INTRAHOSPITAL NEONATAL TRANSPORT AT MUHIMA DISTRICT HOSPITAL, KIGALI, RWANDA

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INTRAHOSPITAL NEONATAL TRANSPORT AT MUHIMA DISTRICT HOSPITAL, KIGALI, RWANDA

by
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DECLARATION

I declare that this dissertation contains my own work except where specifically acknowledged.

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ABSTRACT

Introduction:effective neonatal transport is crucial to survival and good outcomes of referred preterm and sick neonates. Critically ill infants are a vulnerable population and are at high risk for adverse effects during transport; therefore, it must be done in strict safest way possible. Neonatal transport is not well established in low-income countries and is likely contributing to the high neonatal mortality rates. In Rwanda, there is no information on intrahospital neonatal transport.

Purpose: This study aims to assess intrahospital neonatal transport and infant's stability upon admission to the Neonatal Intensive Care Unit (NICU) at Muhima District Hospital (MDH) in Kigali, Rwanda.

Methodology: A descriptive cross-sectional study design were used. A totality of 92 neonates who met inclusion criteria were enrolled in this study by using a convenience sampling strategy. An observational checklist was used for data collection. Data analysis was done by using descriptive statistics and Chi-square test.

Results: Out of 92 transported neonates; 60% didn't receive any pre-transport care, 38% of neonates were transported without communicating with the receiving unit.Transport incubator, radiant warmer, and portable oxygen cylinder were not used during transport; 92.4% of neonates were carried in arms and 7.6% were transported in kangaroo mother care(KMC); means of transport were statistically associated with hypothermia on admission. Hypothermia was the most clinical adverse to be present at 52.2%, followed by poor perfusion in 41.3%, tachypnea in 39.1, hypoxia in 32% and hypoglycemia in 27%.

Conclusion and recommendation:The practice of intrahospital neonatal transport was not appropriate and associated with altered infant's clinical status ; therefore is recommended to establish a neonatal transport system by elaborating policies, protocols, and guidelines. Given a resource-limited settings use of KMC to transport neonates is highly recommended and training of staffs is required. Availability of appropriate medical equipment is recommended.

Key words:Intrahospital transport, neonatal, district ,hospital

KEY WORDS

Intrahospital

Neonatal transport

District

Hospital

LIST OF SYMBOLS AND ABBREVIATIONS/ACRONYMS

ABBREVIATIONS/ACRONYMS

AAP: American Academy of Peadiatric

APGAR: Appearance, Pulse, Grimace, Activity, Respiration

CVI: Content Validity Index

KMC:Kangaroo Mother care

MDH: Muhima District Hospital

NICU: Neonatal Intensive Care Unit

SPSS:Statistical Package for the Social Sciences

S.T.B.L.E: Sugar, Temperature, Blood pressure, Laboratory work, emotional support

USA: United States of America

SYMBOLS

<: Less than

>: Greather than

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE: INTRODUCTION

1.1. INTRODUCTION

The first chapter will provide detailed information about the background on Intrahospital Neonatal Transport. The problem statement, aim, objectives, and significance of this study on Intrahospital Neonatal Transport will also be explained through this chapter.

1.2. BACKGROUND

The term neonate is defined as an infant less than 28 days of life; they are a vulnerable and high-risk population (You *et al.*, 2015, p. 6). Globally, each year neonatal deaths are estimated at 2.7 million; 99% of neonatal death occurs in low and middle-income countries especially in Africa and south Asia (You *et al.*, 2015, p. 6). The first 24 hours of life are crucial for newborn survival as almost 1 million neonates die during this period (You *et al.*, 2015, p. 7).

Worldwide neonatal mortality has declined in high-income countries in the last 15 years. Yet, the neonatal mortality rate is almost seven times higher in low-income countries compared to high-income countries (You *et al.*, 2015, p. 7). Worldwide, the leading cause of neonatal death is preterm birth complications, intrapartum birth complications, and sepsis (Liu *et al.*, 2015, p. 3). In Rwanda, the top causes of neonatal death are asphyxia (39%), complications related to prematurity (32%), and neonatal sepsis (11%) (Rwanda Ministry of health, 2013, p. 43).

