital for review and treatment. This is mainly seen in the oncology wards where children with cancer are readmitted severally on scheduled days to receive chemotherapy.

Hospital outcome: Discharge home, death, length of hospital stay.

CHAPTER ONE: INTRODUCTION

1.1 Background

There is no internationally agreed upon definition of readmission. According to Rumball and Hider (2009), readmission rate may be defined as the number of patients who experience unintended, acute readmission or death within 30 days of discharge from the index admission, divided by the total number of patients discharged alive within that period. Majority of researchers have used admission within 30 days from the previous discharge to define readmission Berry et al (2013) whereas others have used as few as 3 days from discharge Puttha, Sampath, Thalava and Burns (2012) to as long as one year after discharge Feudtner et al. (2009).

Readmissions within 30 days of discharge are more likely to be related to the previous admission compared to readmissions that occur several days after discharge. Puttha et al. (2012) found 74% of acute paediatric medical readmissions were related to the initial diagnosis.

Readmissions are common and vary from hospital to hospital. Berry et al (2013) analyzed 72 hospitals in the United States over 1 year and found the rate of unplanned readmission at 30 days was 6.5% and it varied across conditions and hospitals. Stanley, Graham, and Parrish (2008) in a review of internal medicine readmission in a peri-urban South African hospital found a readmission rate of 8.5% among the adult medical patients. Here in Kenya, Snow et al. (2000) in a study on paediatric survival and readmission risks following hospitalization on the Kenyan Coast found a readmission rate of 9% within 3 months of discharge from hospital.

A proportion of readmission has been found to be avoidable. According to Hain et al. (2012), 20% of the readmissions are potentially avoidable. They did a chart review

on 200 randomly selected readmissions occurring within 15 days on a freestanding children's hospital in the United States.

Readmission rate has been used as a measure of the quality of service offered in hospitals. Sub-standard care may result in higher readmission rates. Rumball and Hider (2009) found readmission rate to be a valuable indicator of the quality of care received because of its ease of collection and its ability to be combined with other variables while acknowledging it may be prone to confounders. Ashton, Kykendall, Johnson, Wray and Wu (1995) in a meta-analysis of the evidence of association between the quality of inpatient care and readmissions, found an increased readmission rate of 55% for those who experienced lower quality of care. This was done in adults readmitted to both surgical and medical wards. Hospitals offering high quality services are expected to have lower readmission rates.

Different diseases are associated with different readmission rates. Chronic diseases and increasing severity of the illness are associated with higher readmission rates. In a retrospective cohort analysis of children admitted to 37 Children's hospitals in the United States, Berry et al. (2011) found a positive correlation between the rate of readmission and the prevalence of complex chronic conditions. Having an underlying chronic condition would therefore increase the chance of being readmitted. Berry et al (2013) found the most prevalent readmissions were due to anaemia and neutropenia, ventricular shunt, sickle cell disease, seizure disorders and asthma.

There are very few published studies on paediatric readmissions. Majority of the studies on readmission were carried out in the adult population. Initial paediatric readmission studies focussed on specific diseases for example diabetes mellitus, asthma and sickle cell disease. Kwee et al (2012) focussed on paediatric patients with

Diabetes Mellitus while Mitchelle, Bland and Thompson (1994) focussed on readmission in children with asthma.

Published studies on paediatric readmissions are mainly in the West. There are no local studies looking at the characteristics of the children who are readmitted. Such studies would enable clinicians and institutions understand the risk factors for readmission and therefore develop mitigating strategies. Reducing avoidable readmission would in turn reduce competition for available limited hospital supplies like oxygen, bed space in both the general wards and intensive care units (ICU).

There is paucity of data on the outcomes of children who are readmitted to hospital. Majority of researchers focus on the rate and clinical characteristics with little being mentioned on the outcomes of readmitted children.

1.2 Problem statement

Congestion in the paediatric wards at MTRH is a recognized problem. Statistics from the records department in MTRH show the average bed occupancy to be as high as 140%. Avoidable readmissions in this setting will complicate the problem even further. This congestion can be reduced by preventing avoidable readmissions and ensuring quality care is given to patients.

According to Jencks, Williams, and Coleman (2009) in a study on rehospitalisation among patients in the Medicare-fee-for service programme in the US, the cost of unplanned readmission is quite expensive, it accounted for $ 17.4 billion in 2004. Health care is expensive in our country especially for those who do not have any medical cover. We have a national medical cover, NHIF but only a few people are enrolled. According to Kenya Household Health Expenditure and Utilisation Survey, 2013 (KHHEUS) only 17.% of Kenyans have a medical insurance cover. From the

same survey, the cost of inpatient admission was 13.7 billion. Savings to both the insurance payers and parents would be accrued if measures were put in place to reduce the potentially avoidable readmissions.

There are children who are often readmitted too soon after discharge from the paediatric wards at MTRH but there is no analyzed data giving us the proportion of these children, their clinical characteristics and outcomes.

1.3 Justification

Studies have shown that a proportion of readmissions are potentially avoidable. According to Hain et al. (2012), 20% of the readmissions are potentially avoidable. They did a chart review on 200 randomly selected readmissions occurring within 15 days on a freestanding children's hospital in the United States. Measures can therefore be put in place to avoid these readmissions.

Describing the characteristic of these children will help identify the group at risk and therefore targeted measures can be put in place to reduce the number of readmissions. Such measures include educating caregivers and close follow up after discharge. The information obtained from this study will help guide the clinicians in ensuring the group at risk of readmission is closely followed up with proper discharge care plans and instructions given to the caregivers.

In Kenya where health care is already expensive and majority of the patients pay from their pockets, reducing unnecessary readmissions would result in great savings for the parents and healthcare system as a whole.

Information on the pattern of readmission could be used by the policy makers in MTRH to improve the quality of services and prevent potentially avoidable

readmissions in the patients at risk of being readmitted. The information may help develop policies on discharge plans for high risk patients.

No study has been done to characterize readmissions in the paediatric ward at MTRH which is a referral centre for the whole of Western Kenya. This study attempts to bridge this knowledge gap.

1.4 Research question

What is the burden, clinical characteristics and outcomes of children readmitted in the paediatric wards at MTRH?

1.5 Objectives

1.5.1 Broad objective

To determine the burden, clinical characteristics and hospital outcomes of children readmitted to the paediatric wards of MTRH.

1.5.2 Specific objectives

1. To determine the proportion of children readmitted within 30 days to the paediatric wards at MTRH.

2. To describe the clinical and socio-demographic characteristics of children readmitted within 30 days to the paediatric wards at MTRH.

