ADHERENCE TO NATIONAL GUIDELINES BY HEALTH CARE PRACTITIONERS IN THE MANAGEMENT OF ACUTE ASTHMA AND SHORT-TERM OUTCOMES AMONG CHILDREN AT MAMA LUCY KIBAKI HOSPITAL, KENYA

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Adherence to National Guidelines by Health Care Practitioners in the Management of Acute Asthma and Short-Term Outcomes among Children at Mama Lucy Kibaki Hospital, Kenya

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A Thesis Submitted in Partial Fulfilment of the Requirements for the Degree of Master of Medicine in Child Health and Paediatrics of the Jomo Kenyatta University of Agriculture and Technology

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

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DEDICATION

I dedicate this thesis and research work to God, all children with asthma and healthcare providers who have willingly entrusted us with their well-being. Through our encounters with them, we have improved our skills in paediatrics and child health over time.

To my beloved wife, Penina, your endless love, tireless support, and unmatched patience have been the foundation of my success. Through every sleepless night, every challenge, and every moment of doubt, your encouragement has illuminated my path. Your confidence in me, even when I struggled, has carried me through. Your sacrifices, care, and commitment to our family have been my greatest source of motivation.

To my incredible sons, Valen and Valor, your curiosity, laughter, and joy are the heartbeats of my life. Your innocence and wonder remind me daily of the beauty of life beyond academia. You have been my source of strength and joy, grounding me in the most meaningful ways as I navigated this journey.

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ABBREVIATIONS AND ACRONYMS

ANOVA	Analysis of Variance Software.
GINA	Global Initiative for Asthma.
ICS	Inhaled Corticosteroids.
ISAAC	International Study of Asthma and Allergies in Childhood.
JKUAT	Jomo Kenyatta University of Agriculture and Technology.
KAMG	Kenya Asthma Management Guidelines.
LABA	Long-Acting Beta Agonists.
LMIC	Low and Middle-Income Countries
MLKH	Mama Lucy Kibaki Hospital.
MOH	Ministry of Health.
NACOSTI	National Commission for Science Technology and Information.
pMDI	Pressurised metered-dose inhaler.
SABA	Short Acting Beta Agonists.
SPSS	Statistical Package for the Social Sciences.
USA	United States of America.
WHO	World Health Organization.

DEFINITION OF OPERATIONAL TERMS

Acute asthma exacerbation	Acute asthma exacerbation (Flare-ups) refers to a change in the patient's usual status characterised by an increase in symptoms of shortness of breath, cough, wheezing or chest tightness which is unresponsive to usual effective therapy, and which may necessitate care in an emergency room or hospital ward
Adherence	the degree to which health practitioners follow the recommended guidelines, specifically the national asthma guidelines.
Asthma	Using the KAMG, a child more than 1 year presenting with, wheezing, breathlessness, chest tightness and cough that vary in time and intensity associated with airflow limitation and has either been on follow-up for asthma or has a diagnosis of asthma.
Health Care Practitioner	Any clinician or nurse directly involved in the assessment and management of children aged 3–18 years presenting with acute asthma both in the in-patient and outpatient departments whether interns or registered and is responsible for implementing components of the national asthma management guidelines within their scope of practice.
Short-term outcome	Immediate effects of an action, in this case management of acute asthma such as symptom relief, length of hospital stay, complications, and death.

Symptoms of asthma	a child who presents with wheeze shortness of breath, chest tightness or heaviness and cough.

ABSTRACT

Asthma is a global health burden, with over 300 million people affected. Guidelines provide a framework of reference by healthcare workers for the management and improvement of care for patients. The Ministry of Health has provided the Kenya Asthma Management Guidelines to help reduce the mortality and morbidity of asthma. This study assessed adherence to national asthma guidelines and short-term patient outcomes at Mama Lucy Kibaki Hospital, Kenya in the management of acute asthma and identified barriers to their implementation. A mixed-methods study was conducted that incorporated a retrospective design that quantitatively reviewed the medical records of 135 children aged 3-18 years in which data on initial assessment, severity classification, treatment adherence, and outcomes over a one year from June 2022 to June 2023 was collected while qualitative methods of data collection included key informant interviews (KIIs) from twenty-six healthcare workers and three focused groups discussions (FGDs) that highlighted insights on the challenges to implementation of guidelines were done. Quantitative data were collected using a validated data abstraction sheet, while qualitative data from FGDs and KIIs were transcribed, coded, and securely managed. Ethical approval from the appropriate institutions were obtained, and informed consent were obtained where applicable, with strict measures implemented to ensure confidentiality and data protection throughout the study. Quantitative data were analysed using R version 4.3.3, while qualitative data were thematically analysed. Among the 135 children enrolled, the median age was 4 years, with 55.6% male versus 44.4% female participants. Most (76.3%) were inpatients with an average hospital stay of 4 days. Severity classification adherence was low (11.1%), while 60.7% received oxygen, 82.2% antibiotics, and 77% systemic corticosteroids. Nebulisation was used in 86.7 %, but only 0.7% received an inhaler with a spacer and mask. Follow-up at the paediatric respiratory clinic was booked for only 29.6%, while 72.6% were discharged on oral antibiotics. Pneumonia was the most common comorbidity (75.6%), significantly increasing hospital stay ($p < 0.0001$). The mortality was low at 1.5% and most of the patients improved after management. Challenges to implementing guidelines included shortages of resources, training deficiencies, and operational constraints. The healthcare workers pointed out gaps in the availability of essential medications, equipment, and printed protocols, while the high patient loads were associated with poor adherence. A significant gap exists between national asthma management guidelines and their implementation in practice, while outcomes were influenced by co-morbidities that need further study. Addressing challenges like inadequate resources and training is key to improving adherence and patient outcomes.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Asthma is a heterogeneous disease characterised by chronic airway inflammation (Mims, 2015). It is defined by a recurrent history of respiratory symptoms, such as wheezing, chest tightness, shortness of breath and cough that may vary over time and in intensity. A syndromic approach to the diagnosis of asthma is therefore favoured, but much attention should be paid to differentiating it from asthma mimics such as viral infections, reflux disease, and anatomical airway diseases (Irungu et al., 2022). Asthma is the most common chronic illness in children and adolescents (*GINA, 2024*), and the prevalence varies markedly based on social demographic characteristics (Asher et al., 2021). It affects people of all age groups, with the older population having higher mortality and morbidity (Busse et al., 2020), and the prevalence is predicted to rise to 400 million by 2025 (Masoli et al., 2004). Genetics, exposure to pollutants and economic status, have been demonstrated to play a role in the development and severity of asthma (Taherian et al., 2024). Asthma has shown considerable variability across the life course. Childhood asthma is known for its overall high prevalence with a male predominance prior to puberty, common remission, and minimal mortality.

Concerted universal and national efforts have been made to develop management guidelines that are backed up by scientific evidence of efficacy in disease control. These include the Global Initiative for Asthma (GINA) that are updated annually and KAMG (Kenya Asthma Management Guidelines) guidelines; MOH Basic Paediatric Protocol which are updated regularly providing a good framework on how to approach the children with a well-written management plan. These are available in the form of soft copies and hard copies. Therefore, healthcare providers are expected to familiarise themselves with these guidelines and execute them correctly to improve the quality of life.

Improved paediatric asthma control is imperative to prevent potential adverse consequences of the disease later in life. Maintaining adherence to long-term controller therapy is problematic in all chronic diseases, and in paediatric asthma, this is often further complicated by incorrect use of the inhaler device, which can increase under-treatment with the ICS. The need for training in optimal inhaler use and for regular checks of inhaler technique and treatment adherence is another challenge that needs to be addressed (Trivedi & Denton, 2019). Asthma is associated with airway hyper-responsiveness and variable degrees of airflow limitations (Mims, 2015), resulting in different levels of acute exacerbations, ranging from mild, moderate, severe, and life-threatening. Over time, the airway remodels with the bronchial lumen narrowing, goblet cells increase in number, the basement membrane thickens, and mast cells increase, hence increasing histamine, neutrophils, and T-helper cells release. There is an 'atopic march' that is used to describe a link of progression from atopic dermatitis to asthma to allergic rhinitis; however, it's more inference rather than causality (Belgrave et al., 2015). Asthma poses significant individual, family, and national concerns due to its impact on health, education, and work. Asthma's economic burden on families, strain on healthcare systems, and environmental triggers make it a major public health issue due to the financial burden(Serebrisky & Wiznia, 2019). Early diagnosis, proper management, and public health initiatives are essential to alleviate the impact of asthma on individuals and society and adherence to guidelines reducing the negative impact.

The prevalence of asthma in Africa is variable and on the rise, especially among children aged 12-14 years, with an estimate of 6 - 20% by International Study of Asthma and Allergies in Childhood (ISAAC) studies(Pearce et al., 2007). Approximately 4 million (7.5%) Kenyans are currently living with asthma according to the World Health Organization (WHO). (*Kenya Asthma Management Guidelines, 2022*). Asthma affects all aspects of life, including productivity and quality of sleep, among other spheres. This not only holds for the patient but also for the caregivers who have to intensify their attention in symptom identification, avoidance of triggers and dealing with high economic burden (Serebrisky & Wiznia, 2019). Asthma is often underdiagnosed and under-treated, particularly in low- and middle-income countries (Serebrisky & Wiznia, 2019). Children and adolescents presenting with

acute exacerbation of asthma should have their vital signs taken and recorded, together with a thorough history and physical examination.

The management of asthma varies in different countries based on their development capacities, with varying priorities. In some African countries, the main challenge is providing effective medication to asthma patients (Wang et al., 2023). Children presenting with respiratory symptoms of asthma are more likely to be prescribed ICS rather than SABA now than before. Asthma treatment guidelines have been revised over time with increasingly stronger recommendations of anti-inflammatory treatment with ICS and avoidance of single asthma management with SABA. Thus, the decreased symptom prevalence is likely an effect of increased use of ICS among children with asthma, supported by a Cochrane Library Review, concluding that ICS use improved asthma control, forced expiratory volume in 1 second (FEV1), and asthma symptom scores.(Hedman et al., 2024)

Alternative measures that might improve paediatric asthma management and control include replacement of short-acting β2-agonist relievers by an inhaled corticosteroid plus a fast-acting β2-agonist (short-acting β2-agonist or fast- and long-acting β2-agonist) combination at Global Initiative for Asthma step 1 or 2 to ensure that patients receive an inhaled corticosteroid whenever they feel there is a need for symptomatic relief. Such an approach could eliminate the problem of learned excessive use or over-reliance on short-acting β2-agonist reliever medication and address the other difficulties in current paediatric asthma management. More clinical studies in paediatric patients or wider studies involving a proportion of paediatric patients are important in order to provide the supporting evidence needed to help advance such new approaches and improve asthma control from a paediatric perspective (Szefler & Chipps, 2018)

Improved paediatric asthma control is important to avoid potential adverse consequences of the disease later in life. Maintaining adherence to long-term controller therapy is challenging in all chronic diseases, and in paediatric asthma, this is often further complicated by inappropriate use of the inhaler device, which can increase under-treatment with the inhaled corticosteroid. The need for training in

optimal inhaler use and regular checks on inhaler technique and adherence to treatment are another problem that needs to be sorted out.(Szefler & Chipps, 2018b)

Access to and adherence to guidelines-based medical care, including prescribing inhaled corticosteroids, is an important component of effective asthma management. According to the study by Zaheran et al they found out that just more than half (54.5%) of children diagnosed with asthma who were taking asthma controller medications were taking them regularly as prescribed, indicating a need for further improvement in medication adherence.(Zahran et al., 2018).

Clinical Practice Guidelines for childhood illnesses, including acute asthmatic exacerbations in Kenya, are contained in the Ministry of Health Basic Paediatric Protocol and various other guidelines. Global and national asthma guidelines provide a good framework on how to approach these children with a well-written management plan.(*GINA, 2024*; *Kenya Asthma Management Guidelines, 2022*). Therefore, healthcare providers are expected to familiarise themselves with these guidelines and execute them correctly to improve the quality of life. In our set-up, asthma diagnosis is mainly clinical due to inadequate resources and the unavailability of spirometry, and difficulty in performing in children, particularly below 6 years; however, spirometry is very critical in getting the lung function status(Binegdie et al., 2024).

A study at Mama Lucy Kibaki Hospital (MLKH), among adult patients attending the chest clinic and who had been diagnosed with asthma at least three months before, demonstrated that only 57% of patients had good adherence to asthma control measures.(Kagwaini et al., 2018). At MLKH, a disparity has been noted in the management of children presenting with acute asthma, hence the need to assess the level of adherence to the stipulated guidelines. A study done at a secondary hospital in Sub-Saharan Africa, however, showed that having a dedicated paediatric respiratory clinic improved the use of inhaled corticosteroids in children (Simba et al., 2021a). Additionally, MLKH is located in a region with informal settlements, which predisposes the people living there to the development of wheezing that is consistent with asthma due to air pollution(Meme et al., 2023)

Despite the availability of national asthma guidelines, there may be a lack of adherence to these guidelines in the management of children with acute asthma in Kenya. This can lead to suboptimal treatment and poor outcomes for children with asthma, including increased hospitalizations, morbidity, and mortality. There is a major overuse of short-acting beta agonists, showing poor compliance with guidelines due to delays in commencing relievers(Chakaya et al., 2024). Barriers might include difficulties in diagnosis due to challenges in the use of spirometry in children as seen in the Kenyan setting. Moreover, studies in Kenya have demonstrated a reluctance of patients and parents/guardians to admitting they have asthma (Simba et al., 2018). Also, stigma plays a key role in people avoiding seeking care, which becomes a vicious cycle as poor asthma control worsens the stigma (Ahmed et al., 2024). Therefore, this research assessed the level of adherence to national asthma guidelines in the management of children with acute asthma in Kenya and identified potential barriers to adherence to improve asthma care and outcomes for children in the country.

1.2 Statement of the Problem

Asthma puts a significant health burden in Africa despite being often underdiagnosed and undertreated. With the increasing incidence rates and large variations in healthcare systems, its management remains reduced by decreased access to medical resources and qualified specialists. The prevalence of asthma in Africa is highlighted, with broad estimates and inadequate information on the disease's determinants and burden. In addition to diagnostic challenges, medication unavailability, under treatment, poor healthcare, sociocultural misunderstandings, and infrastructure remain the hallmarks of asthma management in Africa. Notably, a significant number of these cases are sub optimally controlled, with limited access to healthcare and deficiencies in healthcare delivery systems identified as major contributing factors. Quite a number of strategies have been proposed to sort out the limitations faced in effective asthma treatment. Measures such as the provision of affordable medicines and diagnostic equipment, the development of national and regional evidence-based asthma guidelines, and the improvement of community-based asthma education programs can improve the goals of asthma control programs. Furthermore,

restructuring health systems to incorporate asthma care into primary care and investing in human resource capacity are crucial steps. Adopting and applying evidence-based treatment guidelines, such as those established by the Global Initiative for Asthma (GINA), can drastically reduce asthma morbidity and mortality.(Faniyi et al., 2024)

Asthma is a chronic and recurrent respiratory illness that requires proper diagnosis and management to be undertaken (*GINA, 2024*). In Kenya and other developing countries, children continue to visit healthcare facilities with acute asthma, an indicator of poor control. The prevalence of asthma in Africa is variable and, on the rise, especially among children aged 12-14 years, with an estimate of 6 - 20% by International Study of Asthma and Allergies in Childhood (ISAAC) studies (Pearce et al., 2007). Approximately 4 million (7.5%) Kenyans are currently living with asthma according to the World Health Organization (WHO). (*GINA, 2024*; *Kenya Asthma Management Guidelines, 2022*.). Concerted universal and national efforts have been made to develop management guidelines that are backed up by scientific evidence of efficacy in disease control. These include the Global Initiative for Asthma (GINA), which is updated annually, and the KAMG (Kenya Asthma Management Guidelines) guidelines; the MOH Basic Paediatric Protocol, which is updated regularly, providing a good framework on how to approach the children with a well-written management plan. These are available in the form of soft copies and hard copies. Therefore, healthcare providers are expected to familiarise themselves with these guidelines and execute them correctly to improve the quality of life. Adherence to these guidelines by healthcare practitioners remains varied depending on the setup. Non-adherence to guidelines continues to be a significant challenge(Weinstein, 2011). There was low adherence to asthma guidelines in Britain, irrespective of the patient's sociodemographic characteristics.(Roghmann & Sexton, 2009). A study in the United States demonstrated variation in adherence to asthma guidelines based on clinician group and the various components of care, with paediatricians having a better overall adherence to guidelines, especially on assessment and action plan provision, compared to interns. However, interns had better adherence to the assessment of triggers. (Akinbami et al., 2020)

A study in Sweden revealed a substantial gap between the actual care provided for paediatric asthma and the recommendations formulated in national guidelines (Jonsson et al., 2012).

In South Africa a study revealed that there was poor adherence to guidelines in acute asthma care with antibiotics and imaging being the most misused. (Hoosen S. et al., 2020)

A survey demonstrated that in Kenya only 60% of people with asthma were on medications, majorly, oral prednisolone and salbutamol (Mortimer, Masekela et al., 2022). Therefore, it shows that poor adherence to guidelines may contribute to increased treatment costs, morbidity and mortality. Adherence to the Kenya Asthma Management guidelines in children remains unclear in our setup.

The burden of asthma can only be approximated from the data since no prevalence studies have been done in our facility, approximately 40 patients with asthma are seen every month both children and adults based on data from the Health Information Management System (HIMS). The cost of treating asthma in children is not well documented in Kenya but it is expensive as it encompasses consultations, diagnostic tests, medications, and follow-up visits. The expenses may also include indirect costs like transportation to medical appointments. Mortality due to asthma is not established at MLKH hence the need for studies. Lack of optimum management due to poor adherence to guidelines results in disease progression, depreciation in the quality of life, and increased healthcare costs. (Serebrisky & Wiznia, 2019). Proper management of asthma not only entails symptom alleviation, but also long-term exacerbation avoidance. Support tools interventions have demonstrated improvement of adherence to guidelines (Okelo et al., 2013) while provider education and resources support showed an improvement and adherence to guidelines(Pudasainee-Kapri, 2021).

At MLKH, a disparity was noted from the records in the classification of asthma clinical severity and management of children presenting with acute asthma. There was also increased morbidity as seen from the frequent revisits, hence the need to assess the level of adherence to the stipulated asthma guidelines and the barriers to

adherence to said guidelines. Some of the barriers were healthcare-related, such as a lack of outcome expectancy (Wisnivesky et al., 2008).There are no studies on the level of adherence to asthma guidelines among health care workers at MLKH in the management of acute asthma.

1.3 Justification of Study

While adherence to guidelines is self-reported and may be good, studies around the world have been done and demonstrated that good adherence to guidelines promotes better asthma control.

Anecdotal data at MLKH suggest prescription conflicts, especially in the management of acute asthma exacerbations, hence the need for the study. Three to five children are nebulised daily in MLKH on average, despite the presence of a paediatric respiratory clinic, hence the need to assess the level of adherence. Non-pharmacological management has poorer adherence to national guidelines compared to pharmacological. There is limited data in Kenya on studies regarding adherence to national asthma guidelines.

Suboptimal adherence to established asthma management guidelines is associated with poor disease control, increased exacerbations, reduced quality of life, and higher healthcare utilisation and costs. This study provides empirical evidence on current practice gaps, offering a basis for targeted quality improvement interventions. The findings are expected to inform clinical practice at MLKH, support evidence-based policy decisions, and strengthen adherence strategies in acute asthma care. By identifying modifiable barriers, the study contributes to optimizing patient outcomes and resource use. Furthermore, existing evidence indicates that structured interventions, such as clinical audits and pharmacy-led support, can significantly improve guideline adherence, underscoring the translational relevance of this work.

1.4 Research Questions

1. What proportion of children treated at MLKH receive appropriate acute asthma management as per the National guidelines?

2. What are the short-term outcomes of children managed for acute asthma at MLKH?
3. What are the challenges to the implementation of national guidelines in the management of acute asthma in children at MLKH?

1.5 Objectives

1.5.1 Broad Objective

To determine the level of adherence to national asthma guidelines by healthcare practitioners in the management of children with acute asthma, short-term outcomes and implementation challenges at MLKH.

1.5.2 Specific Objectives

1. To determine the level of adherence to national asthma guidelines by healthcare practitioners at MLKH.
2. To determine the short-term outcomes of children between 3-18 years managed for acute asthma at MLKH.
3. To establish challenges facing healthcare practitioners in the implementation of national guidelines for the management of acute asthma at MLKH.

1.6 Hypothesis

1.6.1 Null Hypothesis

There is poor adherence to national asthma guidelines in the treatment of children presenting with acute asthma**.**

1.6.2 Alternate Hypothesis

There is good adherence to the national guidelines in the treatment of children presenting with acute asthma.