Rwanda is among the few African countries that achieved millennium development goals (MDGs) four by reducing child mortality rates by two thirds from 2000 to 2015 (You *et al.*, 2015, p. 3). Rwanda's neonatal mortality rate has declined from 44 per 1000 in 2000 to 20 per 1000 live births in 2015(National Institute of Statistics of Rwanda, 2015, p. 43). Although Rwanda has reduced neonatal mortality to 20 death per 1000 live births, the statistics show that 40% of deaths among children less than five year age occur during the first month of life (National Institute of Statistics of Rwanda, 2015, p. 14).

The Government of Rwanda has made an effort to improve maternal and neonatal health by elaborating strategies such as the use of community health workers to facilitate early diagnosis and treatment of common childhood (under 5 years old) diseases such as malaria and diarrhea,

free and focused antenatal care, effective public education on deliveries at health care facilities, maternal and neonatal death surveillance, and provision of quality health services boosted by performance-based financing (Rwanda Ministry of Health, 2013, p. 6,7). However, more improvements need to be done to achieve sustainable development goals of reducing neonatal mortality less than 12 per 1000 live birth by 2030(You *et al.*, 2015, p. 3).

Pregnant women with high risk of preterm birth and who are likely to give birth to a very sick neonate are identified and transferred to a center with a Neonatal Intensive Care Unit (NICU) for advanced care of preterm infants and critically ill neonates (Hosseini *et al.*, 2014, p. 26). Prenatal transfer of high-risk pregnant women commonly called in utero transfer is the first choice and safest method to care for the mother and neonates (Abdulraheem *et al.*, 2016, p. 5). However, in utero transfer may not be possible due to many reasons, such as preterm delivery, and unexpected illness and malformations in the newborn after a normal pregnancy. These infants need to be transferred timely and in a stable condition after delivery to a center where there is a NICU(Kong *et al.*, 2014, p. 251).

Both intrahospital and interhospital transport of critically ill neonates are intended to transport the critical infants in the most stable condition and to minimize adverse effects related to transport. The transport team must have enough knowledge of neonatal physiology and clinical requirements in order to optimize care and ensure good outcomes of the transferred neonates (Bowen, 2010, p. 415)

The outcome of the transferred neonate depends on the effectiveness of the transport system (Abdulraheem *et al.*, 2016, p. 5). Effective communication is crucial for effective neonatal transport, as well as the use of a safe mode of transport, adequate equipment, and appropriate drugs (Narang *et al.*, 2013b, p. 100) .

Organized and improved interhospital neonatal transport system in Beijing, China reduced neonatal mortality among transferred neonates from 5.1% to 2.82%, and the mortality of transferred preterm infants was decreased from 8.47% to 4.34% (Kong *et al.*, 2014, p. 251). Neonatal physiology may be impaired by transport (Gente *et al.*, 2015, p. 3).

Poor transportation methods and care may cause thermoregulation instability such as hypothermia and metabolic impairment such as hypoglycemia, which significantly increases

neonatal mortality rates. It is very crucial to prepare and stabilize the neonate before transfer and to keep the infant stable during transport in order to enhance the newborn's survival (Abdulraheem *et al.*, 2016, p. 2).

In many high-income countries neonatal transport is well organized, they have detailed protocols and guidelines about neonatal transport. Since 1950, the first neonatal transport program was organized in the United State of America (Hosseini *et al.*, 2014, p. 26). Unfortunately, neonatal transport in resource-limited countries is negligible even though they have a large number of newborns who need transfer daily for medical assistance, contributing to the high neonatal mortality rate in those countries (Abdulraheem *et al.*, 2016, p. 1)

1.3. PROBLEM STATEMENT

Effective neonatal transport is crucial to survival and good outcomes of referred preterm and sick neonates (Abdulraheem *et al.*, 2016, p. 5). Lack of trained personnel and appropriate equipment during transport of ill neonates may lead to neonatal morbidity and mortality (Pankaj *et al.*, 2012, p. 2). Neonatal physiology is impaired during transport which increases the mortality and morbidity of ill neonates (Gente *et al.*, 2015, p. 3).