3. To describe the hospital outcomes of children readmitted within 30 days to the paediatric wards at MTRH.

CHAPTER TWO: LITERATURE REVIEW

2.1Definition of Readmission

Readmission is hospitalisation to the same hospital within a period of time after a previous discharge. There is no international agreed upon definition of readmission. In a review of literature on readmission rate, Rumball and Hider (2009) defined readmission as the number of patients who experienced unintended, acute readmission or death within 30 days of discharge from the index admission. This definition includes patients who die at home after discharge from hospital. This is because, had they not died at home they would likely have been readmitted to hospital. Majority of researchers have used admissions within 30 days from the previous discharge to define readmission Rumball and Hider (2009); Berry et al (2013) whereas others have used as few as 3 days from discharge Puttha et al (2012) to as long as one year after discharge Feudtner et al. (2009).

Readmission rate is the number of patients who experience unintended, acute readmission or death within 30 days of discharge from the index admission divided by the total number of patients discharged alive within that period according to a recommendation of its definition by Rumball and Hider (2009).

Readmission within 30 days of discharge is more likely to be related to the care received during the previous admission compared to readmissions that occur several days after discharge. Studies on the patterns of readmission reveal that most readmissions occur within the first few days after discharge from hospital. Gay, Hain, Grantham and Saville (2011), in a study on the epidemiology of 15 day readmission to a Children's Hospital in the United States, found that 59.5 % of the readmissions occurred within 7 days of discharge. This increases the possibility of readmissions being related to the care received in the previous admission. Puttha et al (2012) found

that 74% of acute paediatric medical readmissions were related to the initial diagnosis. These were readmissions that occurred within 72 hrs of discharge at a standard district general hospital in the United Kingdom. This indicates that readmissions occurring too soon after discharge are more likely to be related to the initial diagnosis and hence the quality of care received. Majority of researchers use readmissions within 30 days as they are likely to be related to the previous diagnosis and hence likely to be potentially avoidable. Those readmissions that occur several days after admission are less likely to be related to the care received during the previous admission and are therefore less likely to be preventable.

Readmission may be planned or unplanned. Planned admissions is where the patient is given a return date on discharge to come back for continued care. This is mainly seen in children with malignancies who are readmitted severally on scheduled days for chemotherapy.

2.2 Burden

Readmissions are common and vary from hospital to hospital. Berry et al. (2013) in study on paediatric readmission and variability across hospitals by in the United States, found a 30 day unplanned readmission mean prevalence of 6.5%, with a range of 4.5% - 8.5%. The readmission rate varied across hospitals and conditions. This was an analysis of admissions data at 72 children's hospitals in United States over a 1 year period. Feudtner et al. (2009) found that 16.7% of patients aged 2 − 18 years were readmitted within 365 days. They analyzed data collected from 38 children hospitals in the United States for the years 2003- 2005. This higher readmission may have been due to the longer time period of 1 year used in this study. In a study on the epidemiology of 15 day readmission to a children's hospital, Gay et al. (2011) found a

15 day readmission rate of 8.4%. This was a retrospective study done over 1 year in a Children's hospital in the United States.

In Africa, Stanley et al (2008) in a review of internal medicine readmission in a peri-urban South African hospital found a readmission rate of 8.5% among the adult medical patients.

In Kenya, Moisi et al. (2011) did a retrospective cohort analysis of data of children aged less than 15 years discharged from Kilifi District Hospital between January 2004 and December 2008. In the study, they found a readmission incidence of 23.3: 1000. According to Snow et al (2000) on paediatric survival readmission risks following hospitalization on the Kenyan Coast, approximately 9% of children are readmitted within 3 months of discharge from Kilifi District Hospital. The study involved a cohort of 4000 children who were followed up for approximately 6years.

Studies have been done to look at the proportion of readmissions that are potentially avoidable. Puttha et al. (2012) found 74% of acute paediatric medical readmissions were related to the initial diagnosis, making them potentially avoidable with only 18% of those readmissions being unavoidable. The study was done in a standard district general hospital in United Kingdom and it focussed on children readmitted within 72hours of discharge between 1st May and 30th June 2011.

Hain et al. (2013) in a study on preventability of early readmission occurring within 15 days of discharge, found that 20% of the readmissions were potentially avoidable. This was a retrospective chart review of 200 randomly selected readmissions, occurring within 15 days of discharge from a free standing children's hospital between January 1, 2007 and December 31, 2008. The degree of preventability was

assessed independently for each case by 4 paediatricians using a 5 point likert scale and was correlated with chronic conditions and reasons for admission.

2.3 Demographic characteristics

Gay et al. (2010) observed that the age group with the most number of readmissions were infants aged 31- 365 days making up 20.8% of the readmissions and those above 10 years making up 31.3% of the total readmissions. The average age of patients on the index admission was 6.5 years while 54.5% were male. Berry et al. (2013) similarly found that younger children were more likely to experience unplanned readmissions. Unlike Gay et al. (2010), the mean age at readmission was 9.2 years in a study by Feudtner et al (2009) who also found a similar male predominance at 54.4%.

2.4 Clinical characteristics

Berry et al. (2011) in a study on Hospital utilization and characteristics of children experiencing recurrent readmissions within children's hospital found that as readmission frequency increased, there was an increase in percentage of patients with one or more chronic complex condition. The complex chronic conditions prevalent were neuromuscular at 39.6%, malignancy at 22.4%, and cardiovascular at 20.1%. Among the acute conditions, asthma was the most prevalent at 3.8%, pneumonia at 2.8% and seizures at 2.2%. The organ system most involved was blood and immunological system then followed by respiratory system, central nervous system and renal system. Majority of children readmitted had assisted medical technology like tracheostomy and cerebral spinal fluid shunts. Malfunction of those devices led to frequent readmissions.

Berry et al. (2013) found that a third of all readmissions had at least one chronic condition. The most prevalent ten readmissions were due to anaemia and neutropenia

at 22.5% ventricular shunt at 18%, sickle cell disease at 16.9% then seizure disorders and asthma. The others were gastroenteritis, upper respiratory tract infections, pneumonia, appendicectomy and bronchiolitis.

Gay et al. (2010) found that majority (78 %) of the children readmitted to a children's hospital in United States had an underlying chronic illness. Children who had malignancy and neurological conditions, experienced the greatest number of readmissions. Majority (77.1%) of readmissions occurred after an initial stay of < 7 days. However, Puttha et al. (2012) observed that 93% of the children readmitted within 3 days of discharge had acute illnesses like gastroenteritis, respiratory tract infections and head injury.

2.5 Risk factors for readmissions

Munywoki et al. (2013) in a study on severe lower respiratory tract infections in early infancy and pneumonia hospitalization among children in Kenya found elevated incidence of readmissions for pneumonia among children admitted as infants for lower respiratory tract infection (LRTI) with or without Respiratory Syncytial Virus (RSV) diagnosis, compared to children admitted as infants for a non LRTI condition.

According to Berry et al. (2011) complex chronic health condition, black race and medical insurance cover were risk factors for readmissions to 37 children hospitals in the United States.