CHAPTER TWO

LITERATURE REVIEW

2.1 Asthma Definition and Scope

Asthma is defined as a heterogeneous disease usually characterised by chronic airway inflammation (*GINA, 2024*; Mims, 2015). Asthma presents with wheezing, chest tightness, cough and shortness that vary depending on time and with intensity associated with limitation in airflow through the airways (*GINA, 2024*). It is estimated that 334 million people worldwide suffer from asthma, and even that is an underestimation, and it is the most common chronic disease in children (Asher & Pearce, 2014). Asthma remains a major global health concern, especially in low socioeconomic settings (Safiri et al., 2022). Despite the vast understanding of the pathophysiology and treatment of asthma, the morbidity has been unchanged, the costs remain high, and the prevalence of asthma is higher in areas with high levels of outdoor pollution(Gentile et al., 2022).

The pathophysiology entails chronic inflammation with airway remodelling, mucus production and obstruction in airflow that is reversible, based on exposure to allergens and immune response. Asthma diagnosis is mainly descriptive, based on symptoms and presentation patterns(Papadopoulos et al., 2012). The diagnosis of asthma in children is difficult due to this, as wheezing can be caused by various things, including viruses (Zar & Levin, 2012).

Several risk factors contribute to asthma development, including genetic predisposition, environmental exposures, and lifestyle factors. Environmental factors, including air pollution, allergens, respiratory infections, and occupational exposures, significantly influence asthma onset and severity. Lifestyle factors such as obesity, diet, and physical inactivity also modulate asthma risk.

Asthma triggers vary widely among individuals and may include allergens (e.g., pollen, dust mites, pet dander), irritants (e.g., smoke, strong odours, air pollution), weather changes, respiratory infections, exercise, and stress (*GINA, 2024*). Exposure to tobacco smoke, both active and passive, has been strongly linked to increased

asthma prevalence and severity. Additionally, viral respiratory infections such as rhinovirus and respiratory syncytial virus (RSV) have been implicated in exacerbating asthma symptoms, particularly in children. Occupational asthma is another concern, with workplace exposures to chemicals, dust, and fumes contributing to disease onset in susceptible individuals.

The prevalence of asthma has been increasing in China, with more boys affected than girls and more in the rural areas (Li et al., 2020). In the United States, a study showed a decline in prevalence rates among children between 2010 and 2021, while it increased among adults (Pate & Zahran, 2024).

A systemic analysis done on the literature of the last two decades showed an increasing prevalence in Africa and a likelihood of underestimation, 45 studies were included and there are more studies (Adeloye et al., 2013).

In Kenya, the WHO estimates that 4 million people (7.5% of the population) are suffering from asthma (*Kenya Asthma Management Guidelines, 2022*). A true global trend of asthma is objectively assessed by factoring in deaths and the prevalence of disability-adjusted life years(Safiri et al., 2022). Asthma is included among the top 20 global conditions for global ranking for disability-adjusted life years in children, and for those between 5 and 14 years, it is ranked among the top 10 causes (I. Asher & Pearce, 2014). At the same time, the global disparity in the prevalence of asthma has reduced in LMIC. The great majority of asthma patients who live in LMIC have disproportionately high asthma morbidity and mortality, especially due to pollution and allergens. This huge burden of disease is attributed to the fact that essential medications such as Inhaled Corticosteroids (ICS) are unavailable and unaffordable (Mortimer, Masekela et al., 2022).

The prevalence of asthma-related deaths varies significantly among different countries, influenced by factors such as pollution from urbanisation and various socioeconomic factors such as pollution in informal settlements (Meme et al., 2023; Sinharoy et al., 2018). The prevalence of severe asthma in Africa is associated with high morbidity and low quality of life (Kirenga et al., 2024).

A study on allergic conjunctivitis in Muranga and its related morbidity conditions among children below five years revealed that asthma accounted for 19.2% of the cases, while atopic dermatitis and allergic rhinitis accounted for 23.1% and 43.2%, respectively (Ireri et al., 2022).

The diagnosis of asthma is primarily clinical, relying on a good history and physical examination, and is largely descriptive (Papadopoulos et al., 2012). Pulmonary lung function tests are key but are often not achievable, especially in developing countries and are difficult to perform in children under 5 years. (*Kenya Asthma Management Guidelines, 2022*). Studies in Africa and across the globe have demonstrated that spirometry and other lung function tests are highly recommended but are usually underused, especially in developing countries, due to inadequate resources and training deficiencies on use. More often than not, children are treated without lung function tests.(Ayuk et al., 2017). Additionally, even when lung function tests have been performed, reference ranges are unavailable and not standardised or sometimes undetermined (Masekela et al., 2019). However, there is a need to encourage and support healthcare workers to ensure the use of spirometry in paediatric respiratory conditions, including asthma (Jat, 2013). In our study, the diagnosis was based on the history and documentation of the clinician, as current studies are showing continuation of early onset wheezing beyond 18 months is associated with asthma diagnosis (Duijts et al., 2016). The mortality of asthma has not been extensively investigated, but it is generally low and decreases across Europe. It accounts for 1.1% of worldwide disability-adjusted life years for all causes.(Ferrante & La Grutta, 2018). A systematic review done between 1990 and 2019 showed the mortality rate at 0.5 per 100,000, a 65% decrease across 204 countries(Zhang & Zheng, 2022).

2.2 Asthma Guidelines

Several guidelines have been developed about the diagnosis and management of Asthma. These range from global guidelines to national guidelines. The Kenya Asthma Management Guideline (KAMG) was developed to ensure people living with asthma would be provided with quality care and treatment, and thus reduce morbidity and avoidable deaths. It was designed to standardise treatment for asthma

in both the public and private healthcare sectors. The latest guidelines published were in 2021. A study by Pakkasela et al. 2023 in Finland assessing the adherence to guidelines showed that the guidelines are well adopted. Finland's successful asthma management program is characterized by adherence to evidence-based guidelines, emphasizing patient education, and promoting a multidisciplinary care approach. The country's National Asthma Program coordinates efforts to implement standardized and high-quality care across healthcare providers. Finland's efforts have resulted in reduced asthma-related hospitalisations, improved patient quality of life, and healthcare cost savings. The program's success highlights the importance of comprehensive asthma management, including electronic health record systems and public health awareness campaigns. Other countries can learn from Finland's approach to enhance their own asthma care and outcomes**.**

The Global Initiative for Asthma (GINA) has also been in use with the latest publication in the year 2025. The GINA program was initiated to raise awareness among public health and government officials, health workers, and the general public that asthma was on the increase.

These provided recommendations for management tailored to local resources and local healthcare systems that are based on scientific evidence (Reddel et al., 2015). Clinical guidelines are systematically developed to help practitioners and patients make decisions regarding appropriate healthcare for specific circumstances (Bousquet et al., 2007).

GINA Guidelines are divided into stepwise management for different ages of children, to include 5 years and below, 6–11-year-old and 12 years and above.

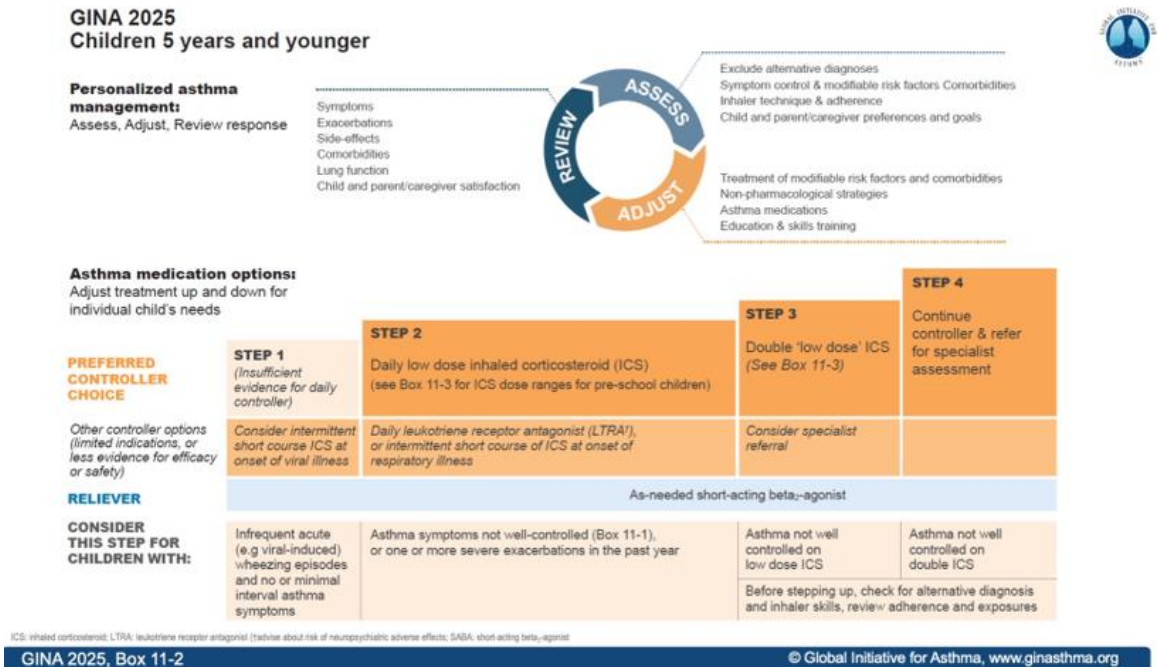

Figure 2.1: GINA Stepwise Asthma Treatment for Children Aged 5 Years and Below (Adopted from GINA Guidelines 2025).

The treatment options for different symptoms are outlined, and the general guideline is for the clinician to assess, adjust and review appropriately before stepping up or down the patient's treatment.

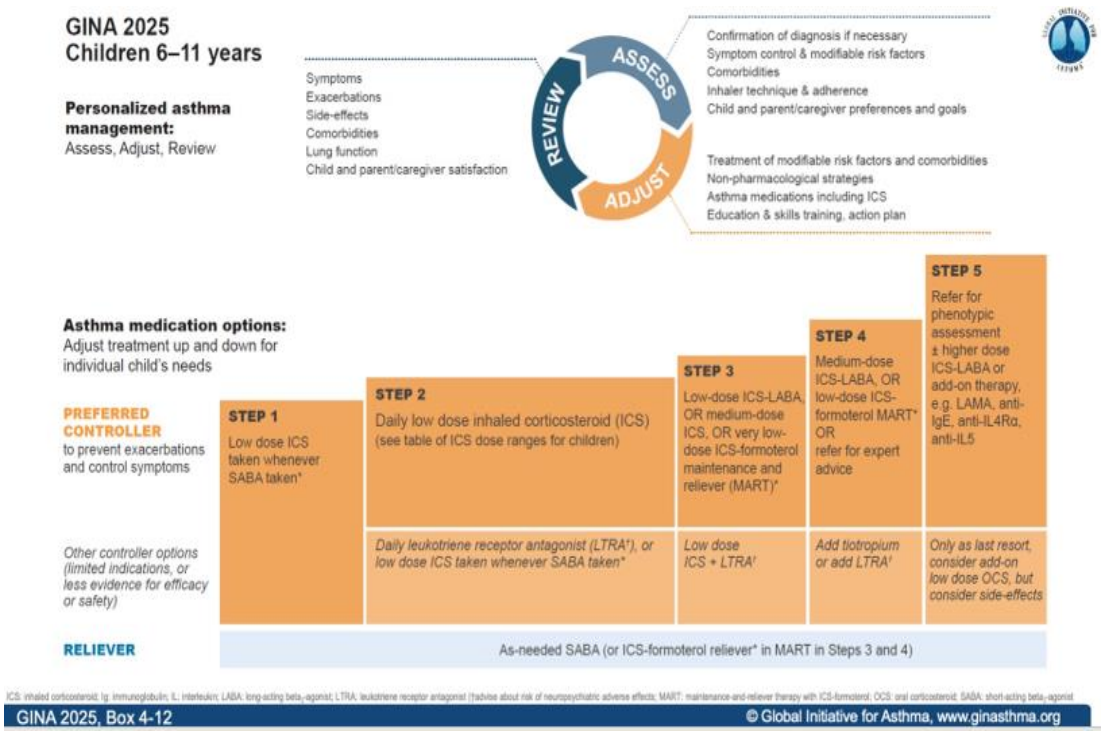

Figure 2.2: GINA Stepwise Asthma Treatment for Children Aged 6-11 Years (Adopted from GINA Guidelines 2025).

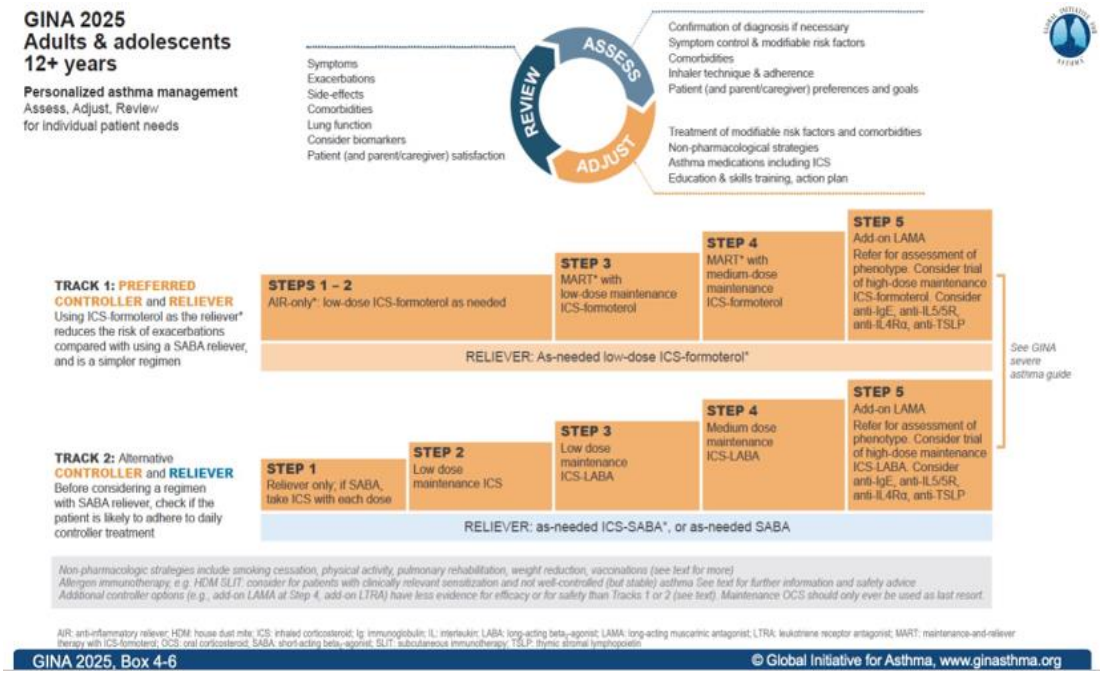

Figure 2.3: GINA Stepwise Asthma Treatment for Children Aged 12 Years and Above and Adults (Adopted from GINA Guidelines 2025).

KAMG Guidelines are divided into stepwise management for different ages of children, including 5 years and below, 6–11-year-old and 12 years and above.

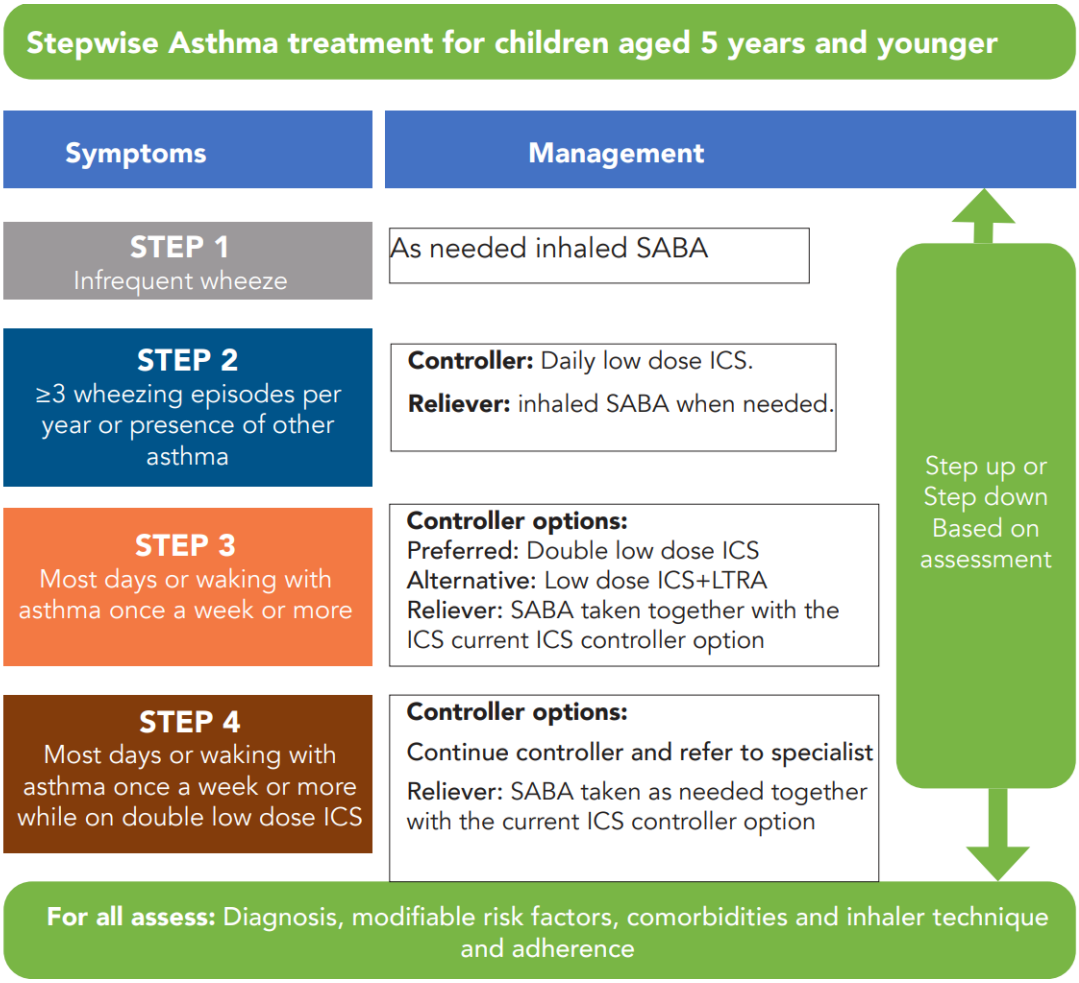

Figure 2.4: KAMG Stepwise Asthma Treatment for Children Aged 5 Years and Below (Adopted from KAMG).

The guideline outlines a stepwise approach to the treatment of asthma in children aged 5 and below. It is conclusive in that it shows symptoms increasing in severity and their corresponding recommended medication. It reminds clinicians to take a holistic approach in assessment and treatment by ascertaining diagnosis, curtailing modifiable risk factors that trigger asthma attacks, addressing comorbidities, and assessing and reminding patients and caregivers of their use of inhalers and their general adherence to the management of asthma.

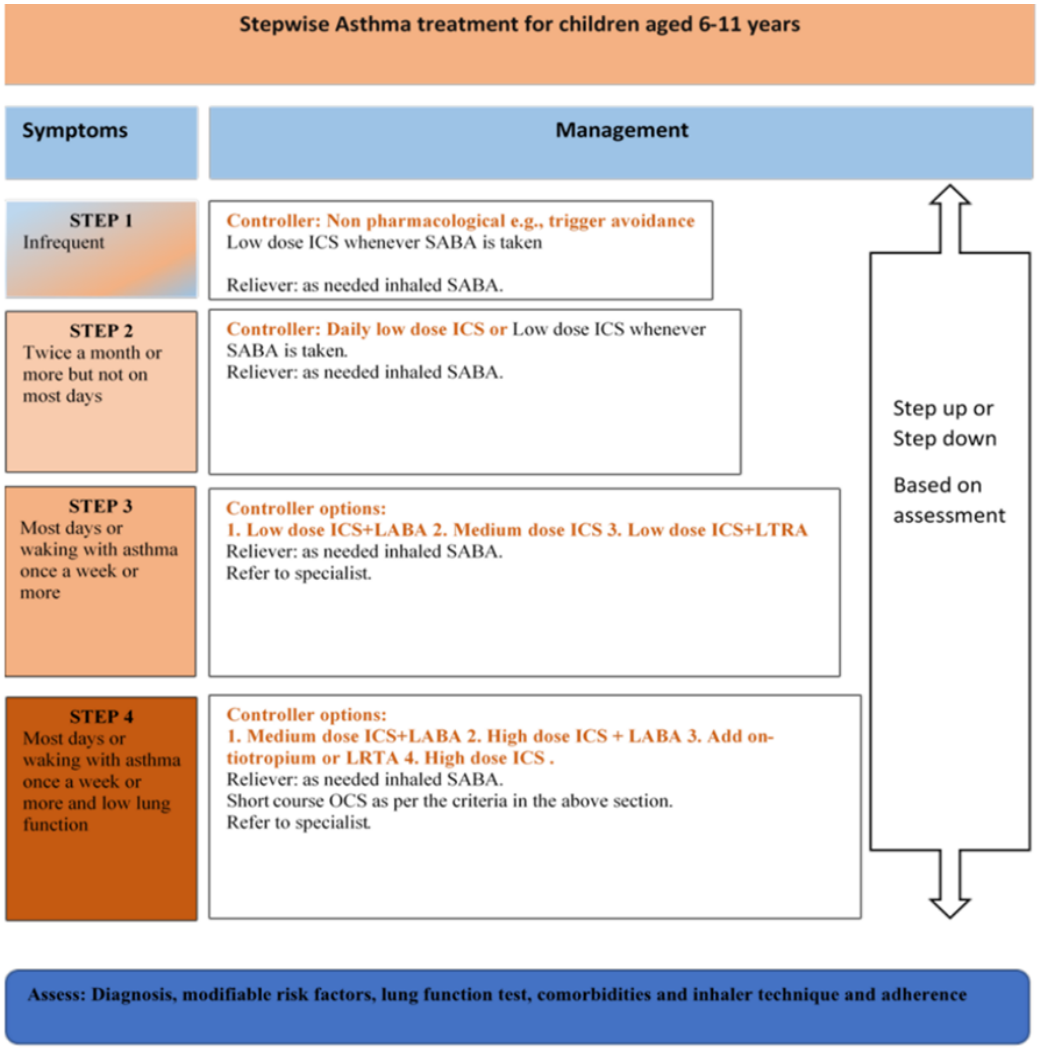

Figure 2.5: Stepwise Asthma Treatment for Children Aged 6 – 11 Years (Adopted from KAMG).