In sub-Saharan countries, there is no available information on neonatal transport. In Rwanda, there is no information on intrahospital neonatal transport; however, studies have been done on neonatal mortality and morbidity. In 2013, Rwanda Ministry of Health reported that 71.2% of admitted neonates in neonatology units across the country were hypothermic. Hypothermia was found to be the first physiological changes to occur during neonatal transport and was associated with high neonatal mortality and morbidity in may studies done on neonatal transport(Pankaj *et al.*, 2012; Dalal, Vishal and Solanki, 2013; Narang *et al.*, 2013a; Rao, Bajaj and Rawat, 2015)

Althought hypothermia was found to occour in transported neonates in hospitals across the country(MOH,2013), so far no studies have been done to identify if hypothermia was due to the poor intrahospital transport of neonates or to the disease process. This study seeks to examine intrahospital neonatal transport in Rwanda.

1.4 THE AIM OF THE STUDY

This study aims to assess Intrahospital Neonatal Transport and stability of infants upon admission to the NICU at Muhima District hospital (MDH).

1.5 RESEARCH OBJECTIVES: TO

Evaluate pretransport stabilization at Muhima MDH

Describe modes of intrahospital neonatal transport at MDH

Evaluate pre-transport communication at MDH

Evaluate infant's clinical status upon admission in NICU at MDH

1.6 RESEARCH QUESTIONS

How is pretransport stabilization carried out at MDH?

What are the modes of intrahospital neonatal transport at Muhima hospital?

How is pre-transport communication at MDH done?

What is the clinical status of infant upon arrival in NICU?

1.7 SIGNIFICANCE OF THE STUDY

This study aims to assess intrahospital neonatal transport, thus it will help to identify gaps in intrahospital neonatal transport and strategies to improve it. This study will help to develop guidelines and protocols on intrahospital neonatal transport and finally to establish a better Intrahospital neonatal transport system.

This study will have a significant impact on nursing research because it will help to branch the existing gap in the literature on neonatal transport in Rwanda and in Sub-Saharan Countries. Also, this study will help to identify more research areas in neonatal transport in Rwanda. In education, this study will help integrate neonatal transport in training of students in nursing as this study is guided by a model of circle caring of neonatal transport that took its origin in nursing theory.

1.8 DEFINITION OF CONCEPTS

Neonatal period: refers to the first 28 days of life of a newborn (You *et al.*, 2015, p. 6).

Neonate: is defined as infant aged less than 28 days of life(You *et al.*, 2015, p. 6). Neonates are the target population for this study.

Intrahospital: occurring within a hospital (online Merriam -Webster Dictionary, 2016).

Transport: the act or process of moving people or things from one place to another (online Merriam -Webster Dictionary, 2016).

Intrahospital transport: in the context of this study intahospital transport consist of moving a patient from one area in the hospital to another area within the same hospital(Bowen, 2010, p.415).

1.9 ORGANIZATION OF THE STUDY

This study is organized into six chapters; first chapter introduction describe the background of the study, problem statement, objectives of the study and significance of the study. The second chapter is the literature review, it outlines the theoretical and empirical literature review by reviewing existing research on neonatal transport and identifying gaps in the literature. The conceptual framework is also discussed in literature review.

The third chapter of this study is methodology; it explains the research approach, study design, sampling strategy, data collection procedures and data analysis. Ethical consideration and study limitations are outlined in methodology. The fourth chapter consists of results presentation and interpretation. The fifth chapter of this study consist of discussion of findings and finally the six chapter is conclusion and recommendation.