Hain et al. (2012) in a study on preventability of early readmissions, observed that lack of social economic resources and access to primary care resulted in readmissions. The readmissions were also influenced by the characteristics of the paediatric patients and their illnesses.

Kwe et al. (2012) found that female diabetic adolescents aged 13-14 years had a higher risk for readmission due to peer pressure, risk taking behaviour and a desire to be normal like their peers.

Mitchel, Bland, and Thompson (1994) in a study on risk factors for readmission to hospital for asthma in childhood, found out that the risk factors for readmissions were related to the characteristics of the individual. This included their age, sex, severity of the condition and number of previous admissions.

McMillan (2013) in an article on readmission in children with sickle cell disease, found increased age at admission, greater use of hospital resource in the previous 12 months and higher admission and discharge pain scores as risk factors for readmission among children with sickle cell disease admitted with painful crisis.

2.6 Cost of readmission

In the United States, a study on rehospitalisation among patients in the Medicare fee-for service program reported a readmission rate of 19.6% at an estimated cost of US$ 17.4 billion. (Jencks et al. 2009).

Berry et al. (2011) found a small cohort of recurrently readmitted paediatric patients as a major contributor to inpatient utilization and expenditure. A quarter of all inpatient bed days and charges were attributable to 3% of the recurrently readmitted patients.

Hospitalizations are expensive in Kenya and unplanned readmissions will contribute to this cost. Majority of Kenyans do not have medical insurance covers and they are therefore forced to pay out of their pockets whenever a family member is sick and requires admission to hospital. In a survey done by the Ministry of Health (KHHEUS,

2013), only about 17.1% of Kenyans had medical insurance cover while the annual expenditure on inpatient care was 13.7 billion. This makes hospitalisations very expensive especially for those patients who pay cash. Reducing avoidable admissions would result in great savings for the parents who are cash payers.

2.7 Outcome

There is paucity of data on the outcomes of children who are readmitted to hospital. Majority of researchers focus on the rate and clinical characteristics with little being mentioned on the outcomes of readmitted children. Among the children who were readmitted, in a retrospective multicenter study by Feudtner et al (2009) in the United States, 0.6% of them died during the admission. Gay et al. (2010) found the average length of stay for the index admission to be 7.6 days in a study on children readmitted to a children's hospital in United States. Hain (2012) found a median length of stay of 3.0 (2.0-7.0) among readmitted children who were randomly selected for review in a children's hospital in the United States.

CHAPTER THREE: METHODOLOGY

3.1 Study site

This study was conducted in the paediatric wards at MTRH which is located in Eldoret town along Nandi road in Uasin Gishu County, Kenya. It is about 300km from Nairobi. Uasin Gishu county is mainly an agricultural region with both large scale and small scale farming. MTRH is the second National Referral Hospital after Kenyatta National Hospital. The hospital is a 800 bed capacity tertiary hospital that serves institutions around Eldoret town. It also serves as a referral hospital for the western part of Kenya, with a catchment population of about 13 million people. The hospital provides various services ranging from primary to specialized care and serves urban and rural populations from near and far counties. It is a teaching hospital providing a learning environment for doctors, nurses, clinical officers and other health care professionals. It is associated with Moi University School of Medicine which is located at the hospital.

The paediatric unit has a capacity of 72 beds. It has 5 wards namely; Tumaini firm I, Tumaini firm II, Upendo firm I, Upendo firm II and Paediatric Oncology ward. Each ward except the oncology ward admits every fourth day. The study was conducted in the 4 paediatric wards, excluding the oncology ward. The staff allocated to the paediatric unit include; paediatricians, resident doctors (paediatricians in training), medical officer interns, nurses, nutritionists and data clerks.

Approximately 400 children are admitted to the paediatric wards every month. This constitutes patients referred from other facilities and those who come straight to the sick child clinic from home. The admissions are either new or readmissions. Among the readmission there are those readmitted within 30 days of discharge and those readmitted more than 30 days after discharge. This study focussed on those

readmitted within 30 days of discharge. This is because these readmissions are more likely to be related to the previous diagnosis and care received and hence are potentially avoidable. The average bed occupancy may go up to 140% with an estimated length of stay of 7 days.

3.2 Study Population

The study population consisted of all children readmitted within 30 days to the paediatric wards of MTRH.

3.3 Study Design

A census was carried out of children readmitted within 30 days of discharge from MTRH paediatric wards. The readmitted children were followed up till discharge home or death.

3.4 Study period

May 2015 to January 2016.

This included both wet and dry seasons and therefore readmissions at different seasons of the year were analyzed.

3.5 Eligibility

3.5.1 Inclusion Criteria

1. Children readmitted to the paediatric wards of MTRH within 30 days of discharge.
2. Preceding discharge from the paediatric wards of MTRH

3.5.2 Exclusion criteria

1. Children with planned readmission.

3.6 Study Procedure

The health care workers in the paediatric wards were sensitized about the study. One research assistant who is a clinical officer was recruited and trained on the study procedure. He was trained on who to include or exclude from the study, data collection, taking the weight and measuring the mid upper arm circumference (MUAC). The supervisors guided the Principal investigator (PI) through the procedure. Data was collected using a pretested structured questionnaire. The staff in the paediatric wards alerted both the PI and research assistant when a child was readmitted to their wards. The trained research assistant went through the admission register in the admitting paediatric wards and identified the new patients daily. He then went through the files of the new admissions and identified the readmitted patients. He then informed the PI when he found children who met the inclusion criteria. The children were recruited by both the PI and the research assistant after obtaining consent from their parents or guardians and assent from children above 7 years. The PI and research assistant interviewed the parents/ guardians and collected data in a structured questionnaire. Additional information when needed was collected from the patient's file. A record of patients discharged home between May and December 2016 was obtained from the admission record book in the paediatric wards to be used as the denominator. Recruitment into the study was done between May 2015 and January 2016 to allow an extra month follow up for all the patients discharged home. The questionnaire contained questions on socio demographic characteristics, type of medical insurance, maternal characteristics and discharge diagnosis. The diagnosis on the previous admission and readmission period was derived from the final diagnosis on the discharge summary as determined by the attending clinician. The children's heights were measured using either a standard

stadiometer or a length/height board and recorded on the questionnaire. The weights of the children were measured using a scientific calibrated weighing scale and recorded. The left MUAC was taken for children below 5 years but more than 6 months and recorded. The Body mass index (BMI) for children above 5 years was calculated by the PI. The PI derived the WH Z score from the WHO chart. The children were then followed up till death or discharge home and the length of stay determined.

3.7 Data Management and Statistical Analysis

The data collected was entered into a Microsoft Access database using double entry to ensure completeness and accuracy after it had been cleaned. Data was exported to STATA version 13 for analysis at 95% confidence interval. Data was stored on password protected computer with back up on write protected flash disk. Children readmitted several times during the study period were analyzed once using data on the first readmission. Socio-demographic and clinical profiles of the study participants were summarized using descriptive statistics. Categorical variables were summarized as frequencies and percentages while the continuous variables were summarized as mean and standard deviation or median and the corresponding inter quartile range. Data was presented using table and bar graphs. Kruskal Wallis Test was used to test for association between age, sex, insurance, diagnosis at readmission, duration before discharge and the LOS. A p value < 0.05 was considered statistically significant.