A well summarised stepwise approach on how to diagnose, treat and manage children aged 6 to 11 years with asthma.

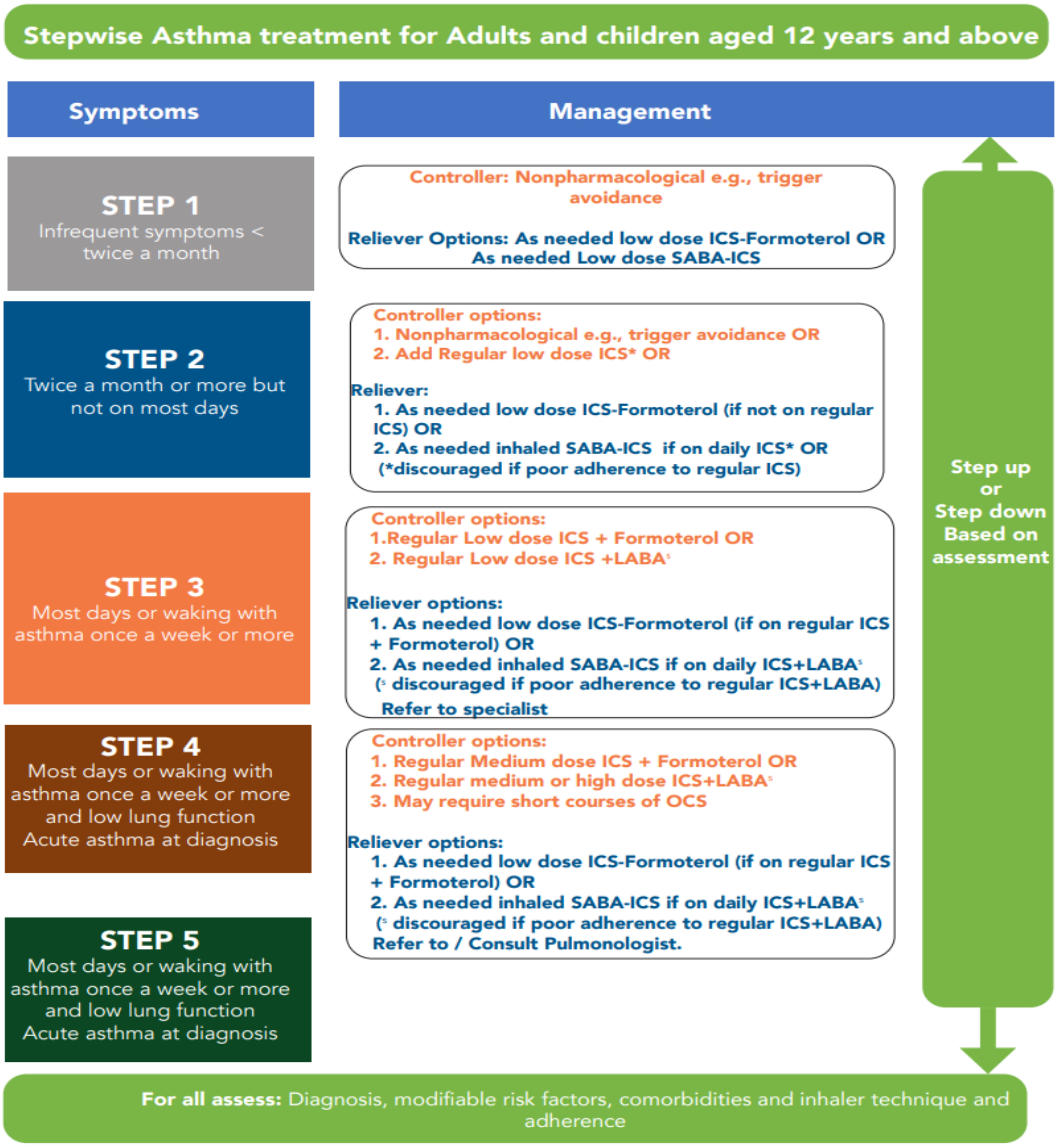

Figure 2.6: Stepwise Asthma Treatment for Children Aged 12 Years and Above and Adults (Adopted from KAMG).

The figure above shows a stepwise approach to the treatment of asthma in children aged twelve years and above. A deranged lung function test is included as part of the investigation, which can be carried out because this age group can follow instructions during the test.

2.3 Acute Asthma Exacerbation Symptoms and Classification

Acute asthma exacerbation (Flare-ups) refers to a change in the patient's usual status characterised by an increase in symptoms of shortness of breath, cough, wheezing or chest tightness, which is unresponsive to usual effective therapy, and which may necessitate care in an emergency room or hospital ward. Previously, there was no dominant definition of an exacerbation as it was based on urgent outpatient visits or hospitalisations and the need for steroids or reliever therapy to prevent serious outcomes (Fuhlbrigge et al., 2012). Flare-ups of asthma increase the burden of health in children as this directly translates to the long-term care of these patients (Leung, 2021). Frequent exacerbations and constant need for medication are indicators of severe asthma and consequently require steps four to five of the suggested GINA guidelines (Kirenga et al., 2024).

Data on the prevalence of acute asthmatic exacerbations in paediatrics in Africa is limited; however, a systematic analysis revealed a rising prevalence of asthma (Adeloye et al., 2013). A study in the United States demonstrated that only a minor 20% of the asthmatic population is responsible for acute asthma. Additionally, several precipitants of exacerbation such as viruses, allergens, drugs, hormones, air pollutants, exercise and stress being common (Dougherty & Fahy, 2009).

Studies have suggested vitamin D insufficiency triggers acute asthma and vitamin D supplementation reduces the frequency of exacerbations (Brehm et al., 2009).

The KAMG defines acute asthma exacerbation as a change in the patient's usual status characterised by an increase in symptoms of shortness of breath, cough, wheezing, or chest tightness which is unresponsive to usual effective therapy and which may necessitate care in an emergency room or hospital ward. The severity of asthma needs to be assessed to provide the appropriate management acutely and better integration on discharge plans.

KAMG classifies flare-ups into 4 categories: life-threatening asthma, severe asthma exacerbation, moderate asthma exacerbation, and mild asthma exacerbation.

Table 2.1: Showing KAMG Classification of Acute Asthma Exacerbations

Classification	Clinical Signs	Measurement
Life-threatening asthma	Silent chest Cyanosis. Hypotension. Bradycardia. Poor respiratory effort. Responds to pain stimulus only or unresponsive.	Saturation of oxygen below 92%.
Severe asthma exacerbation	Unable to complete sentences in one breath. Too breathless to feed. Responds to voice, agitation, or irritability. Has lower chest wall in-drawing Tachycardia Tachypnoea	The saturation of oxygen is below 92%.
Moderate asthma exacerbation	Not responding to initial treatment of a mild exacerbation within 2 hours. Has expiratory wheezing. Tachypnoea. Has no lower chest wall indrawing Able to talk but may have episodes of breathlessness. No altered mental state. May or may not be able to feed.	The saturation of oxygen is above 92%.
Mild asthma exacerbation.	Has an expiratory wheezing Has no tachypnoea Has no lower chest wall indrawing Able to talk and feed with no breathlessness	Saturation of oxygen above 92%.

2.4 Acute Asthma Exacerbation Management

Mild exacerbation is treated using a pressurised metered-dose inhaler (pMDI) and a spacer with continued use of controller medication. A follow-up clinic should be scheduled after 48 – 72 hours from the onset of symptoms. In moderate exacerbation, antimuscarinic agents such as ipratropium bromide, and oral steroids such as prednisolone are used together with the pMDI. These patients are allowed home after they show significant improvement. Other factors to consider before discharging a patient with moderate exacerbation are the need for oxygen supplementation, patients who cannot use their inhaler medication well at home, patients with poor adherence, or those with poor social factors who may not come for follow-up clinic after 48 – 72 hours. Severe and life-threatening acute exacerbations should be managed in the intensive care unit. A single dose of intravenous (IV) magnesium sulphate can be given in the acute care setting while closely monitoring for hypotension. Nebulised magnesium sulphate is not recommended as its studies are still ongoing. IV salbutamol is only administered if the patient is in the critical care unit, where cardiac monitoring can be done. The use of IV aminophylline is only recommended in children and not adults. Where oral corticosteroids are not tolerated IV dexamethasone is recommended. Steroid nasal sprays and non-sedating antihistamines are used for a comorbid flare-up of allergic rhinitis. Adrenaline is only indicated if the flare-up is a result of an anaphylactic reaction.

KAMG almost corresponds with the Italian Society of Paediatrics guidelines. However, the Italian guidelines recommended the use of heliox in life-threatening attacks.[2] Heliox is a breathing gas mixture of helium and oxygen. It is used in the management of several respiratory conditions. The low density and viscosity of heliox allow a greater and easier gas flow within the bronchial tree decrease airway resistance and decrease the work of breathing in selected patients. The use of heliox has not been widely accepted because further research on it is still ongoing.

Merck Manual suggests the use of terbutaline as opposed to adrenaline because of the lesser cardiovascular effects and longer duration of action but pointed out that is more expensive and not produced largely anymore. KAMG suggests the use of

adrenaline only in anaphylactic reactions, but the Merck Manual does not confine its use to asthma exacerbations, only when there is an anaphylactic reaction. They suggested the use of heliox in the management of patients with vocal cord dysfunction.

Canadian guidelines prefer using the Paediatric Respiratory Assessment Measure (PRAM) scoring system to classify asthma severity. British guidelines mention the use of nebulised furosemide to cause bronchodilation, but clinical trials have shown no added benefit compared to beta-agonists.

Similarly, all guidelines discouraged routine prescription of antibiotics unless there's strong evidence of bacterial infection.

The Kenyan Ministry of Health has also briefly included asthma management in the Basic Paediatric Protocol, a pocket booklet, which synergizes the KAMG guidelines.

It highlights the diagnosis and immediate management of acute asthma patients.

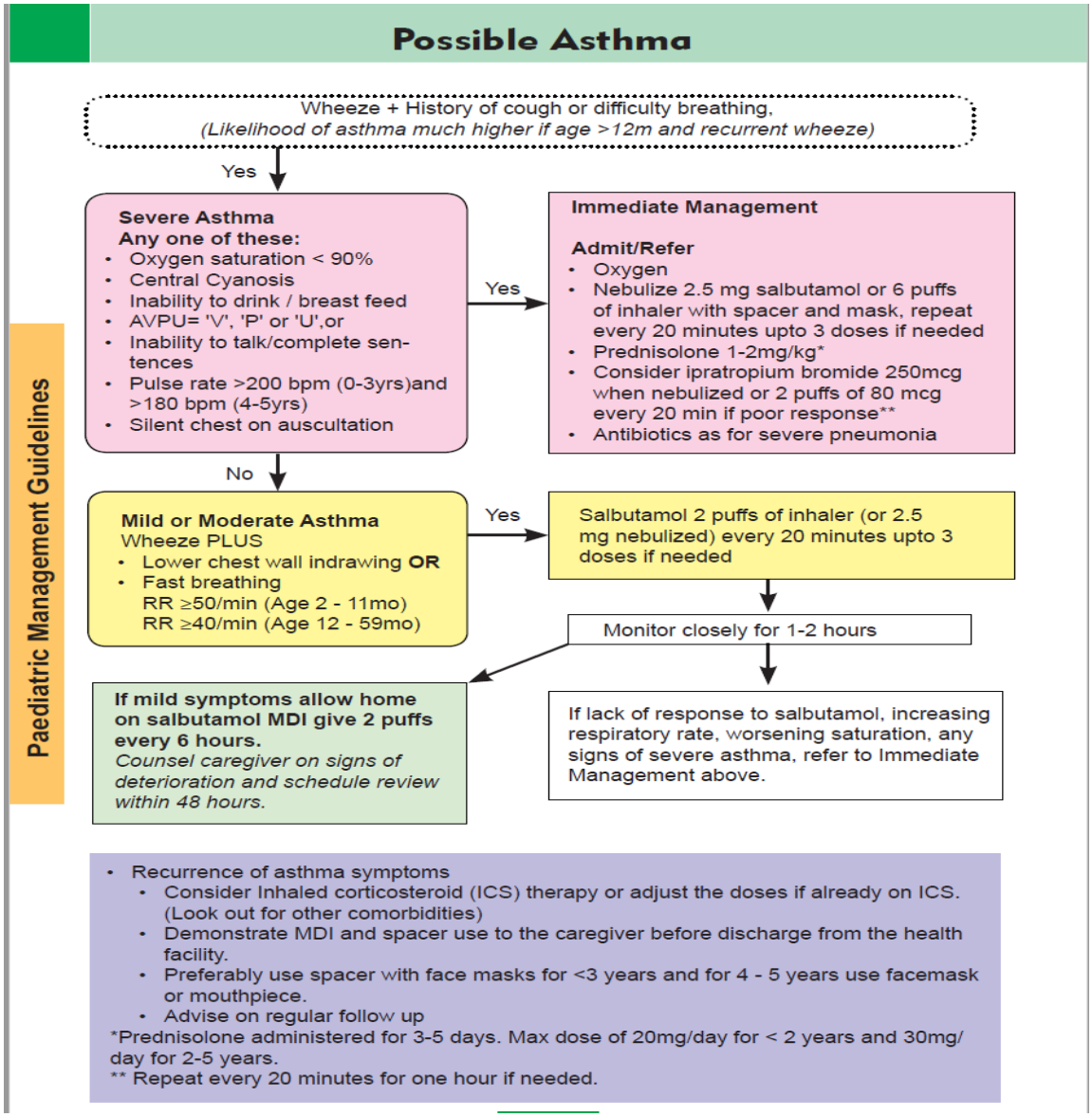

Figure 2.7: MOH Basic Paediatric Protocol Management of Asthma (Adopted from MOH Basic Paediatric Protocol, October 2022).

2.5 Challenges to Adherence National Guidelines in the Management of Acute Asthma

2.5.1 Magnitude of Poor Adherence to Guidelines

Doctors' knowledge contributes to the practice and quality of care rendered to patients (Ozoh et al., 2019). Skills and attitudes are equally paramount in the implementation of treatment guidelines (Lee & Le, 2013). The management of asthma has been simplified by national guidelines into a simple stepwise approach dependent on patient symptoms and response. These guidelines are easy to follow, and some are even printed on posters and placed in emergency rooms for ease of use by healthcare providers. Despite these developments, there is a lack of adherence to treatment guidelines, and this has affected clinical outcomes. In a bid to understand the barriers to adherence to these by patients, caregivers, and healthcare providers, several studies have been carried out, and solutions that are tailored to individual healthcare systems are presented to improve care and outcomes. Proper implementation of guidelines by primary care doctors is still needed in the form of written care plans, and providing routine follow-up is much needed to improve adherence to management guidelines (Cheong et al., 2021). The lack of application of standardised tools to monitor asthma control or to manage treatment has hampered proper adherence to national guidelines in the management of asthma (Chapman et al., 2017).

Sticking to stipulated guidelines that are developed to ensure proper standard care is offered to patients has been shown to reduce morbidity. A study was done at a primary children's medical Centre in Utah and other centres across the state, and it involved children between 2 and 17 years with asthma over the period between the years 2003 and 2013 to determine the effects of an evidence-based care process model. The study revealed that even 5 years after implementation of the program, there was a reduction in the numbers of asthma readmissions, the length of hospital stays and a trend towards reduced healthcare costs (Nkoy et al., 2015).

A lack of adherence to treatment guidelines of adding inhaled corticosteroids as appropriate depending on the level of acute exacerbation of asthma was shown to

have caused poor short-term outcomes- shown by rehospitalizations and a requirement of medical care from the primary physician, within the first week after their initial visit to the emergency department-among 258 children with asthma who were consulted over phone calls 7-15 days after preliminary treatment at a paediatric emergency department in Spain(Benito-Fernández et al., 2004). A study review done in Spain on the short-term outcomes of treatment of acute asthma reported that adequate outpatient follow-up and maintenance treatment with inhaled steroids could improve short-term clinical outcomes (Benito-Fernández, 2005).

2.5.2 Barriers to Adherence to Implementation of Asthma Guidelines

Several interrelated barriers contribute to poor adherence to asthma management guidelines at the level of healthcare providers, patients, caregivers, and the health system. A study done in Ethiopia sought barriers to patients' adherence to treatment and found that among these were a generally limited awareness about asthma management by patients and their caregivers, use of traditional and religious practises, lack of healthcare providers' adherence to treatment guidelines and low access to medication (Kassa et al., 2022). The cost of medication and lack of shared decision-making by their healthcare providers are barriers to adherence to recommended treatment (Davis et al., 2019). Low level of knowledge, unavailability of diagnostic and treatment facilities, poor adherence, and high cost of medication are barriers to good practice guideline-based asthma management (Ozoh et al., 2019). At the time, there is a challenge in the use of spirometry among children as seen in the Kenyan setting (Irungu et al., 2022)

Healthcare providers need to adapt to new guidelines by first understanding scientific developments and evidence-based guidelines, and changing their behaviours accordingly. Lack of this adaptability leads to non-adherence to new treatment guidelines (Umoh & Ukpe, 2012). A general lack of awareness of asthma treatment guidelines and how to implement them still exists, and this hampers adherence (Khan et al., 2022). Parents and caregivers' literacy may interfere with understanding the condition and its management, as seen in the Kenyan setting, where a diagnosis of asthma, which has no proof, is not readily accepted (Simba et al., 2018), and periods

of symptom remission are mistaken for a complete cure by caregivers (Irungu et al., 2022). It therefore goes a long way to show that patient asthma control, that is, a picture of efficacy of management, is affected by parental or caregiver's perception of asthma (Simba et al., 2018).

Prioritisation of symptom control over exacerbation reduction by health practitioners and a deficit in the knowledge of maintenance and reliever therapy among physicians still hinder adherence to treatment guidelines for the proper management of patients with asthma (Chapman et al., 2017). Lack of time, equipment and supporting staff have also been found to lead to poor adherence to asthma management guidelines (Sun et al., 2010). It was found that a lack of self-efficacy hindered the proper use of peak flow metres, and a lack of agreement between the healthcare providers and caregiver on the prescription of corticosteroids led to a lack of adherence to management guidelines (Cabana et al., 2001).

A study done to review the following topic areas: child and adolescent perceptions of physicians' behaviours in paediatric chronic illness management, parental perceptions of physicians' behaviours in paediatric chronic illness management; physicians' adherence to guidelines for paediatric chronic illness management; physicians' communication of information concerning paediatric chronic illness treatment and the relationship of physician behaviours to treatment adherence; revealed discrepancies between needs of parents and adolescents and physician behaviours as well as inconsistencies in physician behaviours, including adherence to practice guidelines, which may limit children's adherence to medical treatment (Drotar, 2009).

It has, however, been found that practice guidelines are most likely to be followed by healthcare providers if they are simple to use, flexible and motivated by the need to improve the quality of care and not to reduce costs. This was shown in the findings of a study done in 50 states of Puerto Rico among members of the American Academy of Paediatrics, involving 627 general paediatricians, where general practice guidelines in mainly treatment of asthma 77%, otitis media19% and

hyperbilirubinemia 27%were applied fully by 35%, partly by 44% and not at all by 21% based on simplicity and flexibility (Flores et al., 2000).