CONCLUSION TO CHAPTER ONE

Effective neonatal transport is crucial to survival of reffered neonates. Lack of appropriate equipment and skilled staffs during neonatal transport may lead to increased neonatal morbidity and mortality. In Rwanda there is no information on neonatal transport, this study represent the first examination of ontrahospital neonatal transport in Rwanda. It is mainly intended to assess the practice of intrahospital transport and infant's stability upon admission in NICU at Muhima district hospital. The findings from this study will help to improve neonatal transport by elaborating policies, protocols and guidelines on intrahospital neonatal transport.

CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

The aim of this study is to assess intrahospital neonatal transport and infant's stability upon admission to NICU. This chapter will outline the theoretical and empirical literature review. The literature will be critiqued on intrahospital neonatal transport and gaps will be identified.

2.2 THEORETICAL LITERATURE

Intrahospital neonatal transport and interhospital neonatal transport consist of transporting the critically ill neonates in optimal stable condition and avoiding adverse effects(Bowen, 2010, p. 415).

a. Neonatal transportation system history

The first organized neonatal transport system was initiated in 1948 in USA by the NewYork department of health in collaboration with regional hospitals. The neonatal transport system was created before establishment of Neonatal Intensive Care Units and had trained nurses that were available 24 hours a day(Mouskou *et al.*, 2015, p. 5).

During the second half of 20 centunary many NICUs were established across Europe, Australia and North America as a result of expansion of kneowelgde in neonatalogy and advanced technology. Thus the number of preterm and severely sick neonates that were transported to a center with NICU increases considerably(Mouskou *et al.*, 2015, p. 5). In 1968 the first guidilenes of transportation newborn to tertiary level in Canada was established by The Departement of National health and welfare. To ensure a safe and quick transportation of preterm and sick neonates , the specialized transportation team was established(Mouskou *et al.*, 2015, p. 6).

In 1990, the American Academy of Pediatrics(AAP) established neonatal transportation as a speciality for continuous education of health care provider and many guidelines were published in consederation of eduction of staffs involved in neonatal transportation, necessary and recommended equipments for transportation, ethical consideration and family centered care(Mouskou *et al.*, 2015, p. 6,7)

b. S.T.B.L.E program

S.T.A.B.L.E is a neonatal education program which provides evidence-based guidelines for care of newborns after resuscitation and stabilization prior to transport to NICU. It is aimed at preventing the leading cause of neonatal mortality. The mnemonic S.T.A.B.L.E stands for six essential components of that program: Sugar and safe care, temperature, airway, blood pressure, lab work, and emotional support. This mnemonic was specifically chosen in order to help health care provider what to do when they have to stabilize and to prepare infant for transportation(Kendall, Scott and Karlsen, 2012, p. 147)

The S.T.B.L.E program was firstily implemented in USA in 1996 and since was extended to other many countries worldwide. Worldiwide, each year about 35000 students complete the learner or provider courses of S.T.B.L.E program. The S.T.B.L.E program is periodically updated to include relavants evidence-based practice. In many high income countries like USA, Canada, Panama and Mexico where S.T.B.L.E program was implemented , it has been shown to be effective in post resuscitation care and in the pre-transport stabilization of sick newborn that requires transport to NICU and contribute significantly to reduce neonatal mortality and morbidity(Kendall, Scott and Karlsen, 2012, p. 147,148,149,150)

c. Neontal transport process

Effective neonatal transport requires that is done with effective planning and organization. Appropriate transport staff and adequate equipment are mandatory to effective neonatal transport (Bowen, 2010, p. 416) Stabilization of neonates prior to transport and during transport is crucial and essential to minimize adverse complications related to transport (Gente *et al.*, 2015, p. 1)

The education of care providers on stabilization of newborn infants is essential to reduce neonatal mortality and morbidity (Borimnejad *et al.*, 2013, p. 201) Neonatal physiology is impaired during transport, thus the staff involved in the transport of newborn should have knowledge in neonatal physiology, pathophysiology and have excellent assessment skills to ensure a safe transport of neonates (Bowen, 2010, p. 416)

Neonatal transport should be organized and well planned, thus effective communication between all staff members involved in transport is essential (Bowen,2010, p. 416,417).