3.8 Study Limitations

Patients readmitted to hospital within 30 days of discharge but died while being attended to at the sick child clinic (paediatric accident and emergency) were never captured in the study. This is because the study was site was based at the paediatric wards.

3.9 Ethical Consideration

The study was approved by the Institutional Research and Ethics Committee (IREC) of Moi University College of Health Sciences. The MTRH hospital director gave us permission to carry out the study in the hospital. Written informed consent, from the parents/guardian and assent for children above 7 years was obtained before data collection. There was no additional risk to the study subjects. No incentive was given to the study participants. Information was provided in appropriate language. Information obtained was kept confidential. Results of this study will be presented to the administration in MTRH, in conferences to peers and in published journals.

CHAPTER FOUR: RESULTS

4.1 Readmission rate

A total of 3067 patients were discharged home. One hundred and thirty out of the 3067 patients discharged home were readmitted within 30 days to the paediatric ward at MTRH. The proportion of children readmitted during the study period was 4.2%.

4.2 Socio-Demographic characteristics.

Out of the 130 children readmitted within 30 days, males were 60 (46.2%) while females were 70 (53.8%). The infants constituted 37% of the children readmitted. The children readmitted mostly came from Uasin Gishu County (57.7%).   A third of the children, 30% came from households where the head was in formal employment. The study participants' mothers who had attained post primary level of education were (63.9%). Households with medical insurance cover among the readmitted children were (55.3%). (Table 1).

Table 1: Socio-Demographic characteristics of the study participants

Variable	n=130	Median (IQR)/ Frequency n(%)
Sex [n(%)]		
Male		60 (46.2)
Female		70 (53.8)
Age in months		51.50 (12, 120)
Age in categories [n(%)]		
<12 month		48(37)
12 to 60 months		17(13)
>60 months		65(50)
Birth order		3(1,4)
Residence [n(%)]		
Rural		76(58.4)
Urban		54(41.6)
County of Residence [n(%)]		
Uasin Gishu		75(57.7)
Others		55(42.3)
Occupation of Household Head [n(%)]		
Formal Employment		39 (30)
Farmer		43 (33.1)
Self Employed		47 (36.2)
Unemployed		1 (0.8)
Type of housing [n(%)]		
Permanent		60 (46.2)
Semi-permanent		40 (30.8)
Temporary		30 (23.1)
Maternal level of education [n(%)]		
None		1(0.8)
Primary		46(35.4)
Secondary		49(37.7)
Tertiary		34(26.2)
Medical Insurance [n(%)]		
NHIF		70 (53.8)
Others		2 (1.5)
None		58 (44.6)

4.3 Clinical characteristics

Majority of the children (66.9%) had an underlying chronic illness. Among the readmitted children below 60 months, 29.5% had a W/H Z score of < -3. The most common diagnosis was pneumonia while the prevalent underlying conditions were congenital heart defects and HIV. (table 2), (figure 1) and (figure 2).

Table 2: Clinical characteristics of readmitted children

Variable (n=130)	Frequency n (%)
Chronic illness	87(66.9)
Duration from discharge to readmission	38(29)
<7 days	26(20)
7 to 14 days	66(51)
>14 days	13 (5-21)
Median	
Diagnosis at readmission	40(30.7)
New	90(69.2)
Same	
W/H Z Score (n=68)	20 (29.5)
<-3	14 (20.6)
-3 to -2	9 (13.2)
-2 to -1	25 (36.8)
>-1	
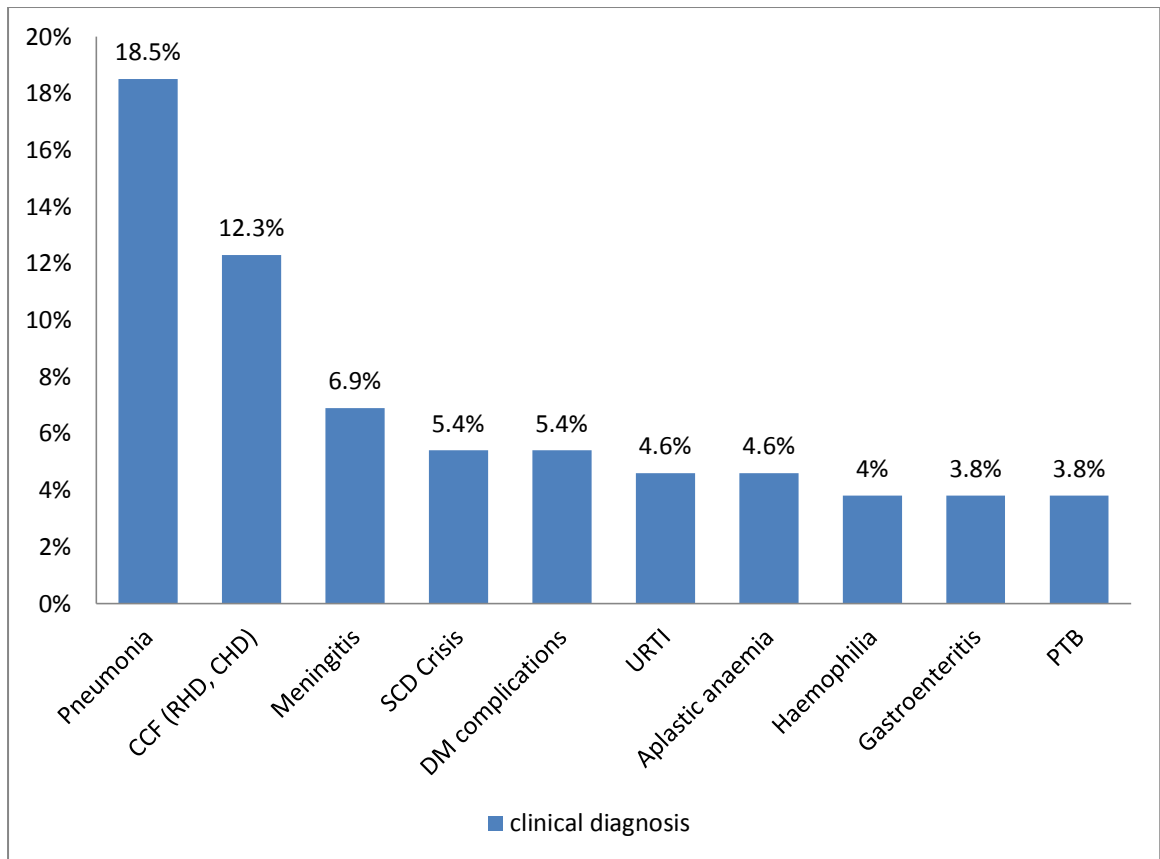
Figure 1 Top ten diagnosis at readmission among children readmitted to the paediatric wards at MTRH.