2.6 Outcomes

The attitude of a physician is an important influence on a child's and parents' adherence to treatment. A study done to review the following topic areas: child and adolescent perceptions of physicians' behaviour in paediatric chronic illness management, parental perceptions of physicians' behaviour in paediatric chronic illness management; physicians' adherence to guidelines for paediatric chronic illness management; physicians' communication of information concerning paediatric chronic illness treatment and the relationship of physician behaviour to treatment adherence; revealed discrepancies between needs of parents and adolescents and physician behaviour as well as inconsistencies in physician behaviour, including adherence to practice guidelines, which may limit children's adherence to medical treatment (Drotar, 2009).

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2.7 Research Gaps

Asthma management guidelines are present and frequently updated to bridge the gap in the care of asthma and support clinical decision-making and subsequently improve overall asthma control. Despite the concerted efforts to provide evidence-based guidelines globally and locally on the management of asthma, adherence to them by both healthcare practitioners and patients remains a challenge. Studies have demonstrated that healthcare workers face barriers such as time constraints, poor dissemination, knowledge gaps and clinical inertia, hence poor adherence to the recommendations. (Mathioudakis et al., 2021). Additionally, the adaptation of international guidelines like the Global Initiative for Asthma (GINA) in various local settings has been uneven. (Allehebi & AL-Jahdali, 2023)

2.8 Conceptual Framework

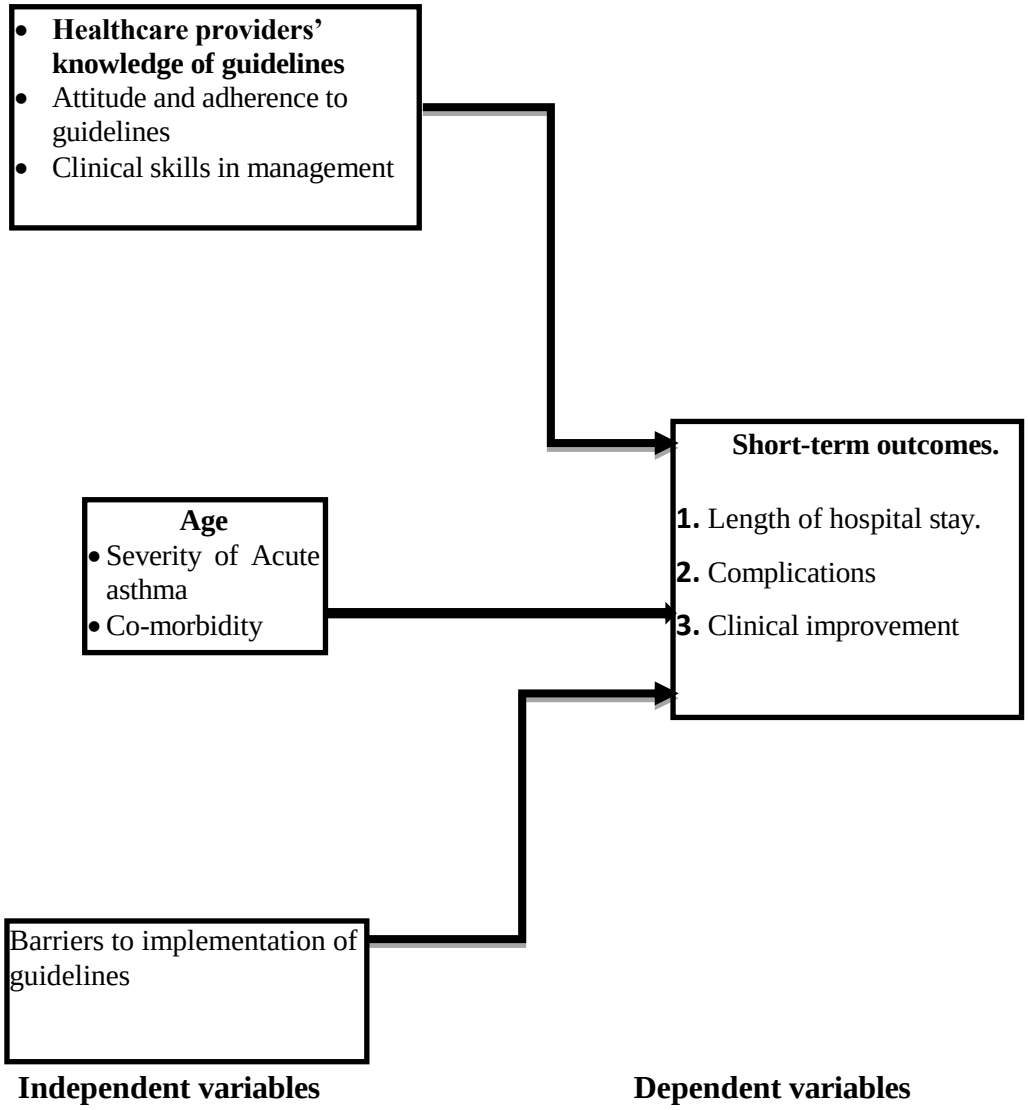

Figure 2.8: Conceptual Framework

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Study Site

The study was conducted in Mama Lucy Kibaki Hospital, a level 5 hospital located in Embakasi constituency in Nairobi County, 11km from Nairobi Central Business District off Kangundo Road along Kayole Spine Road, being the main public hospital in the larger Eastland area. Eastlands is densely populated with residential estates such as Umoja, Dandora, Kayole and Embakasi. A large proportion of the working class in Nairobi lives within these estates. The area has a rich cultural and social life, with numerous markets, entertainment venues, and public transport hubs linking it to the rest of Nairobi. The region is also economically prominent in the city by making inputs through jua kali (small-scale production), retailing, and food vending as the main informal business; therefore, the facility serves an estimated population of about 2 million people. The paediatric outpatient unit is operational daily and has various special clinics run by consultants at least once weekly - Paediatric Outpatient Clinic (POPC), Neonatal Outpatient Clinic (NOPC), Paediatric Diabetic Outpatient Clinic (PDOPC), and Paediatric Respiratory Clinic (PRC). The paediatric unit serves about 24,000 patients a month and about 500 per day. The paediatric inpatient wards include a 35-bed capacity newborn unit, 46 general wards from acute units, a respiratory conditions unit and other conditions. The bed occupancy rate on most days is above 150%, with over 100 reviews in the paediatric emergency unit per day and an average of 1000 admissions across both the newborn unit and the paediatric general wards.

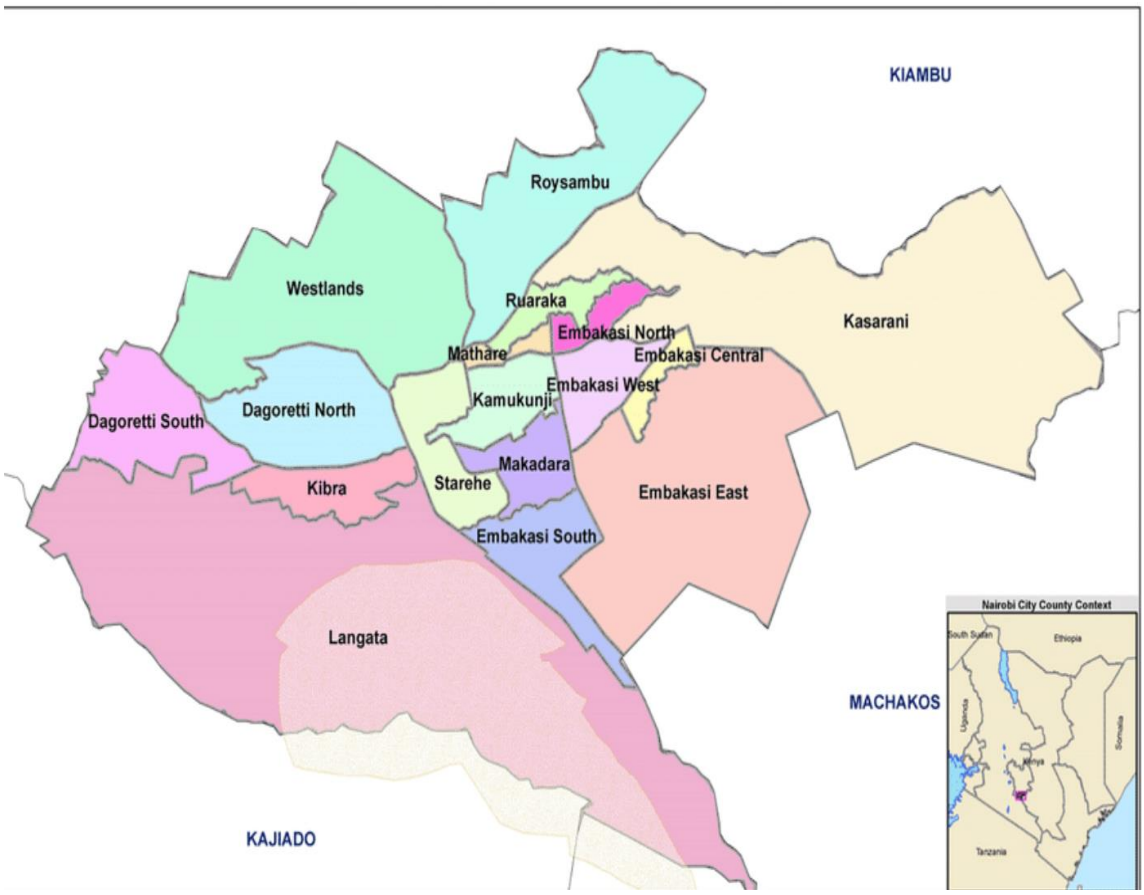

Figure 3.1: A Map of Nairobi County, Showing the Catchment Areas of MLKH

3.2 Study Design

The study was conducted using a mixed-methods design with a retrospective and qualitative design. The quantitative data using a retrospective design, where the medical records of children between the ages of 13 and 18 years who fit the criteria for acute asthmatic exacerbation and management based on the inclusion criteria were reviewed. A phenomenological qualitative design was used, where in-depth interviews (Key Informant Interviews, KIIs) in each hospital cadre of health care were undertaken, and 3 focused group discussions were conducted. The interviews were coded, transcribed, and analysed.

3.3 Study Population

The study population comprised children aged 3-18 years who presented with acute asthma exacerbations and received care at Mama Lucy Kibaki Hospital. These participants were managed within the paediatric services in the facility. Children within this age range were selected because they represent the paediatric population most commonly affected by asthma and are routinely managed under the paediatric care protocols.

Table 3.1: Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Medical records of children aged between 3 and 18 years attending the outpatient and inpatient departments with a diagnosis of asthma.	
Medical records of children aged between 3 and 18 years presenting with symptoms of asthma.	
Healthcare Practitioners (Paediatricians, Registrars, medical officers, clinical officers, medical officer interns, clinical officer intern and nurses) who are involved in the management of children with asthma that consented to the Key informant interviews and focused group discussions.	Unwillingness to participate in the study

3.5 Sample Size Calculation

For Quantitative Data

Using Fischer's formula to calculate the sample size for those with acute asthma / acute asthma symptoms;

$$n = \frac{z^2 P(1-P)}{e^2}$$

Z = the standard normal deviation at the desired confidence interval (1.96 for a 95% confidence level)

P = Estimated adherence level to national guidelines for asthma control 57.1%, (Kagwaini et al., 2018b)

e = Desired level of statistical significance (5%)

Replacing these values in the above formulae:

n = (1.96^2 ∗0.571∗0.429) / (0.05) ^2 =376.413

Adjusting for the finite population for 1 year at MLKH, based on hospital records

An average number is 4 patients with acute asthma/acute asthma symptoms per week.

$$n_a = \frac{n}{1+\frac{(n-1)}{N}}$$

(n_a =is the adjusted sample size, n is the calculated sample size, and N= the population size.)

Thus; N= 4*52= 208, n=376. Therefore, n_a = (376) / 1+ (375/ 208) =134.1475, rounding off brings it to 135. Hence, the adjusted sample size for individuals with acute asthma/ acute asthma symptoms was 135 participants.

For Qualitative Data

The sample size of qualitative data was 26 healthcare practitioners working in the paediatric department, both in and outpatient, involved in the management of acute asthma patients. This was informed by (Guest et al., 2006). Purposive sampling was used to ensure adequate representation of all cadres, given variations in expertise. The size was determined based on the data saturation principles. We determined our sample size for this qualitative study based on the principles of data saturation (Saunders et al., 2018) since failure to reach saturation hurts the quality of research (Fusch & Ness, 2015) (Morse, 2015). The study aimed to explore their perspectives on guideline availability, utility, and barriers to adherence. We collected 26 interviews using the key informant guide since it's the level at which saturation was reached. This was in keeping with the literature that saturation is attained between 15-30 participants ((Hossain et al., 2024; Muellmann et al., 2021; Saunders et al., 2018), and with some studies suggesting it is achieved within the first twelve interviews (Guest et al., 2006). Data analysis revealed that no new themes were being generated beyond the 26 participants. Focused discussion groups contained 8 participants; most studies suggest 6-12 participants (Hennink et al., 2019) to maximise the comprehensiveness of the responses.

3.6 Sampling Techniques

Consecutive sampling was used to recruit participants who met the inclusion criteria. Patient medical records were sorted to include those with a diagnosis of asthma or asthma symptoms who were either seen at an outpatient or underwent inpatient management during the period of June 2022 and June 2023, and were enrolled in the study, one hundred and thirty-five children. This ensured capturing all of the relevant cases without exclusion and reduced selection bias. Healthcare practitioners were selected by a convenience sampling method based on availability and consent, while combining with purposive sampling to ensure representation from all healthcare

practitioners. A total of 26 interviews were conducted in person and recorded using a Huawei P30 Lite phone, and lasted approximately 10-15 minutes after those willing to participate and met the inclusion criteria consented. Three focus group discussions were conducted with eight participants in each group, and recorded and transcribed. The number followed principles of thematic saturation.

3.7 Study Procedure

3.7.1 Quantitative Data

At the beginning of the study, a research assistant with a medical background, a medical officer intern not working in the paediatrics department, and a participant in the research were trained on the objectives and expectations of the study, and familiarised with the tools used.

Data was obtained from the Hospital medical records of children aged three to eighteen years, diagnosed with acute asthmatic exacerbation and managed between June 2022 and June 2023 and reviewed. The data was then abstracted from physical files. The files were retrieved using a Patient Identification number after checking the admission book for asthma diagnosis, from the records department that is located on the ground floor of the medical wards adjacent to the female medical wards at MLKH. The files were retrieved during weekdays from 8:00 am to five pm and between December 2023 and March 2024. The files were screened for eligibility criteria by confirming the diagnosis in the file is the same as that in the admission book. Five hundred and seven files were retrieved, but only one hundred and three were eligible based on the diagnosis and completeness of information, such as age and gender and were enrolled in the study. The files were returned after the data abstraction was completed and more requested. Outcomes of interest included: patient characteristics, signs and symptoms, clinical classification, management-initiated, length of hospital stays, and clinical outcomes with discharge instructions for quantitative data.

The Health Information Management System (HIMS) data was retrieved by running a query in the system on the diagnosis of asthma, wheezing and nebulisation. A total

of thirty-two participants meeting the inclusion criterion were enrolled in the study. The data captured included demographic characteristics, recorded clinical signs and symptoms, disease classification, treatment and short-term outcomes. The data abstraction form (Appendix II) was validated through the expert opinion of pulmonologists and paediatricians, hence ensuring comprehensiveness, and the questions were developed against the established Asthma guidelines (*Kenya Asthma Management Guidelines, 2022,*) (*GINA, 2024*).

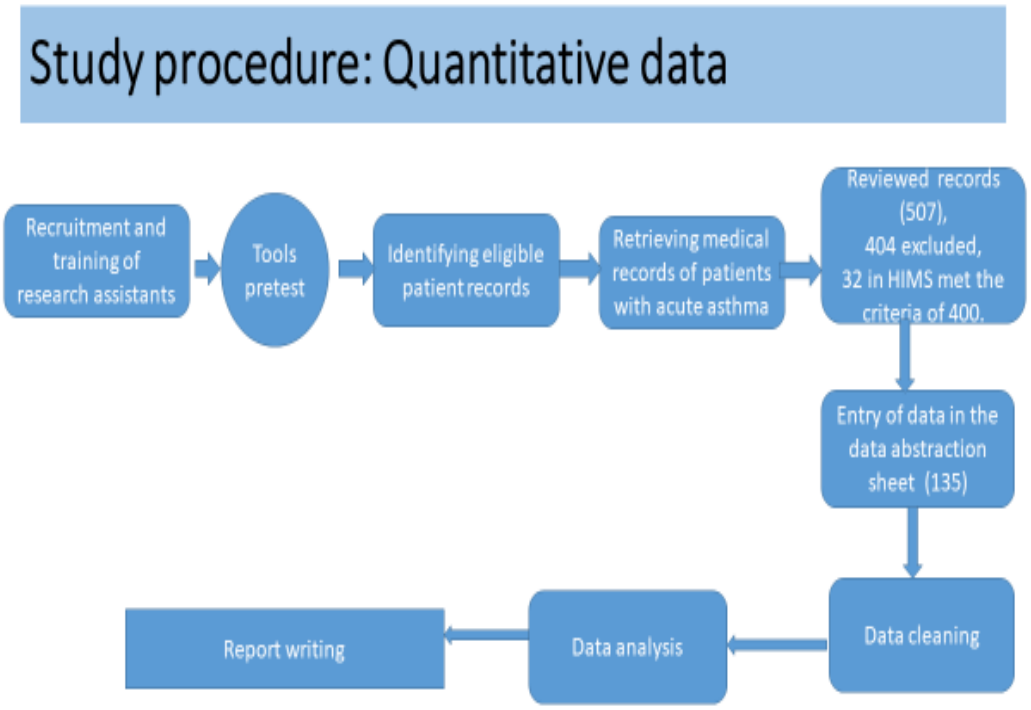

Figure 3.1: Showing the Study Procedure for Quantitative Data Acquisition Process

3.7.2 Qualitative Data

The interviews were conducted after consent had been obtained (Appendix I). Focused group discussions were done in person, recorded and transcribed after consent (Appendix I). A total of twenty-six healthcare practitioners working in the paediatric department, both in and outpatient involved in the management of acute

asthma patients were privately interviewed in person and audio recordings were made using a Huawei P30Lite mobile phone. Providers included (paediatricians, registrars, medical officers, clinical officers, medical officer interns, Clinical officer interns, and nurses), thus a total of 26 in-depth interviews were carried out until saturation was reached. The interviews were 10-15 minutes due to the length of the Key Informant Guide (Appendix III). Additionally, 3 focused group discussions comprising 8 members each, based on availability, were conducted in person with the use of a Focused Group Discussion Guide (Appendix IV). This enhanced the collected data, revealing their perception of the usefulness, availability, knowledge, and skills of guidelines, and potential barriers to adherence. All the interviewees were fluent in English. Three focus group discussions, each containing eight participants, were conducted in person, recorded, transcribed, and each lasted for ninety minutes.

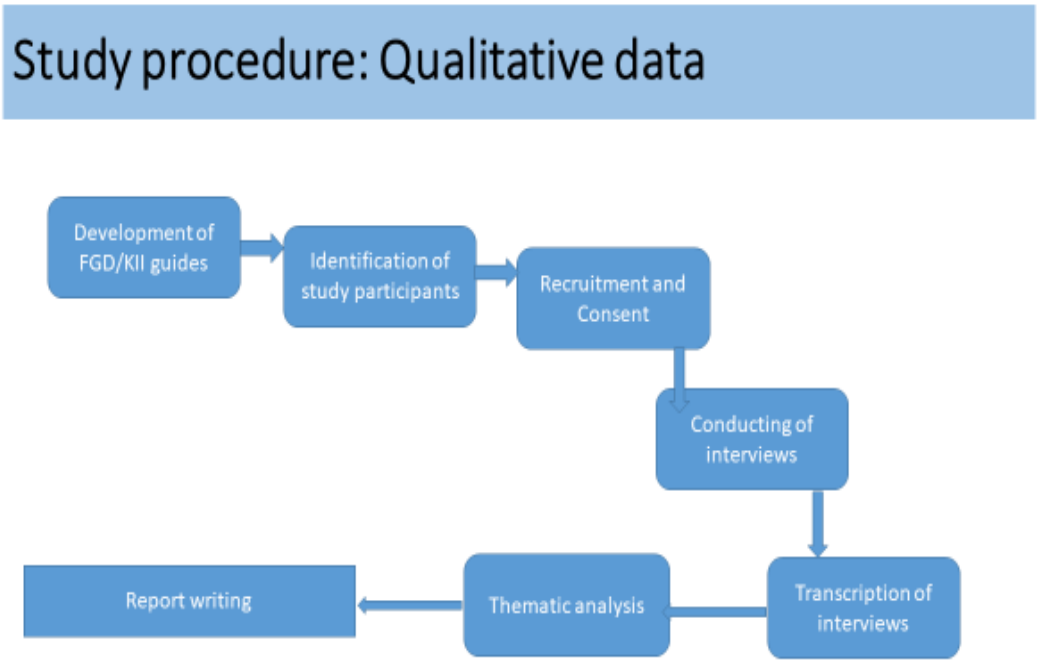

Figure 3.2: Showing the Study Procedure for the Qualitative Data Acquisition Process

3.8 Data Collection Tools

For quantitative data, Data was extracted from one hundred and thirty-five medical records from both the electronic records and physical medical records (files) using a data abstraction form (Appendix II). The Reliability of the data abstraction sheet was ensured by piloting the sheet and identifying any inconsistencies or ambiguities in the questions, while the content Validity was ensured by comparing the content with the guidelines, research objectives and literature review, and additionally, the tool was reviewed by the supervisors who are experts in the field. Additionally, the abstraction form was pretested, and the calculated Cronbach's Alpha for the questionnaire is 0.89, which is above the recommended level of 0.7.