Communication prior to transporting a sick neonate is important and improves the quality of care of the neonate as it ensures adequate preparation before the arrival of the sick neonate (Abdulraheem *et al.*, 2016, p.5).

Appropriate equipment during neonatal transport such as incubators, radiant warmer and synthetic blankets may help to maintain temperature during transport(Borimnejad *et al.*, 2013, p. 200).The transport of sick newborn should be done at least with two health care providers who have skills in the management of critically ill neonates(Borimnejad *et al.*, 2013, p. 203).According to American Academy of Pediatrics, the neonatal transport team is composed of the Physicians, Registered Nurses, Neonatal nurses practitioners, Respiratory therapist and paramedics(Stroud *et al.*, 2013, p. 362).

2.3 EMPIRICAL LITERATURE

To review the literature on intrahospital neonatal transport the databases searched were Hinari and Google scholar. Articles that were used were English peer-reviewed articles and institutional reports that included low, middle and high-income countries, published between 2006 and 2016.

The researcher uncounted the challenge to get research studies done on intrahospital transport, much available research was conducted on interhospital transport. This section discuss available studies and their findings on neonatal transport with a focus on intrahospital neonatal transport

2.3.1 MODES OF INTRAHOSPITAL TRANSPORT

A cross-sectional study conducted in Iran in 2013 by Borimnejad *et al.*,(2013, p. 201), which was aimed to determine intrahospital neonatal transportation situation; a total of 52 intrahospital transport were assessed by using a checklist for transport equipment and drugs, features of transport team and newborn condition. SPSS 19 software and descriptive statistics were used to analyze data from the study.

The findings from this study showed that most of the transport (80.4%) were done by a single person. Most of the neonates were transported in incubators but there is a number of neonates who were transported in cut and arms. Almost 71.8% of transported infants was done without

enough necessary equipment and drugs. Oxygen monitoring in blood was not done in 56.6% of transported neonates(Borimnejad *et al.*, 2013, p. 202,203).

Borimnejad *et al.*, (2013, p. 205) concluded that intrahospital neonatal transport was not effective and didn't follow international standard of intrahospital neonatal transport, they recommended courses and training on neonatal transport and to avail appropriate equipment and drugs during neonatal transport.

Vieira *et al.*, (2011, p. 14) conducted a prospective cross-sectional study in Brazil from 1999 to 2008 with the main objective to determine the incidence of hypothermia and factors associated with hypothermia during intrahospital neonatal transport in a public teaching hospital. Among 1191 enrolled for this study all infants were transported in transport incubators that were equipped with a pulse oximeter and infusion pumps (Vieira *et al.*, 2011, p. 15). In this study, technical complications occurred in 9% of transported neonates and equipment failure occurred at a rate of 4.9%(Vieira *et al.*, 2011, p. 16).

Vieira *et al.*, (2011, p. 19) concluded that Intrahospital Neonatal Transport contributes to the incidence of complications in transported neonates especially hypothermia. Thus continuous training of transport team is required to ensure effective transport.

The study conducted in Beijing, China from 2007 to 2009 by Kong *et al.*, (2014, p. 252) on interhospital transport; equipment used during transport were adequate including resuscitation equipment and drugs, incubators, respiratory support devices, cardiorespiratory monitoring devices, pulse oximeter, infusions pumps and glucometer. Use of appropriate equipment and effective transport system contributed to reducing neonatal mortality among transferred neonates from 5.1% to 2.82%, and the mortality of transferred preterm infants was decreased from 8.47% to 4.34%.

The prospective descriptive cross-sectional study conducted by Abdulraheem *et al.*, (2016, p. 2) on interhospital transport in Nigeria from August 2012 to February 2013, among 401 transported neonates to University College hospital of Ibadan, the majority of neonates 93% were transported without medical equipment and resuscitation kits(Abdulraheem *et al.*, 2016, p. 4).