Pneumonia was the most common diagnosis among the top 10 diagnosis at readmission.
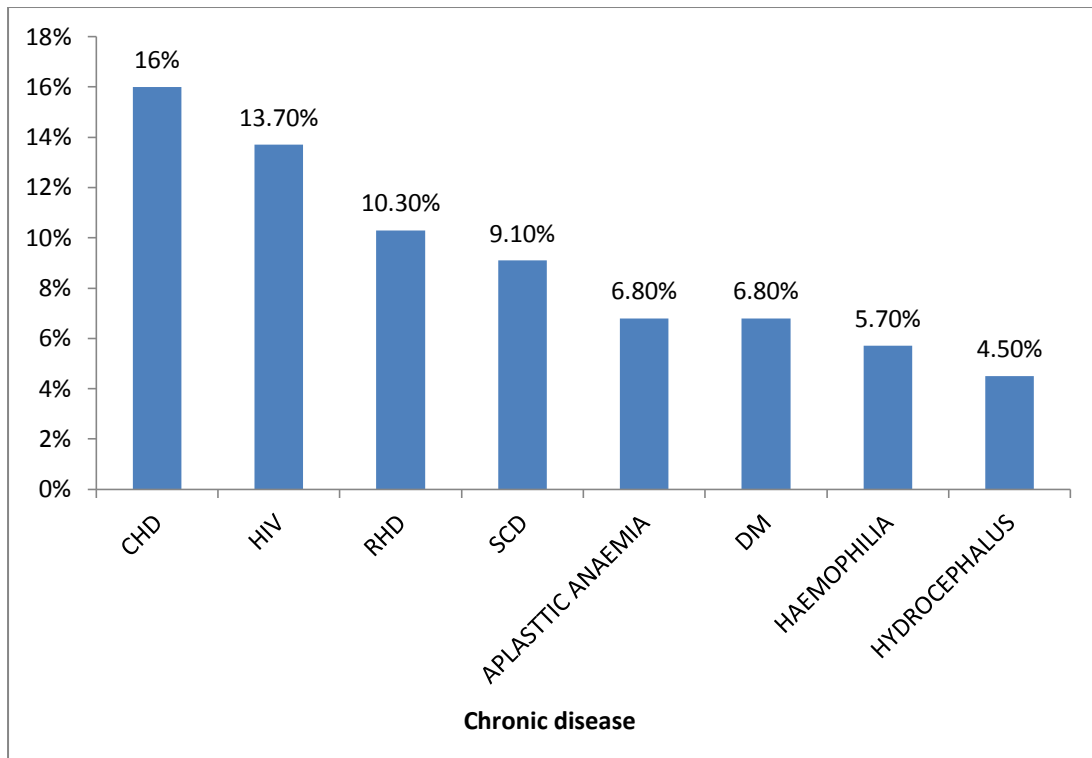
Figure 2. Most common underlying chronic diseases among children readmitted to the paediatric wards at MTRH.

4.4 Hospital Outcome

Out of the 130 children readmitted during the study period, 128 were discharged home while 2 died giving us a mortality rate of 1.5%. The median length of stay in hospital in days was 7.5 (IQR:5.0, 13.00) in the current admission while the previous median length of stay was 9.0 (5.0, 17.0) days.

No factor was found to have any association with the length of stay. (table 3).

Table 3: Factors associated with the LOS

Variable	LOS Median (IQR)	Kruskal wallis p-value
Age in categories		
<12 month	6 (4,16)	
13 to 60 months	7 (4,9)	
>60 months	8(5,13)	0.555
Duration between discharge and readmission		
<7 days	7.5 (4,13)	
7 to 14 days	7 (5,13)	
>14 days	8 (5,14)	0.842
Sex		
Female	8.5 (5.5, 14)	
Male	6 (4,12)	0.096
Insurance		
NHIF	7 (4,13)	
None	8 (6,13)	
Other	12 (4,20)	0.236
Diagnosis on readmission		
New Diagnosis	8 (5,12)	0.851
Same Diagnosis	7(4,13)	

CHAPTER FIVE: DISCUSSION

5.1 Burden of readmissions.

The readmission rate was 4.2%. This is low compared to a study by Snow et al (2000) on paediatric survival and readmission risks following hospitalization on the Kenyan Coast. They found a readmission rate of 9%. This could because they followed up their patients for a longer period of time, recruiting those readmitted within 3 months of discharge while this study recruited those readmitted within 30 days of discharge. This study was conducted in a referral hospital which has a higher catchment population unlike the study by Snow et al (2000) which was done at Kilifi District Hospital. This may have led patients whose residence was outside the county, to seek services at nearby facilities resulting in the low readmission in this study. This is also different from a study done by Berry et al. (2013) on paediatric readmission and variability across children hospitals in the United States. They found a 30 day unplanned readmission mean prevalence of 6.5%. This is because their study was conducted in several different hospitals while our study was done in one facility. There may be patients who may have died at home contributing to the low readmission rate in this study.

5.2 Socio-Demographic characteristics

In this study, more females than males readmitted (53.8%) within 30 days of discharge from MTRH paediatric wards. This differs from two different studies done in the United States where males were more than females. Gay et al. (2011) on the epidemiology of 15 day readmission in a children's hospital in the United States found majority of the readmitted children (54.5%) were boys while Feudtner et al (2009) in retrospective multicenter study in 38 children's hospital in the United States found male predominance at 54.4%.

Half of the readmitted children in this study were in the age category of above five years while about a third of them were below one year. These two groups constituted majority of the readmissions. This is different from a study by Gay et al (2011) in a children's hospital in the United States. Although he similarly found out that the infancy period increased the risk of readmission, his commonest group was above 10 years while in this study it was above 5 years. This is because the age stratification used in both studies was different. They included children above 15 years who were not included in our study. In a different study by Berry et al (2013) across children's hospitals in the United States, the readmission rates were highest for the age group between 13 to 18 years compared to those between 5 to 12 years, 1 to 4 years and infants. This is because the stratification of the age groups and the age limit used was also different compared to our study.

Infants are at a higher risk of falling ill because of their low immunity hence contributing to the high rate of readmissions in this study. This is also the group of children with congenital diseases like congenital heart defects which require closer follow up and may lead to recurrent readmission because of various complications that may occur. The complications include pneumonia, malnutrition and pulmonary hypertension. In our set-up this may be further worsened by the fact that surgery is usually delayed because of financial reasons. Some of the surgical intervention can only be done outside the country making it more difficult for the parents who are not able to raise money for surgery. This puts this group of infants at risk of being readmitted severally with various complications because of lack of definitive timely interventions. The age group above 5 years had most readmissions in this study. This is because this older age group has had the chronic diseases for longer leading to development of complications requiring frequent readmissions. The chronic diseases

in our study included sickle cell disease, HIV, diabetes mellitus, aplastic anaemia and rheumatic heart disease. Some of these chronic diseases may be diagnosed around that age for example rheumatic heart disease. Those diagnosed earlier may be presenting at this age group with complications resulting from inadequate management or lack of close followed up which may be a result of inadequate resources in the community.