For qualitative data, 26 interviews were conducted across the various cadres of healthcare providers to enhance the collected data. Revealing their perception of the usefulness of the guidelines, availability of guidelines, knowledge and skills and potential barriers to adherence for qualitative data using the Key Informant Interview guide (Appendix III) and guided using the Focused discussion group guide (Appendix IV) to provide a holistic understanding of the use of asthma guidelines, availability and implementation barriers. The FGD and KII guides underwent content and face validation through independent expert review and pre-testing in a comparable study population, with iterative refinement to enhance clarity, relevance, and alignment with study objectives; internal reliability was ensured through standardisation of the interview process, including the use of uniform probes, a structured guide, and trained moderators to promote consistency in data collection across interviews and discussion sessions Additionally, the reliability and validity of the key informant guides and focused group discussion guide was ensured by comparing the content with the guidelines, literature review and triangulation with quantitative data.

3.9. Ethical Considerations

The research proposal was presented to the department and upon their approval, Ethical approval was obtained from the Jomo Kenyatta University of Agriculture and Technology (JKUAT) Institutional Ethics Review Committee reference number

(JKU/ISERC/02316/0963) The National Commission for Science, Technology, and Innovation (NACOSTI), The reference number {REF: NACOSTI/P/23/28982}, Nairobi County and the MLKH research committee (REF: MLKH/ADM/RES/2). Informed consent was sought from healthcare providers before interviews and focused discussion groups. No coercion or inducements were made to encourage the participants to join the study. All records were anonymised and de-identified before analysis. The above steps ensured compliance with ethical standards and regulatory requirements, hence facilitating seamless data collection while maintaining confidentiality and anonymity.

3.10 Data Management and Analysis

3.10.1 Quantitative Data

Data was coded and entered into an Excel database, and data cleaning and confirmation of accuracy/consistency /inconsistencies were done. The cleaned data was exported to R version 4.3.3, and a significance of 95% was set.

Descriptive Analysis was done, and frequencies, proportions, interquartile range, mean, median and standard deviations were calculated and used to summarise the characteristics of the study population, while adherence was managed as binary data; hence, inferential statistics were used to analyse adherence to national asthma guidelines. The R version 4.3.3 was used for the analysis of quantitative data.

The chi-square test was used to calculate the association between short-term outcomes and co-morbidities while Fischer's Exact Test was used to calculate the relationship between adherence and short-term outcomes due to the small number of categorical variables.

3.10.2 Qualitative Data

The data from focused discussion groups and key informant interviews were coded and transcribed verbatim. The data was coded in terms of date and cadre to ensure anonymity. The interview transcripts of the key informant interviews and focused

group discussions were imported into NVIVO 13 software (QSR International, Australia) for management and analysis.

Thematic analysis, as elaborated by Kiger & Varpio (2020), used qualitative data to demonstrate the overall theme of limited resources as a challenge to the implementation of national asthma guidelines through deductive and inductive coding.

3.11 Data Presentation

Descriptive data was presented in percentages, charts, graphs, and tables and concise, clear texts for quantitative data, while qualitative data was presented through themes and sub-theme patterns with quotations from the data for support. Text and tables were used to present the integrated findings.

3.12 Data Dissemination

The dissemination of the results and recommendations was presented to the hospital, submitted to the JKUAT University repository in the form of a thesis as a partial fulfilment of the Master of Medicine in Child Health and Paediatrics and to the community through presentations at conferences and publications in peer-reviewed journals.

CHAPTER FOUR

RESULTS

4.1 The Social Demographic Characteristics of Study Participants

A total of 135 individuals participated in the study (N = 135). The age distribution indicates that the majority of participants, n=104, (77.0%) fall within the 3–6 years' age group, followed by 7–12 years, n=26(19.3%) and 13–18 years, n=5 (3.7%). This suggests that asthma diagnosis and hospital visits are more frequent in younger children, possibly due to their underdeveloped immune and respiratory systems. Gender distribution is relatively balanced, with a slightly higher percentage of males who were n= 75 accounting for (55.6%) as compared to females who were n=60 (44%). This aligns with studies suggesting that asthma prevalence is generally higher in young boys, potentially due to differences in lung development and airway size. Service category data shows that most children, 103, (76.3%) were hospitalized as inpatients, indicating that the severity of asthma symptoms required extended medical attention. The length of stay varies, with 47.6% staying between 4 and 7 days, while 45 children (43.7%) were discharged within 1 and 3 days. Only a small proportion required hospitalisation beyond 14 days, highlighting that most asthma cases can be managed effectively within a week. Parental occupation was documented for less than 50% participants, while a significant proportion, 80 (60.8%), had no occupation documented, which may indicate poor documentation and lack of priority for the socioeconomic factors affecting healthcare access. Among reported cases, there were 33 casual workers representing the largest group (24.4%), followed by 20 business owners (14.8%), indicating varied economic backgrounds.

Table 4.1: Sociodemographic Characteristics of Participants

Characteristic	N(Frequency)	Percentage
Age (years)	135	
3-6 years	104	77.0%
7-12 years	6	19.3%
13-18 years	5	3.7%
Gender		
Female	60	44.4%
Male	75	55.6%
Parents occupation		
Business	20	14.8%
Casual	33	24.4%
Not documented	82	60.8%

4.2 Age of Participants

Table 4.2 provides statistical measures of age of the participants. The mean age of participants was 5 years, with a standard deviation of 3.2, suggesting a relatively young study population. The median age of 4 years, with an interquartile range of 3.0–6.0, further confirms that younger children form the bulk of cases.

Table 4.2: Age of the Participants

Characteristic Age (years)	N (135)	Ranges
[Min - Max]; (Mean) [SD]; (Median) [Q1 - Q3]		[3 - 18.0]; (5) [3.2]; (4) [3.0 - 6]

Figure 4.1 provides an in-depth look into the financial means by which patients accessed healthcare services. This figure categorizes different payment methods utilized, including insurance and out-of-pocket spending. The distribution highlights the financial burden on families and potential disparities in healthcare access. Notably, a significant proportion of patients relied on out-of-pocket payments, accounting for 117 (86.7%) of respondents, while 18 (13.3%) reported using insurance (NHIF), suggesting limited insurance coverage in this population. NHIF is the name previously used for national health insurance, currently the Social Health Authority (SHA).

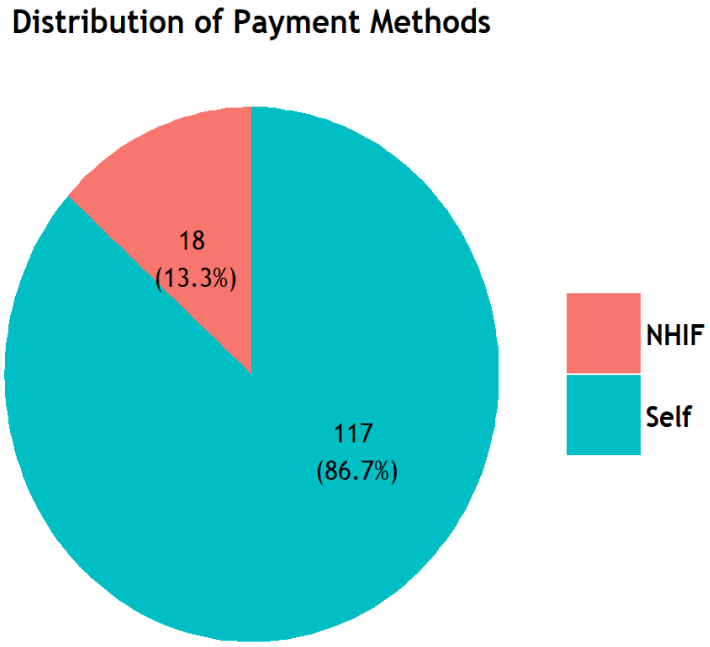

Figure 4.1: Payment Methods

4.3 Length of Stay

Table 4.3 provides statistical measures of hospitalization duration. Length of stay statistics indicate an average hospitalization duration of 4 days (SD = 3.5), with a median of 4 days and an interquartile range of 3.0–5.0. The maximum recorded length of stay was 32 days, possibly due to severe or complicated cases requiring prolonged care. The 32 excluded in the analysis were managed as outpatients.

Table 4.3: Length of Stay

Characteristic	**N**	**N = 135**
Length of stay (Days)	103	
[Min - Max]; (Mean) [SD]; (Median) [Q1 - Q3]		[1 - 32.0]; (4) [3.5]; (4) [3.0 - 5]
Outpatient		32

4.4 Assessment of Relevant Symptoms Consistent with Acute Asthma

Figure 4.2 highlights the prevalence of primary asthma symptoms in the study population. Almost all children (99.3%) experienced wheezing, reinforcing its significance as a diagnostic feature of asthma. Coughing was present in 100% of cases, further validating its relevance in clinical assessment. Dyspnoea (difficulty in breathing) was observed in 94.8% of patients, emphasizing the respiratory distress associated with asthma. Chest tightness was reported in 54.8% of cases, suggesting variability in symptom severity among patients. These findings indicate a high prevalence of classic asthma symptoms in paediatric patients, supporting the need for timely recognition and intervention.

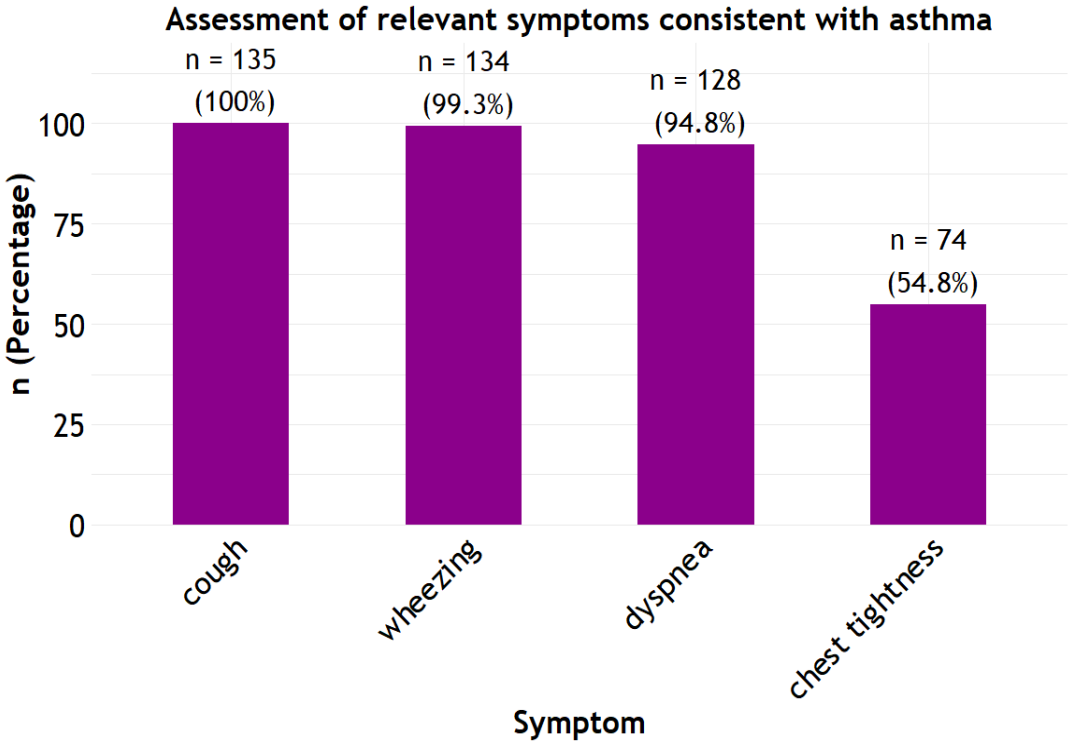

Figure 4.2: Assessment of Relevant Symptoms Consistent With Acute Asthma

4.5 Documentation of Other Comorbid Conditions

Comorbidities can influence asthma severity and treatment outcomes. As depicted by Figure 4.3, pneumonia was the most common comorbid condition (75.6%), which aligns with known associations between respiratory infections and asthma exacerbations. Other comorbid conditions, such as eczema (1.5%), allergic rhinitis (2.2%), and GERD (2.2%), were less common. Notably, obesity, OSA, and rhinosinusitis were absent, suggesting that these conditions may be less relevant in this paediatric population.

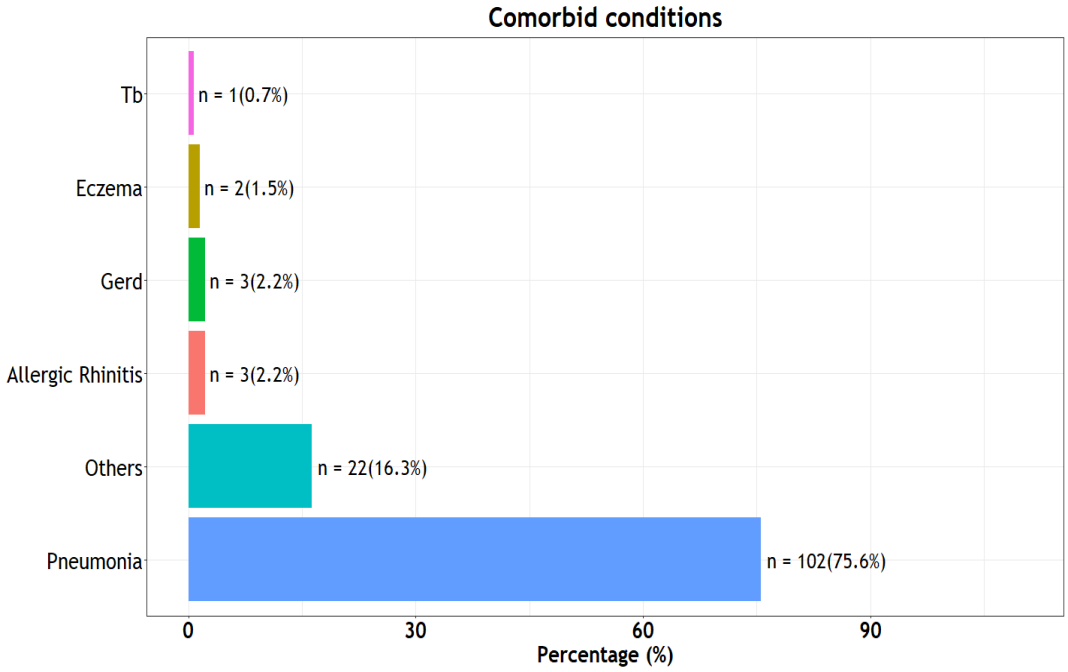

Figure 4.3: Other Comorbid Conditions

4.6 Initial Clinical Assessment

The proportion of patients who underwent key components of the initial clinical assessment is presented in Figure 4.4. Overall, adherence to the recommended primary survey components was consistently high across all evaluated domains. Assessment of breathing was documented in 133 out of 135 patients (98.5%). Similarly, airway, circulation, and level of consciousness (AVPU scale) were each assessed in 132 patients (97.8%). The differences observed between these domains were minimal, with all components demonstrating coverage above 97%. These findings indicate that nearly all patients received a comprehensive initial assessment in line with standard emergency care principles. The uniformly high proportions across airway, breathing, circulation, and consciousness suggest consistent implementation of the primary survey approach among healthcare providers within the study setting.

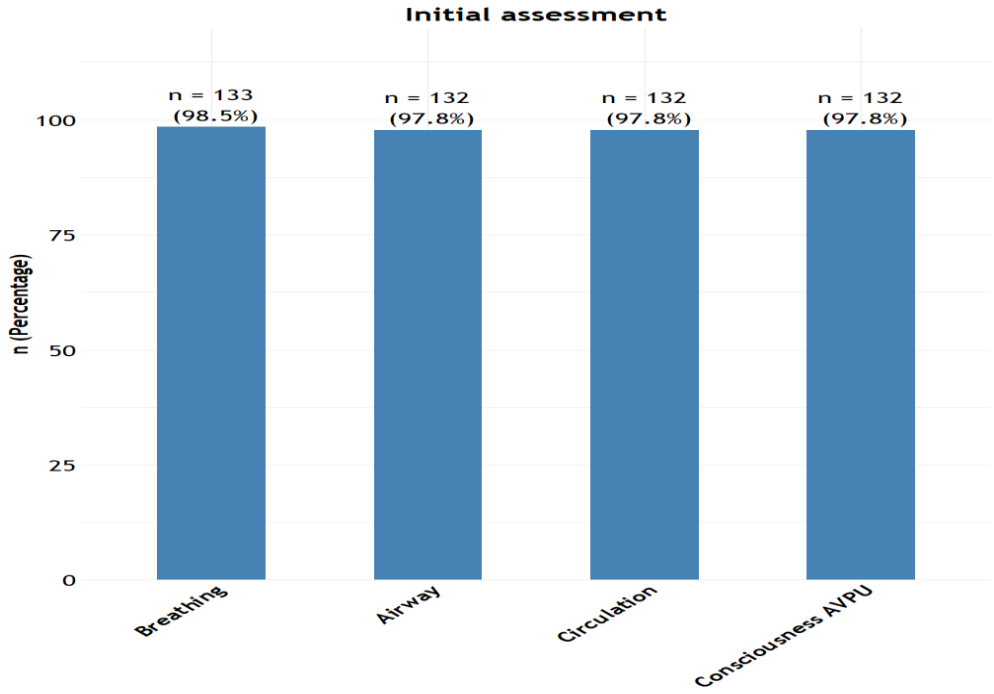

Figure 4.4: Initial Assessment

4.7 Treatment Prescribed for Acute Asthma Management

These tables summarize the medical interventions used. Oxygen therapy was administered to 60.7% of patients, reflecting the necessity for supplemental oxygen in severe cases. Antibiotics were prescribed in 82.2% of cases, likely due to the high pneumonia prevalence. Systemic steroids, including dexamethasone (51.9%) and prednisolone (37.0%), were widely used, demonstrating their importance in reducing airway inflammation. Nebulisation with salbutamol was given to 86.7% of patients, reinforcing its role as a first-line treatment for bronchospasms.

Table 4.4: Treatment Prescribed for the Management of Acute Asthma

Characteristic	Frequency	percentage
Oxygen started		
No	53	39.3%
Yes	82	60.7%
Antibiotics commenced		
No	24	17.8%
Yes	111	82.2%
Systemic steroids		
Dexamethasone	50	37.0%
Hydrocortisone	4	3.0%
Prednisolone	50	37.0%
Not given	31	23.0%
Nebulisation with salbutamol		
No	18	13.3%
Yes	117	86.7%
6 puffs inhaler (spacer and mask)		
No	134	99.3%
Yes	1	0.7%

4.8 Discharge Instructions

Figure 4.5 outlines discharge care, including medication prescriptions and patient education. ICS + SABA therapy was prescribed to 40.0% of patients, while only 6.7% received inhaler technique counselling, indicating a gap in patient education. None of the patients received a written asthma plan, highlighting a critical area for improvement in asthma management and follow-up care.