2.3.2 PRE-TRANSPORT COMMUNICATION

A descriptive cross-sectional nested in a prospective study was conducted in Nigeria on interhospital transport by Abdulraheem *et al.*,(2016, p. 2) from August 2012 to February 2013.This study was mainly intended to describe the communication, pre and intra-transport care, availability of equipment and their impact on morbidity of referred neonates.

The totality of 401 of neonates who were transported to University college hospital of Ibadan, were transported without communication before transport between referring facility and receiving hospital (Abdulraheem *et al.*, 2016, p. 4). Abdulraheem *et al.*,(2016, p. 6) concluded that neonatal transport in Nigeria was not well done, lack effective communication and stabilization and was associated with high neonatal mortality at admission.

2.3.3 PRE-TRANSPORT STABILIZATION

Appropriate stabilization of neonates prior to transport is crucial to anticipate the adverse events during transport(Gente et al., 2015,p.1) In a study by Abdulraheem et al., (2016) on interhospital neonatal transport in Nigeria , the findings from this study showed that among 401 of neonates who were transported to University College Hospital of Ibadan, only 14% were given supplemental oxygen, only 24.4% were given intravenous fluids or fed with cup or breastfeeding . Blood sugar was measured in 6.5% of neonates, the temperature was checked and documented in 13.5%, respiration was checked in 33.7% and oxygen saturation was checked in only 0.7% of transported neonates(Abdulraheem et al., 2016,p 4). The S.T.AB.L.E program which is appropriate to stabilize infants after resuscitation or prior to transport was given a little attention or neglected.Abdulraheem et al., (2016) concluded that pre-transport stabilization neonates were poor.

Another study by Borimnejad et al., (2013,) that was aimed to determine the situation of intrahospital neonatal transport, the way to perform pretransport stabilization was observed by assessing the components of S.T.A.B.L.E program that include stabilization of blood sugar, temperature, airway, blood pressure, laboratory work and emotional support.The findings from this study indicated that blood sugar, airway, and temperature were completely stabilized prior to transport of neonates(Borimnejad et al., 2013,p 204).In this study, pre-transport stabilization was done effectively.

2.3.4 POST-TRANSPORT CLINICAL STABILITY

Even though Intrahospital transport take place within the same hospital and the distance for transport is short, it is associated with risk for the transported neonates (Vieira *et al.*, 2011, p. 14)

In a prospective cross-sectional study conducted in Brazil by Vieira *et al.*, (2011, p. 15) from 1999 to 2008, among the 1,191 intrahospital transports hypothermia was the most clinical complication to occur at a rate of 15.3%. In this same study, hyperoxia occurred at 5.5%, while the drop in oxygen saturation occurred at 4.2%, need to change respiratory support settings occurred at 4.2%., and metabolic disturbance such hyperglycemia occurred at 1.4% (Vieira *et al.*, 2011, p. 17).

In a descriptive study conducted in 2007 by Narang *et al.*, (2013, p. 100) on interhospital neonatal transport in India to referral Centre in Delhi, among the 300 out born neonates who were admitted to NICU, 47% of them were hypothermic, 29.9% were hypoglycemic, 32.6% had hypoxia with oxygen saturation below 90% and 69.3% had prolonged capillary refill time above three seconds (Narang *et al.*, 2013b, p. 101).

Pankaj *et al.*,(2012, p. 1) Conducted a prospective study in India in 2011 on interhospital transport with the aim to assess transport of critically ill neonate and to find out the risk factors associated with mortality. Among transported neonates who died, 79.1% were hypothermic at admission, 14.6% were hypoglycemic, 63.8% presented grunting and 45.8% had a delayed capillary refill time. Thus, hypothermia, hypoglycemia, grunting and delayed capillary refill time were associated with high mortality (Pankaj *et al.*, 2012, p. 3).