Majority of the readmitted children resided in the rural areas. This is because the major economic activity around Eldoret town is farming. From this study, a third of the patients came from families where the head of the household was a farmer.

Whereas majority of the patients had a medical insurance cover, there was a significant proportion of children who were not insured. About half of the children readmitted did not have a medical insurance cover. This is different from a retrospective cohort study by Berry et al (2011) in 37 Children hospitals in the United States where medical insurance cover was found to be a risk factor for readmission. Almost all their readmitted children had medical insurance cover with majority of them having public medical insurance. This may be because few of the patients had head of households who were employed in the formal sector where it is a mandatory requirement by the government to enrol all employees in the NHIF medical scheme. In the informal sector, registration is on voluntary basis and majority of our patients may have been unable to afford the monthly premiums because of their low socioeconomic status. However the percentage of those with medical insurance among the readmission was higher than the national prevalence of 17.1% (KHHEUS, 2013). This is because majority of the patients had underlying chronic diseases which may have led to frequent hospitalizations and subsequently sensitization by the health care workers on the importance of purchasing medical insurance cover hence the higher rate of medical insurance cover.

5.3 Clinical characteristics.

Over two thirds of the readmitted children in this study had the same diagnosis as in the previous admission. This is comparable to a study by Puttha et al. (2012) at a standard district general hospital in the United Kingdom. They found 74% of acute paediatric medical readmissions were related to the initial diagnosis. However unlike this study they focussed on children readmitted within 72hours of discharge. The underlying chronic diseases which majority of the patients in this study had, may have led to readmission with the same diagnosis. If these chronic diseases are not properly managed because of lack of specialized care and when there are no continued ambulatory care in the community then the patients tend to be readmitted with the same conditions.

The commonest cause of readmission in the paediatrics wards at MTRH was pneumonia. Pneumonia constituted about a fifth of all the readmitted cases. This is different from a study done by Berry et al. (2013) done across children's hospitals in the United States. Anaemia and neutropenia was the leading cause of readmission in their study. This is because of different disease patterns in high income countries. In Sub-Saharan Africa, the major burden of disease in children is from infectious causes like pneumonia and diarrhoea. This is different from high income countries whose greatest burden of diseases is non communicable diseases. However, when they analysed the children with acute conditions, respiratory conditions were the most common with asthma as the leading cause followed by pneumonia then seizures.

Pneumonia is the leading cause of child mortality worldwide in the post neonatal period, WHO (Sep 2017). Majority of these deaths occur in Sub Saharan Africa. In MTRH monthly statistics on morbidity and mortality in the paediatric wards, pneumonia has remained the leading cause of morbidity followed by acute diarrheal

illness. Being the commonest cause of morbidity among children admitted in MTRH also makes it the most likely cause of readmission among this cohort of children readmitted within 30 days of discharge from hospital. The large number could also be due to lack of routine confirmatory diagnosis for pneumonia where majority of the diagnosis is made clinically. This may lead to children with other conditions like congestive heart failure being classified and treated as pneumonia. Congenital heart defect, which was the most common underlying chronic disease in this study, predisposes patients to recurrent pneumonia and this would therefore have increase the proportion of children readmitted with pneumonia. A third of the children below 5 years had severe acute malnutrition, this is a known risk factor for pneumonia which may have led to the high proportion of children with pneumonia.

Majority of our patients had an underlying chronic illness. This is similar to studies done before where having a chronic illness increases the risk of being readmitted. Gay et al. (2010) in a study on the epidemiology of 15 day readmission to a Children's Hospital in the United States, found out that 78% of the patients readmitted had a chronic illness. This is because in managing some of the chronic illnesses, devices like ventriculoperitoneal shunts, prosthetic valves may be inserted which lead to complications that may require frequent readmissions. For example, ventriculoperitoneal shunts inserted in children with hydrocephalus may get blocked or infected leading to readmissions with meningitis. Some chronic illnesses like aplastic anaemia will require multiple admissions for blood and platelet transfusions. These conditions are prevalent in our set-up and because of lack of definitive treatment options like stem cell transplant, the children would be admitted severally for supportive treatment like blood and platelet transfusions.

Among the children with underlying chronic diseases in this study, the most prevalent chronic diseases were congenital heart defects, HIV and Rheumatic heart disease respectively. This is different from a study be Berry et al (2011) across 37 children's hospitals in the United States where the most prevalent complex chronic conditions in their study was neuromuscular followed by malignancy and lastly cardiovascular diseases. The reason why cardiovascular diseases were among the prevalent conditions in our study could because unlike developing countries, congenital hearts defects in high income countries are diagnosed prenatally. This leads to early corrective surgery of the defects hence reducing the numbers of readmissions likely to be associated with congenital heart defects. Rheumatic heart disease is commonly seen in our set-up compared to high income countries because of the prevalent risk factors which include overcrowding and poverty. This may have contributed to the high proportion of patients with underlying diseases of the cardiovascular system in this study. We also had HIV contributing significantly to the readmissions as an underlying chronic condition. This is because HIV burden is high in the African Region, WHO (July 2017) and we have not yet eliminated cases of mother to child transmission of HIV because of inadequate utilization of antenatal care and high cases of home delivery.

A third of the children below 5 years who were readmitted within 30 days in this study had severe acute malnutrition while a fifth had moderate acute malnutrition. This could because majority of the patients had underlying chronic disease which may have led to malnutrition secondary to chronic inflammation and high energy requirements especially in those who may have been in heart failure. The underlying malnutrition would also increase the risk of diseases like pneumonia leading to

readmission especially if the malnutrition was not recognized and managed accordingly during the previous admission.

5.4 Outcome

The median length of stay for the previous admission was nine days. This is comparable to a study by Gay et al. (2010) in a children's hospital in United States who found the length of stay for the index admission at approximately eight days. Our median length of stay for the readmission was seven and a half days.

Two out of the 130 readmitted children died before discharge. Feudtner et al (2009) found a similarly low mortality rate of 0.6% in a retrospective multicenter study in the United States. The low mortality was because majority of the patients had known chronic diseases. This led to prompt management of the anticipated exacerbations hence majority of the patients recovered and were discharge home.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS.

6.1 Conclusions

1. The readmission rate in MTRH paediatric wards is low.

2. Majority of the readmitted children at MTRH had pneumonia and underlying chronic illness.

3. Mortality rate among the readmitted children in the paediatric wards at MTRH is low.

6.2 Recommendations.

1. Children with pneumonia and those with chronic diseases should be followed up closely.

2. We recommend a study to look at children who may die at home or are readmitted to other facilities after discharge from MTRH paediatric wards.