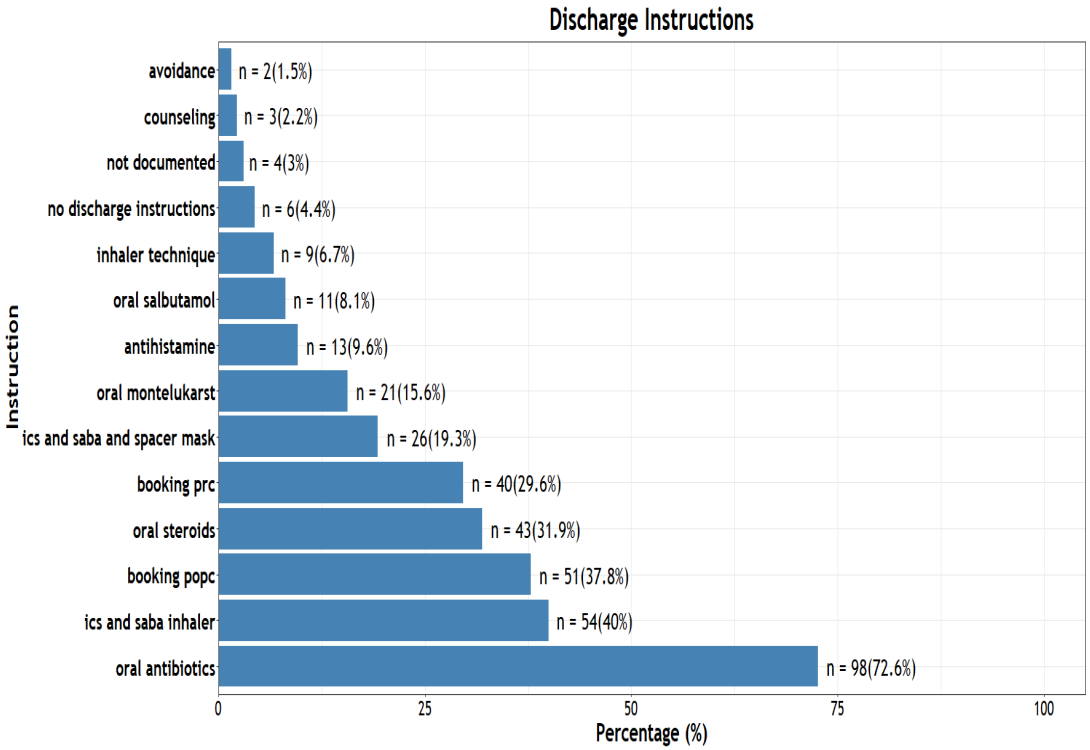

Figure 4.5: Discharge Instructions

4.9 Relationship between Length of Stay and Comorbid Conditions

Due to limiting sample distribution across length of stay categories, only Pneumonia and Others are included in the *chi-square test*.

Table 4.5: Relationship between Length of Stay and Comorbid Conditions

Co-morbidity	LOS<4days	LOS>4days	Total
Pneumonia	18	59	77
Others	17	9	26
Total	35	65	103

Others (allergic rhinitis, DKA, GE, GERD, eczema, autism, malaria, febrile seizure)

Among patients diagnosed with pneumonia, the majority (59/77; 76.6%) had prolonged hospitalisation (>4 days), while only 23.4% were discharged within 4 days. The other patients with pneumonia co-morbidity were managed as outpatients, hence no impact on the length of hospital stay. In contrast, among patients with other co-morbidities (allergic rhinitis, DKA, GE, GERD, eczema, autism, malaria, febrile seizure), most (17/26; 65.4%) had shorter hospital stays (<4 days), with only 34.6% experiencing prolonged hospitalizations.

Table 4.6: Relationship between Length of Stay and Comorbid Conditions

Variable	OR	CI	P-value
Pneumonia	6.19	(2.40, 15.80)	<0.0001
Others	0.16	(0.06, 0.42)	<0.0001

There was a statistically significant association between pneumonia and prolonged hospital stay. Patients with pneumonia had 6.19 times higher odds of staying more than 4 days compared to those with other co-morbidities (OR = 6.19; 95% CI: 2.40–15.80; $p < 0.0001$). Conversely, patients with other co-morbidities were significantly

less likely to have prolonged hospitalization (OR = 0.16; 95% CI: 0.06–0.42; p < 0.0001).

4.9.1 Correlation between Patient Classification and Outcomes

Fisher's Exact Test is used instead of the chi-square test since the sample sizes are small (11% of the participants). This test evaluates whether there is a significant association between severity classification (Classified vs. Not Classified) and each outcome. The reference group is the "Not Classified" group. On improvement, there was no statistically significant difference between patients who were classified by severity and those who were not (OR = 0.405; 95% CI: 0.009–2.984; p = 0.694). Similarly, for adverse outcomes, no significant difference was observed between classified and non-classified patients (OR = 0.264; 95% CI: 0.028–1.252; p = 0.086). Regarding length of hospital stay, classified patients had lower odds of staying >4days compared to non-classified, this was not statistically significant (OR = 0.903; 95% CI: 0.248–1.051; p = 1.000).

Table 4.7: Correlation between Classified Patients and Outcome

Outcome	**Odds Ratio**	**95% CI**	**P Value**
Improvement on non-classified	1		
Improvement on classified	0.405	(0.009, 2.984)	0.694
Adverse outcomes on non-classified	1		
Adverse Outcomes on classified	0.264	(0.028, 1.252)	0.086
Length of Hospital Stay of more than 4 days	1		
Length of Hospital stay more than 4 days	0.903	(0.248, 1.051)	1.000

Table 4.8: Characteristics of Qualitative Data Participants

Hospital	Paediatricians	Registrars	Medical Officers	Medical Officer Interns	Clinical Officers	Clinical Officer Interns	Nurses
MLKH	2	4	4	2	5	4	5

This thematic analysis explores the barriers and facilitators to adherence to national guidelines for managing acute asthma at MLKH. Interviews with healthcare providers reveal key challenges around resource availability, training, guideline adherence, and suggestions for improvement. These findings are grouped into six key themes that reflect the central issues raised by participants.

4.10 Challenges Health Care Workers Face in the Implementation of Guidelines

This thematic analysis explored the adherence to national asthma management guidelines at Mama Lucy Kibaki Hospital, highlighting significant gaps in compliance, resource availability, training, supervision, and protocol implementation. Despite the presence of well-established national guidelines aimed at ensuring standardized and evidence-based asthma management, several barriers hinder effective implementation, leading to inconsistent care delivery and suboptimal patient outcomes.

Table 4.9: Summary of the Themes and Quotes on Barriers to Implementation

Theme: Healthcare provider related factors		
Subtheme	**Example response**	**Mentions**
Knowledge and supervision gaps among healthcare providers.	*"We don't get formal training very often, maybe once every few years''*	20
Reliance on personal clinical judgment and experience.	*Most of what I know is from on-the-job experience."* "pr*otocols/guidelines are not readily available in hardcopy''*	14
High patient Load	*"*The workload makes it difficult to always follow guidelines, especially when we're dealing with so many patient"	16
Theme; Hospital related factors		
Inconsistent availability of essential resources (stock outs- medication, masks, oxygen)	"Salbutamol and oxygen stock outs are a big problem, especially due to high volume of patients''	26
Poor referral systems	Again the referral process for children requiring PICU management is flawed resulting in unwarranted mortalities."	9
Lack of printed protocols	"pr*otocols are not readily available in hardcopy or printed and pinned on walls''*	12
Human resource shortages and staff turnover	*"Lack of enough staff ""Human resource shortages 1 or two clinicians on duty or 2-3 nurses on duty doing all the work makes it a challenge to adhere to the guidelines since you just want to finish"*	22

4.10.1 Inconsistent Resource Availability and Maintenance Challenges

Participants frequently reported the inconsistent availability of essential resources, such as nebulisers, oxygen, and salbutamol, which significantly hampers effective asthma care. Equipment maintenance issues further exacerbate these challenges. One respondent noted, "*We often run out of nebulisers, sometimes the oxygen supply isn't reliable, and we have issues with equipment maintenance*." The stockouts of critical

medications, such as salbutamol, were another common concern, with one participant explaining, "*Salbutamol stockouts are a big problem, especially when we get a surge in patients*."

4.10.2 Obstacles to Guideline Adherence in Asthma Care

Healthcare providers face several barriers when it comes to following national asthma management guidelines. A key issue is the limited access to up-to-date guidelines, forcing staff to rely on outdated hospital-specific protocols. Additionally, the high patient load and lack of supervision make it difficult for staff to consistently adhere to guidelines. As one participant mentioned, "*The workload makes it difficult to always follow guidelines, especially when we're dealing with so many patients*."

4.10.3 Training Gaps and Staff Overload

The infrequency of formal training and patient overload were recurrent themes. Many participants noted that asthma management training was sporadic, often informal, and insufficient to keep up with evolving protocols. "*We don't get formal training very often, maybe once every few years. Most of what I know is from on-the-job experience*," one respondent shared. The overwhelming patient load further compounds this issue, limiting the time staff can spend on each patient.

4.10.4 Variability in Protocol Adherence and Reliance on Clinical Judgment

Participants reported significant variability in adherence to asthma management protocols. In some cases, staff followed national or hospital-specific protocols, but in others, they relied on personal clinical judgment due to the lack of standardized guidelines. This inconsistency in care was a concern for some, as one participant stated, "*We sometimes don't follow a standardized approach, which can affect patient outcomes.*"

4.10.5 Need for Structured Training and Improved Supervision

There is a clear need for more frequent, structured training sessions and better supervision to reinforce proper asthma management practices. "*More regular*

training would help keep everyone updated on the best practices for managing asthma," one participant suggested. Improved supervision during rounds was also mentioned as a potential way to reinforce adherence to guidelines.

4.10.6 Recommendations for Enhancing Asthma Care

Healthcare providers offered several suggestions to improve asthma care at the hospital. These included more frequent and structured training sessions, better access to asthma management guidelines, enhanced supervision, and increased resource allocation. As one respondent explained, "*There should be more frequent training and refresher courses, maybe annually*." Another emphasized the need for better resource management, stating, "*We need more equipment, especially nebulisers, and better management of patient loads*."

4.11: Summary of Challenges to Implementation

Table 4.10: Challenges Experienced in Implementation of Guidelines

Sub-Themes	Quotes
Barriers to Adherence to Guidelines	"…*The workload makes it difficult to always follow guidelines, especially when we're dealing with so many patients*…"
Inconsistent Resource Availability and Maintenance Challenges	"…*We often run out of nebulisers, sometimes the oxygen supply isn't reliable, and we have issues with equipment maintenance*." The stock outs of critical medications, such as salbutamol, were another common concern, with one participant explaining, "*Salbutamol stock outs are a big problem, especially when we get a surge in patients*…."
Training Gaps and Staff Overload	"…*We don't get formal training very often, maybe once every few years. Most of what I know is from on-the-job experience…*,"
Variability in Protocol Adherence and Reliance on Clinical Judgment	"…*We sometimes don't follow a standardized approach, which can affect patient outcomes…*"
Need for Structured Training and Improved Supervision	"…. *More regular training would help keep everyone updated on the best practices for managing asthma….*,"
Recommendations for Enhancing Asthma Care	, "…*There should be more frequent training and refresher courses, maybe annually*." Another emphasized the need for better resource management, stating…., "…. *We need more equipment, especially nebulisers, and better management of patient loads….*"

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter offers a discussion on the detailed results of this study on adherence to national guidelines by healthcare practitioners in the management of acute asthma and short-term outcomes among children at Mama Lucy Kibaki Hospital. It will offer an in-depth summary of the study findings by systematically addressing the study objectives, starting from determining the level of adherence to national asthma guidelines by healthcare professionals, followed by a discussion on the short-term outcomes among children aged 3 to 18 years who were managed for acute asthma at Mama Lucy Kibaki Hospital. The last objective that will be explored is to determine the challenges facing healthcare practitioners in the implementation of national guidelines for the management of asthma at Mama Lucy Kibaki Hospital.

5.2 Sociodemographic Characteristics

In this study, it was found that acute asthma was more prevalent in males at 55.6% compared to females at 44.4% and the incidence decreased with age. This is consistent with other studies like (Schatz et al., 2006) . The trend in age and sex distribution of patients can be explained by the pathophysiology of asthma and the embryology of the respiratory system. The predominance of children aged 3–6 years (77.0%) highlights a critical window of vulnerability in early childhood. Additionally, immune system immaturity and increased exposure to viral respiratory infections are well-established triggers of wheezing and acute asthma exacerbations, likely contributing to the higher frequency of hospital visits in this age group. Young children have had less exposure to allergens, and their respiratory system is still immature. The socioeconomic dimension, as reflected through parental occupation, introduces an important but underdeveloped layer of interpretation. The fact that 60.8% of records lacked occupational data is not just a documentation issue; it represents a missed opportunity to understand and address social determinants of health. Socioeconomic status is strongly associated with asthma outcomes,

influencing environmental exposures (e.g., indoor air pollution, overcrowding), healthcare access, medication adherence, and health literacy. Among the documented cases, the predominance of casual workers (24.4%) and small-scale business owners (14.8%) suggests a population that may experience income instability, which can directly impact the ability to afford controller medications or attend regular follow-ups. This could partially explain the high rates of inpatient care observed. In addition, Mama Lucy Kibaki hospital serves the Eastlands area of Nairobi; it is likely that a majority of the families are of a low to middle-income background. This could result in poor adherence to follow-up and prescribed medications. Additionally, most of the participants, 86.7%, paid out of pocket, thus placing an increased financial burden on families that had children with asthma. According to (Patel et al., 2013), the perceived financial burden in families that have a child with asthma was especially high among female heads of households, low-income level and when the child's asthma is poorly controlled. The participants in this study, therefore, had a higher perceived financial burden, which could hinder the management of asthma in this population. Understanding these trends is essential for policymakers aiming to improve healthcare affordability and accessibility. Future interventions could explore subsidy programs or expanded insurance coverage to reduce financial barriers to asthma treatment.

5.3 Level of Adherence to Asthma Treatment Guidelines by Health Care Providers

The initial assessment reveals a highly encouraging pattern of adherence to standard emergency care principles. The near-universal documentation of airway, breathing, circulation, and level of consciousness (all >97%) indicates strong compliance with the primary survey approach, which is foundational in acute paediatric care. This aligns with recommendations from organizations such as the World Health Organization and paediatric emergency frameworks that emphasize rapid, structured assessment to identify and manage life-threatening conditions promptly and reduce mortality in the emergency departments (Obermeyer et al., 2015). The proportion that was not assessed may be due to lapses in emergency room protocols and failed documentation, which are common errors in busy emergency departments. This is

also supported by a key informant stating that there was a high patient load and inadequate supervision, which makes it difficult to always follow guidelines. A study concluded that lack of time, equipment and supporting staff led to poor adherence to asthma management guidelines (Sun et al., 2010). The near-universal occurrence of cough (100%) and wheeze (99.3%) reinforces their central role in identifying acute asthma exacerbations, consistent with recommendations from the Global Initiative for Asthma (*GINA, 2024*). The high prevalence of dyspnoea (94.8%) reflects significant airflow limitation and bronchospasm, indicative of moderate to severe disease. In contrast, the lower reporting of chest tightness (54.8%) likely reflects developmental differences in symptom perception and communication among younger children, who may have difficulty expressing subjective sensations (Reddel et al., 2022). The results showed that 88% were unclassified based on severity of acute asthmatic exacerbation which was similar to a study in South Africa by (Hoosen S. et al., 2020) that showed 92.3% were unclassified. Similar studies in Nigeria demonstrated low levels of compliance with the guidelines among paediatric residents (Ayuk, Ubesie, et al., 2017). For example, despite the low adherence to severity classification, 60.9% of children were started on oxygen therapy, with 86.7% nebulized and only 0.7% of patients were managed with an inhaler with a spacer and mask, an equally effective method (*GINA, 2024*). A study in the USA demonstrated that inhalers are more effective and cheaper to use in the management of acute asthmatic exacerbations. (Graybill et al., 2024). These findings suggest that healthcare providers may be over-relying on nebulization due to familiarity or perceived effectiveness, despite evidence supporting inhalers as a viable alternative. A significant number, 60.9% of patients, received oxygen supplementation, which can be attributed to the fact that the majority of patients present in respiratory distress. Symptomatically, most participants presented with the triad of asthma, consistent with the findings of other studies such as (Martin et al., 2022). These symptoms could have rationalized oxygen supplementation in the majority of patients.

A majority, 81.2%, received antibiotics, which is likely due to the high prevalence of superimposed pneumonia among patients with asthma. This number is notably high despite the guidelines recommending their use only when bacterial infections

are present. However, this can also be as a result of misdiagnosis of asthma as pneumonia which is a common problem as evidenced by (Kavanagh et al., 2019) which showed that asthma is commonly misdiagnosed as other respiratory illnesses. Additionally, a Cochrane review found limited evidence that antibiotics help acute asthmatic exacerbations (Normansell et al., 2018). This finding indicates a tendency towards overuse of antibiotics (Denholm et al., 2020), which could contribute to antibiotic resistance and unnecessary side effects. From this study, 75.4% of participants had a comorbid diagnosis of pneumonia and asthma, which rationalises the use of antibiotics in acute asthma according to the guidelines. The difference in percentages of participants who had a diagnosis of pneumonia and those who received the antibiotics shows that there is irrational use of antibiotics, which is currently a common problem, especially in low and middle-income countries. (Akinyandenu et al., 2014). It further emphasizes the role of asthma management guidelines which state that antibiotics are usually not required unless there is a superimposed bacterial pneumonia. It is possible that these children did not have pneumonia but were misclassified based on clinical presentation, as the symptoms of pneumonia are similar to those of acute asthmatic exacerbation. This calls into question the appropriateness of widespread antibiotic use in these children, urging a more rigorous diagnostic approach. Additionally, it raises the question of whether we need antibiotics in the management of acute asthmatic exacerbations, especially in low- and middle-income countries.

A majority of the patients also received systemic steroids. However, inhaled corticosteroids are preferred due to their lower side effect profile compared to systemic steroids, which can result in more morbidity both in the short term and long term (Bleecker et al., 2020). Even though steroids are essential for the management of acute asthma, they are not required for mild acute exacerbations, hence the need for classification (*Kenya Asthma Management Guidelines, 2022*).

Moreover, some of the patients received oral salbutamol and prednisolone on discharge despite nebulisations and systemic corticosteroids while admitted, which further puts them at risk of steroid-related complications. The inadequate use of inhaled corticosteroids at Mama Lucy Kibaki Hospital could be due to either

physician preferences for syrups or oral medications in the belief that they work better or another deficiency in the application of the guidelines (Simba et al., 2021). This finding is similar to the findings in a study in Nigeria, which found that less than 50% had ICS as part of their management plans (Oshikoya et al., 2020). This finding shows that a review of corticosteroid prescription practices among patients with asthma is necessary at Mama Lucy Kibaki hospital and this will benefit the asthma patients seen at the facility.

On discharge, patients treated for asthma are supposed to be advised on a few things, such as allergen avoidance and symptom lookout. In this study, we found that some discharge guidelines were not adhered to. 71.7% of participants received oral antibiotics on discharge despite receiving IV antibiotics while admitted. The addition of an oral dose to the IV dose, especially in cases of misdiagnosis, may increase risks of antibiotic resistance in the population. This practice necessitates a review of antibiotic prescription practices within Mama Lucy Kibaki Hospital to reduce the chances of wrongful antibiotic usage and subsequent antibiotic resistance.

This study also found that only 6.52% of participants were trained on the correct inhaler technique, and only 2.17% were advised on danger signs. Failure to adhere to the above instructions puts asthma patients at great risk of serious complications when acute exacerbations occur, as shown by this study (Fortescue et al., 2017). Incorrect inhaler technique may result in underuse of inhaled corticosteroids and therefore poor asthma control, which will subsequently lead to more frequent visits and subsequent readmissions. A lack of advice on danger signs could result in late presentation of patients to the health facility, which will then lead to increased morbidity and mortality of asthma patients.

This study also identified a gap in patient referral and continuity of care in asthma patients. Only 29.6% of the children were discharged through the paediatric respiratory clinic, showing poor adherence to routine follow-up, and none of the children had a written asthma care plan during discharge.

On investigation as to why the level of adherence was poor in this study, the staff reported that they received infrequent formal training on asthma management

guidelines, leading to them being behind on guideline updates. This is similar to the findings that found that there was a general lack of awareness of asthma treatment guidelines and how to implement them (Khan et al., 2022). Moreover, some of them reported only relying on clinical judgement when making decisions on asthma management despite the existence of the national guidelines. Some stated inconsistent availability of essential resources such as oxygen, nebulisers and salbutamol as the reasons why the level of adherence had been poor.