Another descriptive cross-sectional study was conducted in India by Dalal, Vishal, and Solanki, from 2010 to 2012 on neonatal transport at tertiary care center. Of the 300 neonates who were enrolled in the study, 55% presented with hypothermia on admission, 27.4% were hypoxic, 23.4% had poor perfusion, and 20.6% had low blood sugar levels(Dalal, Vishal, and Solanki, 2013, p. 289).

In Nigeria a descriptive cross-sectional prospective study conducted by Abdulraheem *et al.*,(2016) on interhospital transport of neonates admitted at the University College Hospital, Ibadan from August 2012 to February 2013, 4.7% among admitted neonates were dead at arrival in NICU(Abdulraheem *et al.*, 2016, p. 5).

2.4. CRITICAL REVIEW AND RESEARCH GAP IDENTIFICATION

In the literature it is well documented that neonatal transport is associated with physiological and metabolic impairment. Hypothermia was the most clinical complication to occur in most studies reviewed(Vieira *et al.*, 2011, p. 17; Pankaj *et al.*, 2012, p. 3; Dalal, Vishal and Solanki, 2013, p. 289; Narang *et al.*, 2013b, p. 101)

Hypothermia and other physiological impairment such as hypoglycemia, grunting and poor perfusion has been associated significantly with high neonatal mortality(Pankaj *et al.*, 2012, p. 4; Narang *et al.*, 2013b, p. 102). Lack of trained personnel and appropriate equipment lead to increased risk of neonatal morbidity and mortality(Pankaj *et al.*, 2012, p. 2)

Reviewed literature on intrahospital transport was conducted in developed countries and looked at neonate who were transported from NICU to other department for diagnostic investigations and interventions (Vieira *et al.*, 2011, p. 15; Borimnejad *et al.*, 2013, p. 201) there is no available literature for intrahospital transport in a resources limited countries, and for neonates who need to be transported from delivery or post-natal ward to NICU for admission.

Most reviewed literature on interhospital transport was done in India (Pankaj *et al.*, 2012; Dalal, Vishal, and Solanki, 2013; Narang *et al.*, 2013) only one study was done in Africa in Nigeria by Abdulraheem *et al.*, (2016).There is no available literature in sub-Saharan countries on neonatal transport either intrahospital transport nor interhospital transport (Abdulraheem *et al.*, 2016, p. 6)

In Rwanda, there are no available research findings on neonatal transport, especially Intrahospital Neonatal Transport.

Conclusion: there is a paucity of literature on intahospital neonatal transport. Thus this study is intended to breach the existing gap in the literature on Intrahospital neonatal transport in Rwanda.

2.5 CONCEPTUAL FRAMEWORK

This study on intrahospital neonatal transport was guided by the circle of the caring model for neonatal transport which was developed by Jessica Thomas in 2011.

In 1997 Joan Engebretson developed the circle of the caring model which took origin in the nursing grand theory of Anne Boykin and Savina Schoenhofer named “the theory of nursing as caring: a model for transforming practice”. Thus the circle of the caring model for neonatal transport was adopted from the Engebretson’ circle of caring(Thomas, 2011, p. 14).

The circle of the caring model of neonatal transport developed by Jessica Thomas in 2011, is a perfect model to assess Intrahospital Neonatal Transport and to improve neonatal transport.

The circle of the caring model for neonatal transport consists of key elements of the nursing process components: assessment, planning, and evaluation (Thomas, 2011, p. 15).). The nursing assessment includes maternal history, birth history, full physical examination and investigations and determines infant’s response to previous interventions’ this last step of assessment is very important as it assists in the analysis and planning for further care of the neonate (Thomas, 2011, p. 16)Planning process consists of stabilizing neonates by determining needed medical and surgical intervention before or during transport. The circle for the caring model of neonatal transport clearly shows how continuous assessment, planning, evaluation, and collaboration influence outcomes.(Thomas, 2011, p. 19) This model also put emphasize on transport team intuition, appropriate skills sets and advocacy of patients and families to ensure delivery of effective nursing care(Thomas, 2011, p. 19).The step of evaluation help to identify the safest mode of transport of the patient.