REFERENCES

Ashton, C.M., Kykendall, D.H., Johnson, M.L., Wray, N.P., & Wu, L. (1995). The association between the quality of inpatient care and early readmission. *Annals of Internal Medicine,122*,415-421.

Berry, J.G., Hall, D.E., Kuo, D.Z., Cohen, E., Agrawal, R., Feudtner, C., ... Neff, J. (2011). Hospital Utilization and Characteristics of Patients Experiencing Recurrent Readmissions Within Children's Hospitals. *The Journal of the American Medical Association, 306*(13), 1454-1460.

Berry, J.G., Toomey, S.L., Zaslavasky, A.M., Jha, A.K., Nakamura, M.M., Klein, D.J., ... Schuster, M.A. (2013). Paediatric Readmission Prevalence and Variability Across Hospitals. *The Journal of the American Medical Association, 309*(4), 372-380.

Dilworth, S. (2009). A Literature review; Readmission of Older Patients To The Acute Care Setting. *Handover for Nurses and Midwives, 2*(1), 2-6.

Feudtner, C., Levin, J.E., Srivastava, R., Goodman, D.M., Slonim, A.D., Sharma, V., ... Mall, M. (2009). How well can hospital readmission be predicted in a cohort of hospitalized children? A retrospective multi-center study. *Paediatrics, 123* (1),286- 293.

Gay, J.C., Hain, P.D., Grantham J.A., & Saville, B.R. (2011). Epidemiology of 15 day Readmissions to a Children's Hospital. *Paediatrics 127*, 1505-1512 DOI:10.1542.peds.2010-1737

Hain P.D., Gay J.C., Berutti T.W., Whitney, G.M., Wang, W., & Saville B.R. (2013) Preventability of Early Readmission at a Children's Hospital. *Paediatrics* 2013,*131*, e171-e181. DOI:10.1542/peds.2012-0820

Jencks, S.F., Williams, M.V., & Coleman, E.A. (2009). Rehospitalisation among patients in the Medicare fee-for service program. *The New England Journal of Medicine, 360*(14), 1428-1428

Kwee, L.P., Yen, C.Y., Ngee, L., Lim, J.S., Ching,H.Y., Rashida, V., & Yap, F.K. (2012). Paediatric hospital readmission with diabetes mellitus. *Singapore Nursing Journal, 39*(4), 23-28.

McMillan, J.E. (2013). A geospatial approach to describe risks for 30 day readmission amongst paediatric patients in a major metropolitan region. *SCDAA 41ˢᵗ Annual Convention.* www.sicklecelldisease.org/sicklecelldisease/upload/File/2013ConventionPowerPointPresentation/JeffersonMcmillanSCDFinal

Ministry of Health, Government of Kenya. (2014). 2013 Kenya Household Health Expenditure and Utilisation Survey, Nairobi: Government of Kenya.

Minott, J. (2008). Reducing hospital readmissions. *Academy Health,* Retrieved from www.academy.health.org/files/publication/ReducingHospitalReadmission.pdf.

Mitchell, E.A., Bland, J.M., & Thompson, J.M.D. (1994). Risk factors for readmission to hospital for asthma in childhood. *Thorax, 49*(1),33-36

Moisi, J.C., Gatakaa H., Berkley, J.A., Maitland, K., Mturi, N., Newton, C.R., ... Scott J. A. (2011). Excess child mortality after discharge from hospital in Kilifi, Kenya: a retrospective cohort analysis. *Bulletin of the World Health Organization, 89,*725-732. http://dx.doi.org/10.2471/BLT.11.089235

Munywoki, P.K., Ohuma, E.O., Ngama, M., Bauni, E., Scott, J.A., & Nokes, D.J. (2013). Severe Lower Respiratory Tract Infection in Early Infancy and Pneumonia Hospitalizations among Children, Kenya. *Emerging Infectious Diseases*, *19*(2), 223-229. DOI:http://dx.doi.org/10.3201/eid1902.120940

Puttha, R., Sampath, S., Thalava, R. & Burns, S. (2012). Acute paediatrics medical readmissions: characteristics, trends and reasons *Archives of Disease in Childhood. 97*,A107. DOI:10.1136/archdischild-2012-301885.254

Rumball, J. M., & Hider, P. (2009). The validity of readmission rate as a marker of the quality of hospital care, and a recommendation for its definition. *The New Zealand Medical Annaal , 122* (1289), 63-70.

Snow, R.W., Howard, S.C., Mungala, V., English, M., Molyneux, C.S., Waruiru, C., ... Marsh, K. (2000). Paediatric survival and readmission risks following hospitalisation on the Kenyan Coast. *Tropical Medicine and International Health, 5*, 377-383. DOI:10.1046/jo.1365-3156.2000.0056

Stanley, A., Graham, N., & Parrish, A. (2008). A review of internal medicine re-admissions in a peri-urban South African hospital. *The South African Medical Journal*, *98*(4), 291-294

Williams, E.I. & Fitton, F. (1988). Factors affecting early unplanned readmission of elderly patients to hospital. *The British Medical Journal, 297*(6651),784-787.

World Health Organization, (July 2017)

http://www.who.int/mediacentre/factsheets/fs360/en/

World Health Organization, (September 2017)

http://www.who.int/mediacentre/factsheets/fs331/en/

APPENDICES

Appendix I: Data Collection Form

Serial No………………………

Child's characteristics

At admission

weight…………kg   ht in cm................

Z Score.....................(nutritional status)

MUAC.......................

Sex............................

Age ....(years).............(months)

Birth order..................

Current admission

Date of readmission……/……/…….   Date of discharge/death…../…../.......
LOS.........days

Final
diagnosis...

Documented complications
....
....

Co-morbid conditions/ underlying chronic condition
....
....
....
....
....

Duration before readmission in days ☐

Number of outpatient visits before readmission ☐

Number of admissions in the last 1 year ☐

Is child on regular medication at home YES ☐ NO ☐

If yes, has child missed medication YES ☐ NO ☐

Was child discharge through the outpatient clinic YES ☐ NO ☐

If yes was the outpatient clinic appointment kept YES ☐ NO ☐

Was health education given in the ward YES ☐ NO ☐

Did patient obtain and complete all discharge medications YES ☐ NO ☐

Previous admission

Date of admission……/……/……. Date of discharge/…/……/ LOS.........days

Final

diagnosis..

Reasons for readmission

New diagnosis [ ]

Same diagnosis[ ]

Worsening condition[ ]

Others...

....

....

....

SES

Low ☐

Middle ☐

High ☐

Residence

....

Rural ☐

urban ☐

Medical insurance cover

NHIF ☐

OTHER ☐

NONE ☐

Maternal characteristics

age ....