In general, the results of this study are a contrast to the results of the study by Pakkasela et al., which found that the treatment guidelines were well adopted in Finland, which had led to successful management of asthma and reduced morbidity from the disease (Pakkasela et al., 2023). This contrast can be explained by the differences in health systems in the two countries. Kenya is a developing country that is still plagued by poor national and county health systems, which may hinder the implementation of treatment guidelines, mostly due to high healthcare costs and an imbalance in the ratio of healthcare workers to patients. However, the results of this study are consistent with many other studies done in low and middle-income countries, such as in Ethiopia, that found that there was a lack of provider adherence to treatment guidelines (Kassa et al., 2022)

This study showed that there was poor adherence to discharge guidelines, whereby 60.9% of patients did not receive the ICS+SABA combination, which is essential for asthma control and prevention of frequent exacerbations. Furthermore, a critical requirement was missed as only 18.8% of patients received the ICS+SABA +spacer/mask combination, which is very important, especially given that the majority, 76.1% of study participants, were aged between 3- 6 years, who usually are unable to use the metered dose inhalers correctly. The low adherence to best practices for inhaler use could result in poor asthma control, which will further increase the morbidity of these patients and increase overall healthcare costs due to frequent visits and readmissions. Studies like (Chapman et al., 2017) have also shown that practitioners prioritize symptom control over exacerbation reduction and that there is a deficit in the maintenance and reliever therapy among physicians. This is consistent with the results of this study since a majority did not receive the

recommended ICS +SABA therapy upon discharge.

The level of adherence reduced as the chain of management went down. Initially, at the point of initial assessment, almost all the participants were managed according to the guidelines, and this declined significantly, such that at the point of discharge, the level of adherence was significantly lower, and only a small proportion of participants were discharged according to the KAMG guidelines requirements. This is similar to the findings by (Yawn et al., 2016), who found that adherence was highest when it came to medication prescriptions but low for the asthma action plan.

5.4 Short Term Outcomes and Comorbid Conditions

Despite poor guideline adherence, a majority of patients, 85.3%, showed improvement after treatment, showing that as long as treatment guidelines are followed, acute asthma has a good prognosis. In contrast to a study done by Benito-Fernandez et al, where only 1.6% of participants required admission, the number from this study is exponentially higher at 76.1%. This might be attributed to the difference in health systems, whereby moderate and severe asthma are managed as inpatients due to the close observation required, which is usually impossible in busy, understaffed outpatient and emergency departments. In the study by Benito-Fernandez, the majority of the patients were treated as outpatients. Almost half, 42.9% of participants in this study, spent less than 72 hours in hospital, and by the end of one week, almost all of them had been discharged, with only 0.95%spending more than 14 days in hospital. At the time of discharge, participants had shown significant clinical improvement. Results from this study show that inpatient management of acute asthma yields better results compared to outpatient management. Benito et al found that participants who were discharged early, i.e. outpatient observation, had worse outcomes, and 43% of them still had signs and symptoms of difficulty in breathing at the end of week 1 (Benito-Fernández et al., 2004)

In this study, there was a 1.5% mortality. This number is relatively low but still significant. Several studies have shown that asthma results in an increase in mortality in children. A population-based study in Sweden concluded that asthma results in

increased mortality regardless of other life-limiting conditions and parental socio-economic status.(Caffrey Osvald et al., 2020) Asthma deaths are rare, but are a very important statistic to look out for as they can be easily prevented through proper management of these patients. From this study, it was found that the presence of a comorbid condition increases the length of stay in hospital. The presence of a comorbidity, especially pneumonia, significantly increased the length of hospital stay among study participants. The statistical analysis between pneumonia and prolonged hospital stay yielded a p-value of <0.0001. With such a low p-value, we reject the null hypothesis of independence between pneumonia and length of stay, indicating that the presence of pneumonia is significantly associated with different lengths of hospital stay. Patients with "other" comorbid conditions are distributed differently across the length of stay categories than would be expected by chance alone. Both "others" and "pneumonia" show significant associations with the length of stay categories in the hospital. This means that these conditions likely influence how long patients stay hospitalized. It would be valuable to further explore why these associations exist and if specific management strategies or complications related to these conditions contribute to longer or shorter hospital stays. The increased length of hospital stay was related to the severity of the disease. Similar to (Selmanoglu et al., 2025), the existence of eczema was found to increase the severity of acute exacerbation of asthma and therefore necessitated a GINA guidelines step-up in treatment upon discharge. The association between prolonged hospital stay and superimposed pneumonia on asthma has also been found to be significant in other studies such as (Nantanda et al., 2014; Terraneo et al., 2014).

The study also found that there was no association between severity classification and patient outcomes. This might be due to the fact that there were only 2 classification classes, as patients either fell into the classified or unclassified categories, thus there was insufficient data to determine whether severity classification was associated with specific outcomes. Future research should focus on assessing the clinical outcomes of the patients based on their severity score according to KAMG.

5.5 Challenges Facing Healthcare Practitioners in the Implementation of National Asthma Guidelines at Mama Lucy Kibaki Hospital

From this study, several challenges that are faced by healthcare professionals were discovered. Through Key informant interviews and focused group discussions, several themes came up in terms of challenges. The main challenge was inconsistent resource availability and equipment maintenance challenges. This resulted in the unavailability of essential drugs such as salbutamol, which are required for the management of asthma. This challenge is common in many low and middle-income setups, as evidenced by a study done in Malaysia (Cheong et al., 2021), which found that a shortage of inhaled combination therapy ICS/LABA led to inefficient management of acute asthma. Due to this, the guideline was followed inconsistently, which led to a low level of adherence. Other studies in sub-Saharan Africa have also found similar results, indicating that adherence to recommended guidelines has been hindered by resource limitations. (Mortimer, Reddel, et al., 2022)

Healthcare practitioners also cited that there were limited up-to-date guidelines, which forced them to use old hospital-specific guidelines and posters during the management of asthma, and therefore, poor adherence to national guidelines. Moreover, the staff stated that there was no formal training on the guidelines, and therefore, they were forced to learn on the job and use their clinical judgement most of the time instead of following the guidelines. This is similar to the results of a study in Nigeria (Onubogu et al., 2024)

Additionally, there were staff shortages similar to those that led to patient overload, meaning that the provider would spend less than the required time with each patient in order to attend to as many as possible. This meant that the asthma patients did not get the continuous observation recommended, and therefore some steps within the guidelines ended up being missed, leading to poor adherence. A healthcare worker made the sentiment that “due to high patient numbers, it is difficult to adhere to all guidelines precisely”. This reflects broader systemic issues where the over stretched

staff struggle to balance patient care and guideline compliance. Some solutions that can be implemented to mitigate this include task- shifting, electronic decision support tools and improved workflow management.

5.6 Study Limitations and Strengths

This study has limitations that should be considered when interpreting the findings. First, it was conducted in a single centre, which may limit the generalizability of the results to other settings with different patient populations, resource availability, and clinical practices. Second, the presence of missing data, particularly in variables such as socioeconomic indicators, may have introduced information bias and restricted the depth of analysis. However, these limitations are balanced by key strengths: the use of a mixed-methods approach, which enabled a more comprehensive assessment of both clinical practices and barriers, and the novelty of the study as one of the first in this setting to evaluate adherence to paediatric acute asthma management guidelines.

5.7 Conclusion

In conclusion, this study found:

1. Healthcare providers demonstrated good adherence to national guidelines during the initial assessment of children with acute asthma, there was poor adherence in subsequent management and discharge instructions.

2. Poor adherence to national guidelines in acute asthma management did not significantly impact the length of hospital stay. However, the presence of comorbidities played a key role in prolonging hospitalization, highlighting the need for comprehensive patient evaluation beyond asthma management alone.

3. Similar challenges affected both the management and discharge processes, including limited resources, high patient load, and variations in practitioner training and preferences. These barriers contribute to poor adherence to national guidelines beyond the initial assessment phase, potentially affecting overall patient care quality

5.8 Recommendations

1. Use of simplified checklist protocols for classification to avoid missing out on the diagnosis and management, this will facilitate better patient outcomes. Additionally, future research on other short-term outcomes like re-admissions, outpatient visits and chronic asthma control to better inform the outcomes.

2. There is a need to undertake locally driven studies to evaluate the applicability, feasibility, and effectiveness of existing national and international asthma guidelines within this setting. This will help determine whether current recommendations are appropriate for the local context or require adaptation to better address resource constraints, patient profiles, and healthcare system realities.

3. Provision of targeted training and decision-support resources for healthcare practitioners should be prioritized to enhance the quality of care for children with acute asthma. This should be complemented by strengthening system capacity through adequate staffing, reliable availability of essential equipment

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APPENDICES

Appendix I: Consent Form

Title of Study: Adherence to National Guidelines in the management of acute asthma and short-term outcomes among children at Mama Lucy Kibaki Hospital.

Principal Investigator: Dr. Vincent Munene Ngore **Affiliation:** JKUAT

You are being invited to participate in a focused group discussion (FGD) or a key informant interview (KII) as part of a research study titled "Adherence to National Guidelines in Management of Acute Asthma and Short-Term Outcomes among Children at Mama Lucy Kibaki Hospital." The purpose of this study is to assess the adherence to national guidelines in the management of acute asthma and evaluate the short-term outcomes among children at Mama Lucy Kibaki Hospital.

Your participation is voluntary, and your decision to participate or not will not affect your employment or relationships within the hospital. If you decide to participate, this consent form will provide you with detailed information about the study, the purpose, procedures involved, risks, and potential benefits.

Study Procedures:

Focused Group Discussion (FGD): You will be invited to participate in a group discussion facilitated by the research team. The discussion will focus on the management of acute asthma in children and the adherence to national guidelines. The FGD will be audio-recorded for accurate data collection, and your identity will remain anonymous.

Key Informant Interview (KII): If selected for a KII, you will have an individual interview with a member of the research team. The interview will be conducted in a private setting and will be audio-recorded to ensure accurate data collection. Your identity will remain anonymous.

Benefits and Risks:

Participating in this study will contribute to improving the understanding of asthma management and guideline adherence, potentially leading to improved healthcare outcomes for children with acute asthma. While there are no direct benefits to you as a participant, your insights and experiences will be invaluable for this research.

The potential risks associated with participating in this study are minimal. However, you may experience some discomfort when discussing sensitive topics related to the management of acute asthma. If you feel uncomfortable or distressed during the discussion or interview, you may choose to stop at any time without any negative consequences.

Confidentiality:

All information collected during the FGDs or KIIs will be kept confidential. The research team will assign unique identifiers to participants to ensure anonymity. The audio-recordings will be transcribed, and any identifying information will be removed. Only the research team will have access to the data, and it will be stored securely for a specified period as required by the institution's guidelines.

Voluntary Participation:

Participation in this study is entirely voluntary, and you have the right to refuse or withdraw from the study at any time without providing a reason. Your decision will not impact your employment or relationships within the hospital. If you choose to withdraw, any data collected up until that point will be anonymized and used for analysis.

If you have any questions or concerns about the study, please feel free to contact the Principal Investigator at +254718434539. The ethics review committee through the secretary, Dr. Eucabeth Majiwa on 0725996171/ethics@jkuat.ac.ke, additionally feel free to contact the supervisor through Dr. Justus Simba 0723114529. Thank you for considering participation in our study.

By signing this form, you acknowledge that you have read and understood the information provided, and you voluntarily agree to participate in the focused group discussion or key informant interview for the study

Participants: Signature: _____ Date: _____

Researchers: Signature _____ Dat _____

Appendix II: Data Abstraction Form

1. What is the unique identification number of the child whose medical records are being reviewed?

   _____

2. What is the age of the child with acute asthma whose medical records are being reviewed?

   _____

3. What is the gender of the child with acute asthma whose medical records are being reviewed?

   ☐Male ☐Female

4. What is the date of admission? _____
5. What is the date of discharge? _____
6. What is the education level of parents/guardians?

   ☐ Primary. ☐Secondary ☐Tertiary ☐None.

7. What is the Occupation of the parents/guardian(s)?

   Father _____

   Mother _____

   Other guardians_____

8. What is the marital status of the parents?

   ☐ Single ☐ Married ☐Widowed ☐Separated ☐ Divorced

9. Did the medical records document the presence of relevant symptoms/signs consistent with acute asthma? (Select all that apply)

☐Wheezing YES NO

☐Cough YES NO

☐Ability to talk YES NO

☐Dyspnoea YES NO

☐Chest tightness YES NO

☐Fever YES NO

☐Cyanosis YES NO

☐SPO2 YES NO

☐Blood pressure YES NO

☐Pulse rate YES NO

☐Respiratory rate YES NO

☐Lower chest wall in drawing YES NO

☐Silent chest on auscultation YES NO

☐Others (please specify)

10. Did the medical records document any other comorbid conditions?

☐Eczema

☐Allergic rhinitis

☐Obesity

☐Pneumonia.

☐GERD.

☐OSA

☐Rhinosinusitis.

☐TB

☐Not documented

11. Did the medical records document the initial assessment containing the status of?

☐Airway

☐Breathing

☐Circulation

☐Consciousness level AVPU status

12. Did the medical records document the presence of relevant clinical signs consistent with acute asthma**?**

☐Cyanosis

☐SPO2

☐Ability to talk

☐Blood pressure

☐Pulse rate

☐Respiratory rate

☐Lower chest wall in drawing

☐Silent chest on auscultation

☐Other (signs suggestive of co-morbid condition)

☐ Crackles

☐ Hype resonance

13. Was the disease severity of acute asthma correctly classified according to national guidelines?

☐Life-threatening asthma

☐Severe asthma exacerbation

☐Moderate asthma exacerbation

☐Mild asthma exacerbation

☐Not classified

☐Not documented

14. Was the appropriate treatment prescribed for the management of acute asthma based on the disease severity classification and national guidelines? (Select all that apply)

☐ Oxygen started

☐ Nebulise 2.5 mg salbutamol or 6 puffs of an inhaler with spacer and mask, repeat every 20 minutes up to 3 doses if needed.

☐ Re-evaluated every 20-30 minutes for reclassification

☐ 2-4puffs of salbutamol using spacer/mask given

☐ Oxygen is given as necessary, with a target of 94-98%

☐ Started oral corticosteroids

☐ Antibiotics for severe pneumonia

☐Inhaled corticosteroid (ICS)

☐ No treatment prescribed

☐ Not documented

Other Measures instituted

☐ No treatment prescribed

☐ Not documented

☐ Dexamethasone

☐ Hydrocortisone

☐ Antibiotics

☐ Anti-histamine

☐ Cough syrup

☐ Salbutamol syrup

☐Inhaled corticosteroid (ICS)

☐SABA plus ICS

15. What are the short-term outcomes of the child?

☐Improvement of symptoms

☐Referral

☐Follow up in the Outpatient department (PRC).

☐Intensive care unit (ICU) admission

☐Prolonged symptoms

☐Poor response to treatment

☐Other (please specify)

☐No adverse outcomes

☐Mortality

☐Not documented

16. What was the duration of the Hospital stay?

_____

17. What were the discharge instructions?

☐ICS Inhaler

☐SABA Inhaler

☐Spacer and mask

☐Oral steroids

☐Oral antibiotics

☐ Inhaler technique taught

☐Counselling on danger signs

☐Avoidance of allergens

☐Booking of Paediatric Respiratory Clinic

☐Written asthma action plan

☐No discharge instructions

☐Not documented

Appendix III: Key Informant Interview Guide

Title of Study: Adherence to National Guidelines in the Management of Acute Asthma and short-term outcomes among children at Mama Lucy Kibaki Hospital, Kenya.

Principal Investigator: Dr. Vincent Munene Ngore **Affiliation:** JKUAT.

Thank you for your feedback.

1. What is your role at Mama Lucy Kibaki Hospital?

   ☐Paediatric pulmonologist ☐ Consultant paediatrician ☐Registrar ☐Medical Officer ☐Medical Officer Intern ☐Clinical officer ☐Nurse ☐Other (specify)

2. How long have you been practicing in the field of healthcare?

   ☐less than 5 years ☐ 5-10 years ☐10-15 years ☐15-20years ☐20-30 years ☐over 30 years ☐Other (specify)

3. How familiar are you with the Kenyan national guidelines for the management of acute asthma in children?

   ☐Extremely ☐ Very ☐ Fairly ☐Slightly ☐Not sure ☐Completely unfamiliar ☐Other (specify)

4. How often do you encounter cases of acute asthma in children at Mama Lucy Kibaki Hospital?

   ☐Daily ☐ 1-5 cases a week ☐5-10 cases a week ☐10-20 cases a week ☐20-30 cases a week ☐more than 30 cases a week ☐Other(specify)

5. Can you describe the typical presentation and severity of these cases? (Tick the most common symptoms you encounter).

   ☐ Wheezing ☐ Cough ☐ Inability to talk/feed/complete sentences ☐ Dyspnoea ☐ Chest tightness ☐ Eczema ☐ Allergic rhinitis ☐ Obesity ☐ other (specify)

6. What are the common treatments or interventions you provide for children with acute asthma at Mama Lucy Kibaki Hospital, and how do they align with the national guidelines?

   ---

7. What challenges, if any, do you face in adhering to the national guidelines in the management of acute asthma in children at Mama Lucy Kibaki Hospital? (This could include issues related to the availability of medications, equipment, staffing, or other factors.)

   ---

8. Do you receive any formal training, attend workshops, or engage in other activities to update your knowledge and skills in this area?

   ☐Yes ☐ No

   If yes, please specify.

   ---

9. What are the common outcomes you have encountered and what would you do to promote or discourage the outcomes?
10. What strategies, if any, are in place at Mama Lucy Kibaki Hospital, that you know of, to promote adherence to the national guidelines for the management of acute asthma in children?

    ---

11. How do you assess your adherence to the national guidelines in the management of acute asthma in children? Do you encounter any challenges or limitations in doing so?

    ---

12. Have you received any feedback or performance evaluations related to your adherence to the national guidelines for the management of acute asthma in children at Mama Lucy Kibaki Hospital?

    ☐Yes ☐No

    If yes, how has this feedback influenced your practice?

    ---

13. Are there any specific resources or support that you need to improve adherence to the national guidelines for the management of acute asthma in children at Mama Lucy Kibaki Hospital? (This could include training, medications, equipment, staffing, or other resources.)

    ---

14. What are your recommendations or suggestions for improving adherence to the national guidelines in the management of acute asthma in children at Mama Lucy Kibaki Hospital, based on your experience and knowledge?

    ---

15. How do you involve parents or caregivers in the management of acute asthma in children, by the national guidelines?

    ---

16. Is there anything else you would like to share about your experience with adherence to national guidelines in the management of acute asthma in children at Mama Lucy Kibaki Hospital?

Appendix IV: Focused Discussion Group Guide

Title of Study: Adherence to National Guidelines in the Management of Acute Asthma and short-term outcomes among children at Mama Lucy Kibaki Hospital, Kenya.

Principal Investigator: Dr. Vincent Munene Ngore **Affiliation:** JKUAT.

Thank you for your feedback.

Proportion of Children Receiving Appropriate Acute Asthma Management:

a. Are you familiar with the national guidelines for the management of acute asthma in children?

b. In your opinion, what proportion of children treated at Mama Lucy Kibaki Hospital receive appropriate acute asthma management as per the national guidelines?

c. What are the indicators or factors that you consider when assessing whether management is appropriate or not?

Short-term outcomes

a. Based on your experience, what are the short-term outcomes of children managed for acute asthma at our hospital?

b. What are the common complications of acute asthma management?

c. Are there any specific challenges or factors that influence the short-term outcomes?

Challenges to the Implementation of National Guidelines

a. In your experience, what are the main challenges to implementing the national guidelines for the management of acute asthma at Mama Lucy Kibaki Hospital?

b. Are there any barriers or constraints that hinder healthcare providers from adhering to the guidelines?