Maternal level of education

PRIMARY ☐

SECONDARY ☐

TERTIARY ☐

Appendix II: Consent Form

CLINICAL CHARACTERISTICS OF CHILDREN READMITTED AT THE

PAEDIATRIC WARDS IN MOI TEACHING AND REFERRAL HOSPITAL,

ELDORET, KENYA.

Introduction

My name is Dr. Nyaboke Ann. I am a post graduate student in the department of

Child Health and Paeditrics at Moi University and as part of the post graduate studies,

am required to carry out a research project. My research study will describe the

characteristics of children readmitted in the paediatric ward at Moi Teaching and

Referral Hospital, Eldoret.

Study procedure

If you agree to participate in this study, you will be asked questions relating to the last

admission and the current admission.

Benefits of the study

Information derived from the study will be used by the hospital to help reduce

readmissions.

Costs

There is no money or any incentive that will be given to you in order to participate in

this study.

Confidentiality

All information obtained from you in this study will be kept confidential.

Withdrawal

You are free to withdraw from the study.

In case of any questions regarding the study, you should contact

Dr. Nyaboke Ann on mobile phone No. 0721260480.

IREC, Moi University P.O. Box 4606, Eldoret. Tel 33471/1/2/3

Contact persons:

NAME	TITLE	CONTACT
Dr. Ann Nyaboke	Principal investigator	Tel 0721260480 Email address annegisira@yahoo.com
Dr. Paul Kiptoon	Supervisor	Tel 0720-421893
Dr Irene Marete	Supervisor	Tel 0720458695 Email address mareteirene07@yahoo.com

Having read and been explained to the above;

I Mr. / Mrs. / Miss…………………………………………. with the knowledge that

this study is voluntary, do hereby give consent for my child to participate in it.

I understand that my child has a right to be withdrawn from the study without any

penalty or harm.

Parent/ guardian

signature…………………………………………….Date…………………………………………

Principal investigator

Signature…………………………………………Date…………………………………………

Appendix III: Assent Form

CLINICAL CHARACTERISTICS AND OUTCOMES OF CHILDREN READMITTED AT THE PAEDIATRIC WARDS IN MOI TEACHING AND REFERRAL HOSPITAL, ELDORET, KENYA.

Introduction

My name is Dr. Nyaboke Ann. I am a post graduate student in the department of Child Health and Paeditrics at Moi University and as part of the post graduate studies, am required to carry out a research project. My research study will describe the characteristics of children readmitted in the paediatric ward at Moi Teaching and Referral Hospital, Eldoret.

Study procedure

If you agree to participate in this study, your parent/guardian will be asked questions relating to the last admission and the current admission. Your height and weight will be measured.

Benefits of the study

Information derived from the study will be used by the hospital to help reduce readmissions.

Costs

There is no money or any incentive that will be given to you in order to participate in this study.

Confidentiality

All information obtained from you in this study will be kept confidential.

Withdrawal

You are free to withdraw from the study at any point in time.

In case of any questions regarding the study, you should contact Dr. Nyaboke Ann on mobile phone No. 0721260480.

Having read and explained to the above, I agree to take part in the study.

Child Name...Date...........................

Principal investigator

Name..Date...

Appendix IV IREC Approval

INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)

MOI TEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 33471//2/3
Reference: IREC/2014/190
Approval Number: 0001353

MOI UNIVERSITY
SCHOOL OF MEDICINE
P.O. BOX 4606
ELDORET
16th February, 2015

Dr. Annah Nyaboke Gisira,
Moi University,
School of Medicine,
P.O. Box 4606-30100,
ELDORET-KENYA.

INSTITUTIONAL RESEARCH &
ETHICS COMMITTEE
16 FEB 2015
APPROVED
P. O. Box 4606-30100 ELDORET

Dear Dr. Gisira,

RE: FORMAL APPROVAL

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

"Clinical Characteristics of Children Readmitted in the Pediatric Wards at Moi Teaching and Referral Hospital."

Your proposal has been granted a Formal Approval Number: *FAN: IREC 1353* on 16th February, 2015. You are therefore permitted to begin your investigations.

Note that this approval is for 1 year; it will thus expire on 15th February, 2016. If it is necessary to continue with this research beyond the expiry date, a request for continuation should be made in writing to IREC Secretariat two months prior to the expiry date.

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

Sincerely,

PROF. E. WERE
CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

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

Appendix V: MTRH Approval

MOI TEACHING AND REFERRAL HOSPITAL

Telephone: 2033471/2/3/4
Fax: 61749
Email: director@mtrh.or.ke
Ref: ELD/MTRH/R.6/VOL.II/2008

P. O. Box 3
ELDORET

16th February, 2015

Dr. Annah Nyaboke Gisira,
Moi University,
School of Medicine,
P.O. Box 4606-30100,
ELDORET-KENYA.

RE: APPROVAL TO CONDUCT RESEARCH AT MTRH

Upon obtaining approval from the Institutional Research and Ethics Committee (IREC) to conduct your research proposal titled:-

"Clinical Characteristics of Children Readmitted in the Pediatric Wards at Moi Teaching and Referral Hospital".

You are hereby permitted to commence your investigation at Moi Teaching and Referral Hospital.

DR. JOHN KIBOSIA
DIRECTOR
MOI TEACHING AND REFERRAL HOSPITAL

CC   -   Deputy Director (CS)

    -    Chief Nurse

    -    HOD, HRISM

Appendix VI Approval of Amendment

INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)

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

MOI UNIVERSITY
SCHOOL OF MEDICINE
P.O. BOX 4606
ELDORET
Tel: 33471/2/3

Reference: IREC/2014/190

18th November, 2016

Approval Number: 0001353

Dr.Annah Nyaboke Gisira,

Moi University,

School of Medicine,

P.O. Box 4606-30100,

ELDORET-KENYA.

INSTITUTIONAL RESEARCH &
ETHICS COMMITTEE
18 NOV 2016
APPROVED
P. O. Box 4606-30100 ELDORET
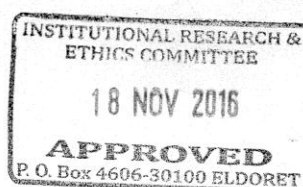
Dear Dr. Gisira

RE: APPROVAL OF AMENDMENT

The Institutional Research and Ethics Committee has reviewed the amendment made to your proposal titled:-

"The Burden, Clinical Characteristics and Outcomes of Children Readmitted in the Paediatric Wards at MTRH"

We note that you are seeking to make amendments as follows:

To change study title from "Clinical Characteristic of Children Readmitted in the Paediatrics Wards in MTRH" to the title in bold above.

The amendments have been approved on 18th November, 2016 according to SOP's of IREC. You are therefore permitted to continue with your research.

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

Sincerely,

PROF. E. WERE
CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

cc: CEO - MTRH Dean - SPH Dean - SOM
Principal - CHS Dean - SOD Dean - SON