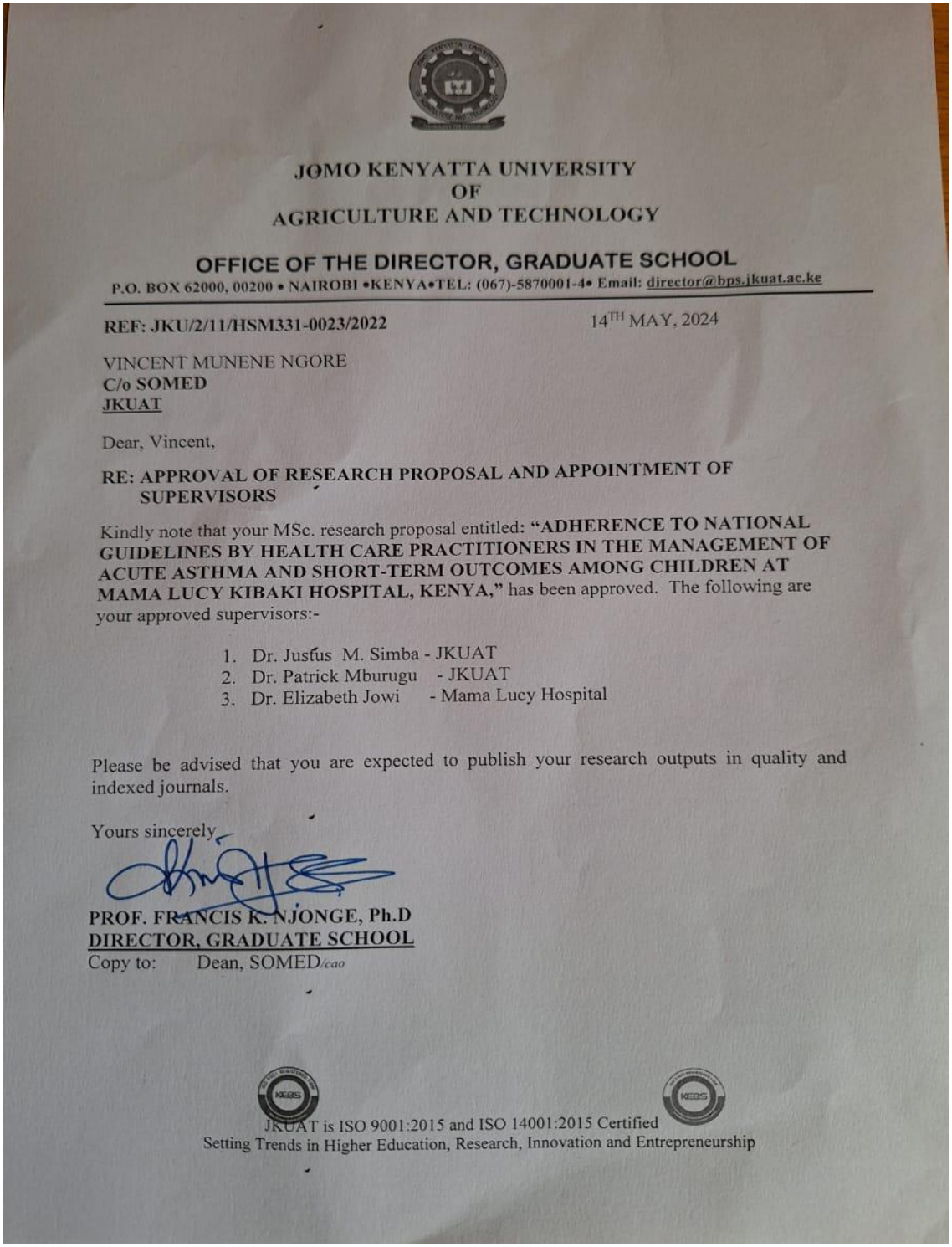
c. How do you think these challenges can be addressed or overcome?

Recommendations

a. based on the findings of this discussion, what recommendations would you suggest to improve the proportion of children receiving appropriate acute asthma management and enhance short-term outcomes at Mama Lucy Kibaki Hospital?

b. Are there any specific resources, support systems, or training needs that could facilitate better adherence to guidelines and improve outcomes?

Appendix V: Approval/Appointment of Supervisors



JOMO KENYATTA UNIVERSITY
OF
AGRICULTURE AND TECHNOLOGY

OFFICE OF THE DIRECTOR, GRADUATE SCHOOL

P.O. BOX 62000, 00200 • NAIROBI •KENYA•TEL: (067)-5870001-4• Email: director@bps.jkuat.ac.ke

REF: JKU/2/11/HSM331-0023/2022 14TH MAY, 2024

VINCENT MUNENE NGORE
C/o SOMED
JKUAT

Dear, Vincent,

RE: APPROVAL OF RESEARCH PROPOSAL AND APPOINTMENT OF SUPERVISORS

Kindly note that your MSc. research proposal entitled: **"ADHERENCE TO NATIONAL GUIDELINES BY HEALTH CARE PRACTITIONERS IN THE MANAGEMENT OF ACUTE ASTHMA AND SHORT-TERM OUTCOMES AMONG CHILDREN AT MAMA LUCY KIBAKI HOSPITAL, KENYA,"** has been approved. The following are your approved supervisors:-

1. Dr. Justus M. Simba - JKUAT
2. Dr. Patrick Mburugu - JKUAT
3. Dr. Elizabeth Jowi - Mama Lucy Hospital

Please be advised that you are expected to publish your research outputs in quality and indexed journals.

Yours sincerely,

PROF. FRANCIS K. NJONGE, Ph.D
DIRECTOR, GRADUATE SCHOOL
Copy to: Dean, SOMED/cao

JKUAT is ISO 9001:2015 and ISO 14001:2015 Certified
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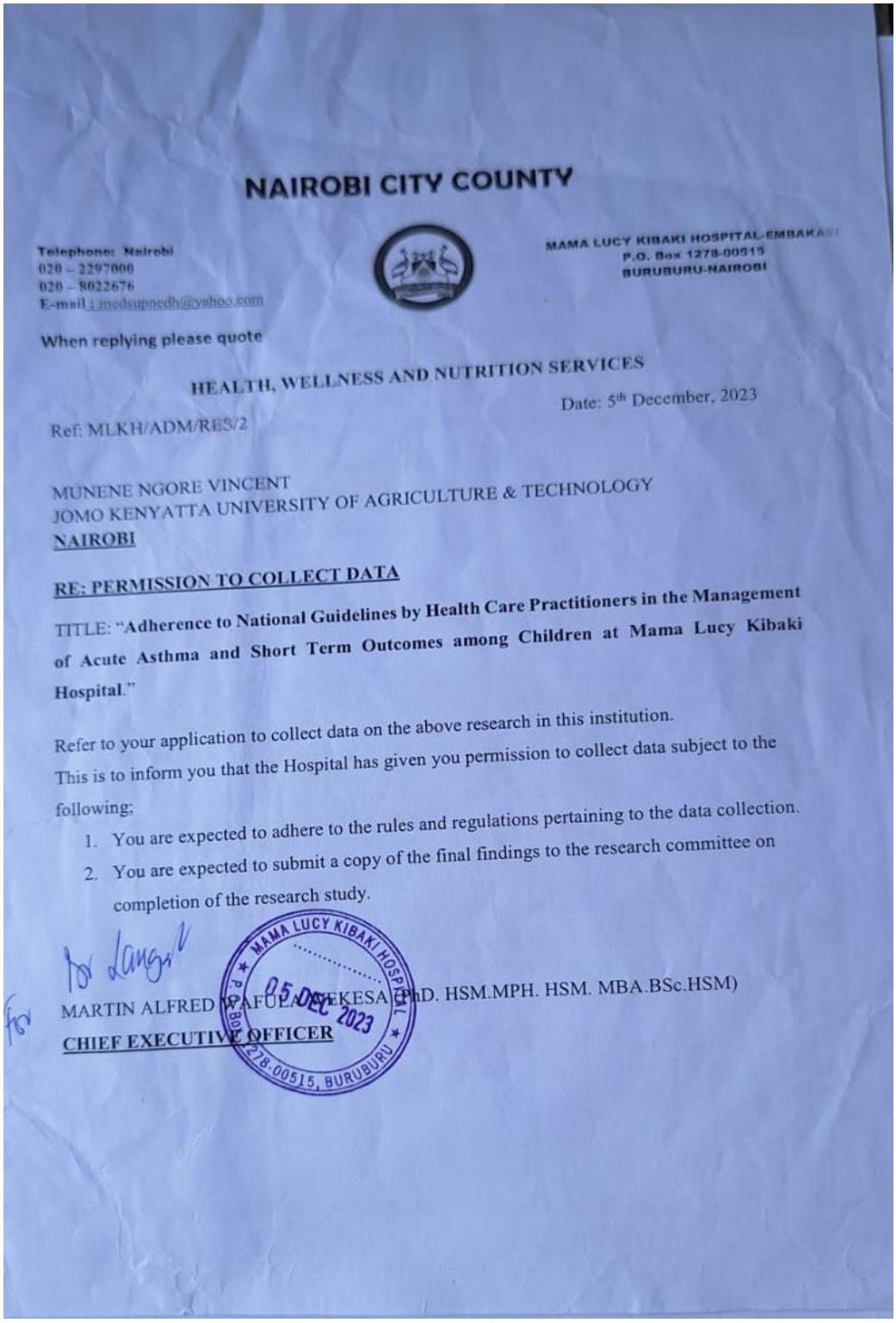
Appendix VI: Data Collection Approval Mlkh



NAIROBI CITY COUNTY

Telephone: Nairobi
020 – 2297000
020 – 8022676
E-mail : medsupnedh@yahoo.com

MAMA LUCY KIBAKI HOSPITAL-EMBAKASI
P.O. Box 1278-00515
BURUBURU-NAIROBI

When replying please quote

HEALTH, WELLNESS AND NUTRITION SERVICES

Ref: MLKH/ADM/RES/2

Date: 5th December, 2023

MUNENE NGORE VINCENT
JOMO KENYATTA UNIVERSITY OF AGRICULTURE & TECHNOLOGY
NAIROBI

RE: PERMISSION TO COLLECT DATA

TITLE: "**Adherence to National Guidelines by Health Care Practitioners in the Management of Acute Asthma and Short Term Outcomes among Children at Mama Lucy Kibaki Hospital.**"

Refer to your application to collect data on the above research in this institution.

This is to inform you that the Hospital has given you permission to collect data subject to the following;

1. You are expected to adhere to the rules and regulations pertaining to the data collection.
2. You are expected to submit a copy of the final findings to the research committee on completion of the research study.

MAMA LUCY KIBAKI HOSPITAL P.O. BOX 1278-00515, BURUBURU 05 DEC 2023

MARTIN ALFRED WAFULA WEKESA (PhD. HSM.MPH. HSM. MBA.BSc.HSM)
CHIEF EXECUTIVE OFFICER

Appendix VII: Data Collection Approval NACOSTI

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **251772**

Date of Issue: **11/September/2023**

RESEARCH LICENSE

This is to Certify that Dr.. Vincent Munene munene of Jomo Kenyatta University of Agriculture and Technology, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: ADHERENCE TO NATIONAL GUIDELINES BY HEALTH CARE PRACTITIONERS IN THE MANAGEMENT OF ACUTE ASTHMA AND SHORT-TERM OUTCOMES AMONG CHILDREN AT MAMA LUCY KIBAKI HOSPITAL, KENYA for the period ending : 11/September/2024.

License No: **NACOSTI/P/23/28982**

251772

Applicant Identification Number

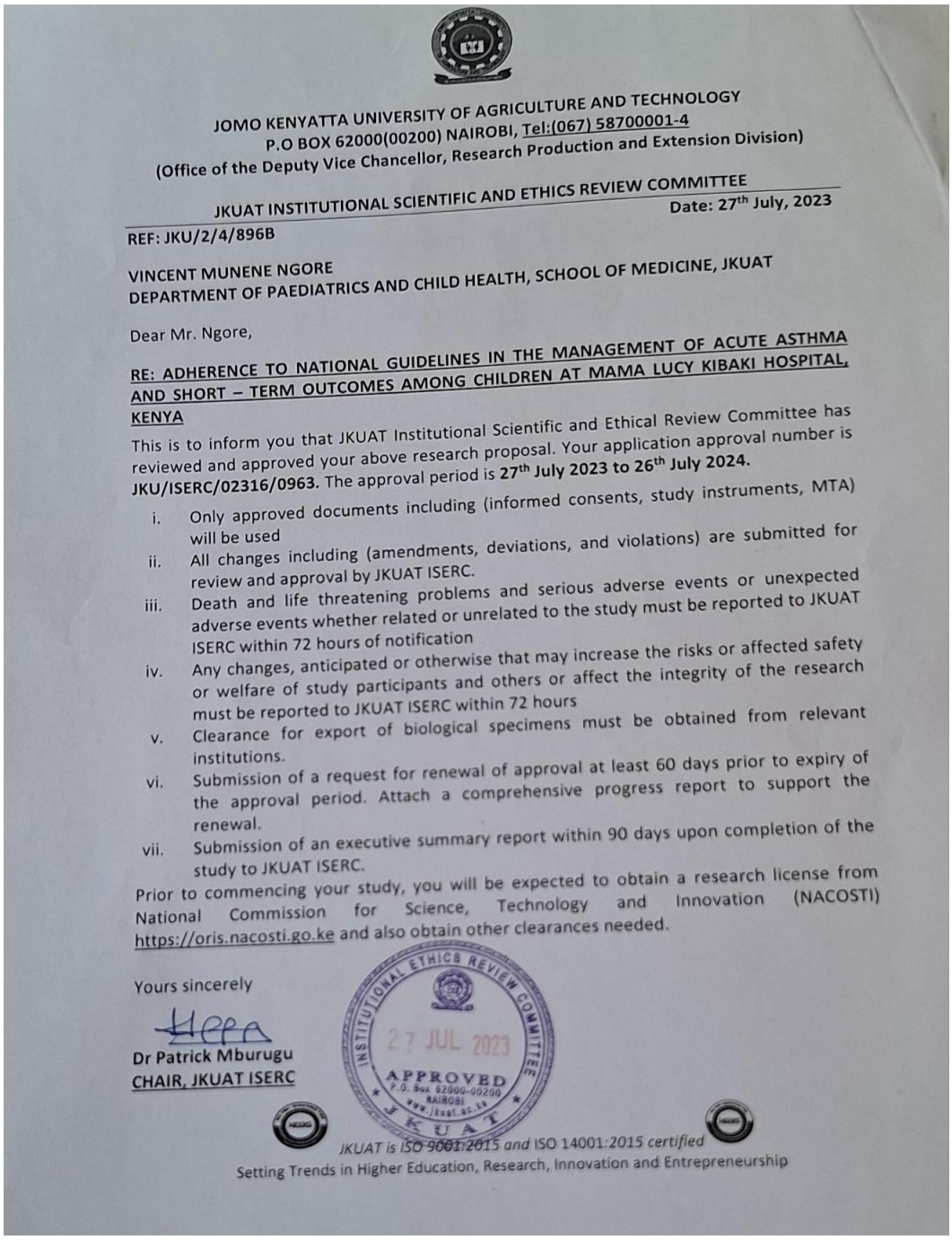
Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

Appendix VIII: Data Collection Ethical Approval JKUAT



JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY
P.O BOX 62000(00200) NAIROBI, Tel:(067) 58700001-4
(Office of the Deputy Vice Chancellor, Research Production and Extension Division)

JKUAT INSTITUTIONAL SCIENTIFIC AND ETHICS REVIEW COMMITTEE

Date: 27th July, 2023

REF: JKU/2/4/896B

VINCENT MUNENE NGORE
DEPARTMENT OF PAEDIATRICS AND CHILD HEALTH, SCHOOL OF MEDICINE, JKUAT

Dear Mr. Ngore,

RE: ADHERENCE TO NATIONAL GUIDELINES IN THE MANAGEMENT OF ACUTE ASTHMA AND SHORT – TERM OUTCOMES AMONG CHILDREN AT MAMA LUCY KIBAKI HOSPITAL, KENYA

This is to inform you that JKUAT Institutional Scientific and Ethical Review Committee has reviewed and approved your above research proposal. Your application approval number is **JKU/ISERC/02316/0963.** The approval period is **27th July 2023 to 26th July 2024.**

i. Only approved documents including (informed consents, study instruments, MTA) will be used
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by JKUAT ISERC.
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to JKUAT ISERC within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to JKUAT ISERC within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to JKUAT ISERC.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://oris.nacosti.go.ke and also obtain other clearances needed.

Yours sincerely

Dr Patrick Mburugu
CHAIR, JKUAT ISERC

INSTITUTIONAL ETHICS REVIEW COMMITTEE
27 JUL 2023
APPROVED
P.O. Box 62000-00200 NAIROBI
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JKUAT

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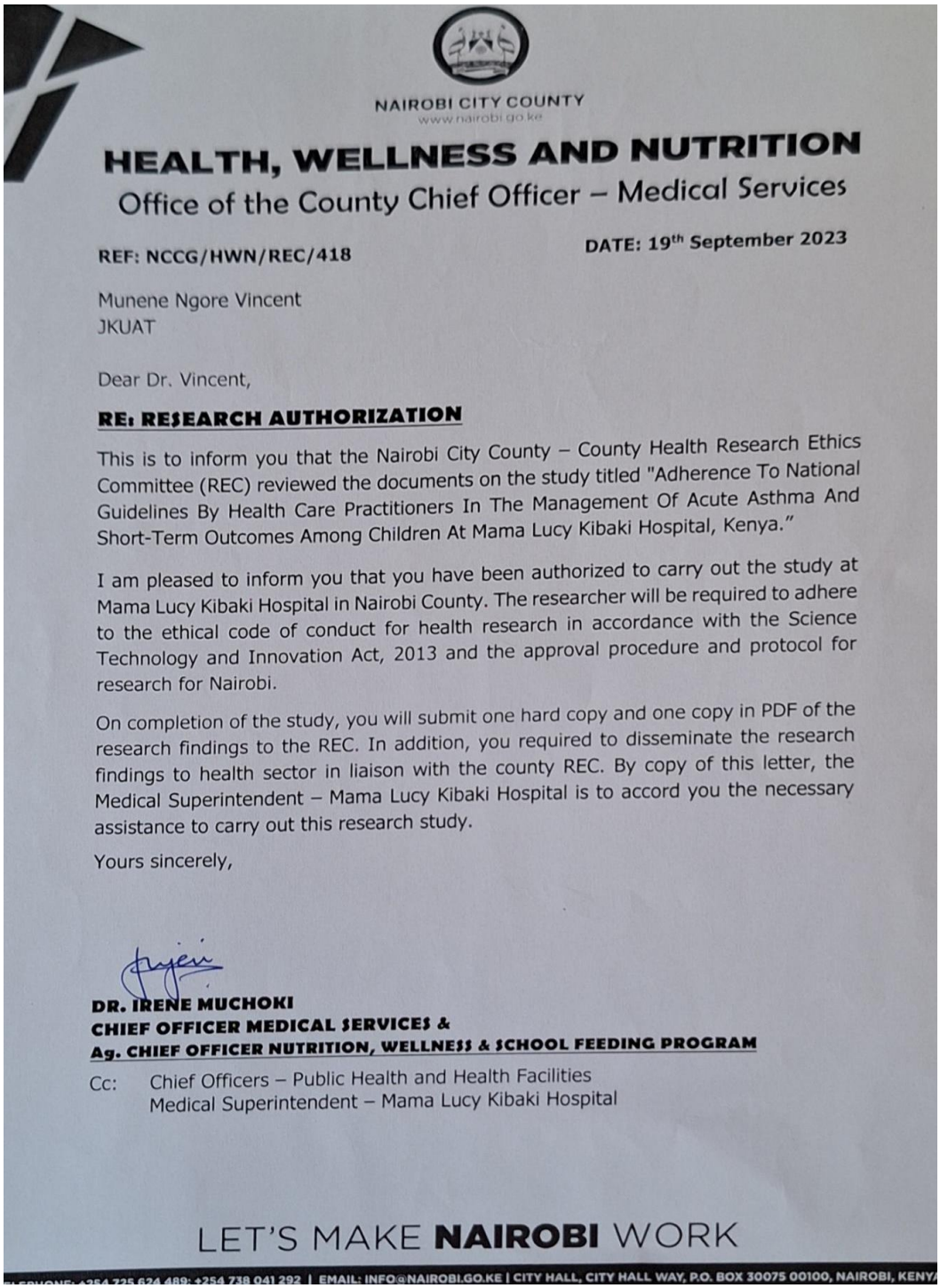
Appendix VIX: Data Collection Approval Nairobi County



NAIROBI CITY COUNTY
www.nairobi.go.ke

HEALTH, WELLNESS AND NUTRITION

Office of the County Chief Officer – Medical Services

REF: NCCG/HWN/REC/418 **DATE: 19th September 2023**

Munene Ngore Vincent
JKUAT

Dear Dr. Vincent,

RE: RESEARCH AUTHORIZATION

This is to inform you that the Nairobi City County – County Health Research Ethics Committee (REC) reviewed the documents on the study titled "Adherence To National Guidelines By Health Care Practitioners In The Management Of Acute Asthma And Short-Term Outcomes Among Children At Mama Lucy Kibaki Hospital, Kenya."

I am pleased to inform you that you have been authorized to carry out the study at Mama Lucy Kibaki Hospital in Nairobi County. The researcher will be required to adhere to the ethical code of conduct for health research in accordance with the Science Technology and Innovation Act, 2013 and the approval procedure and protocol for research for Nairobi.

On completion of the study, you will submit one hard copy and one copy in PDF of the research findings to the REC. In addition, you required to disseminate the research findings to health sector in liaison with the county REC. By copy of this letter, the Medical Superintendent – Mama Lucy Kibaki Hospital is to accord you the necessary assistance to carry out this research study.

Yours sincerely,

DR. IRENE MUCHOKI
CHIEF OFFICER MEDICAL SERVICES &
Ag. CHIEF OFFICER NUTRITION, WELLNESS & SCHOOL FEEDING PROGRAM

Cc: Chief Officers – Public Health and Health Facilities
Medical Superintendent – Mama Lucy Kibaki Hospital

LET'S MAKE **NAIROBI** WORK

TELEPHONE: +254 725 624 489; +254 738 941 292 | EMAIL: INFO@NAIROBI.GO.KE | CITY HALL, CITY HALL WAY, P.O. BOX 30075 00100, NAIROBI, KENYA