Figure 2.1 Caring model for neonatal transport developed by Jessica Thomas in 2011

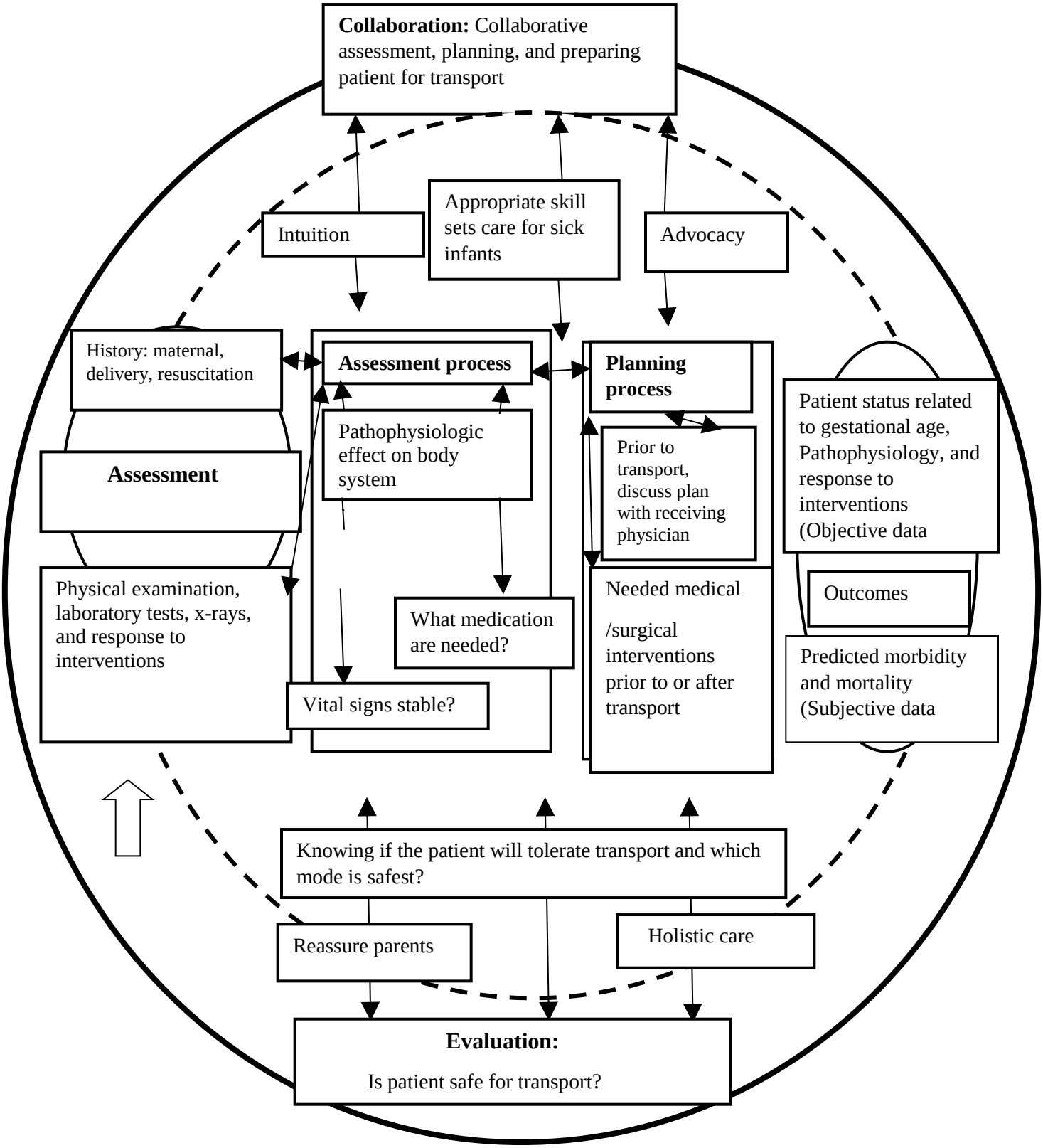
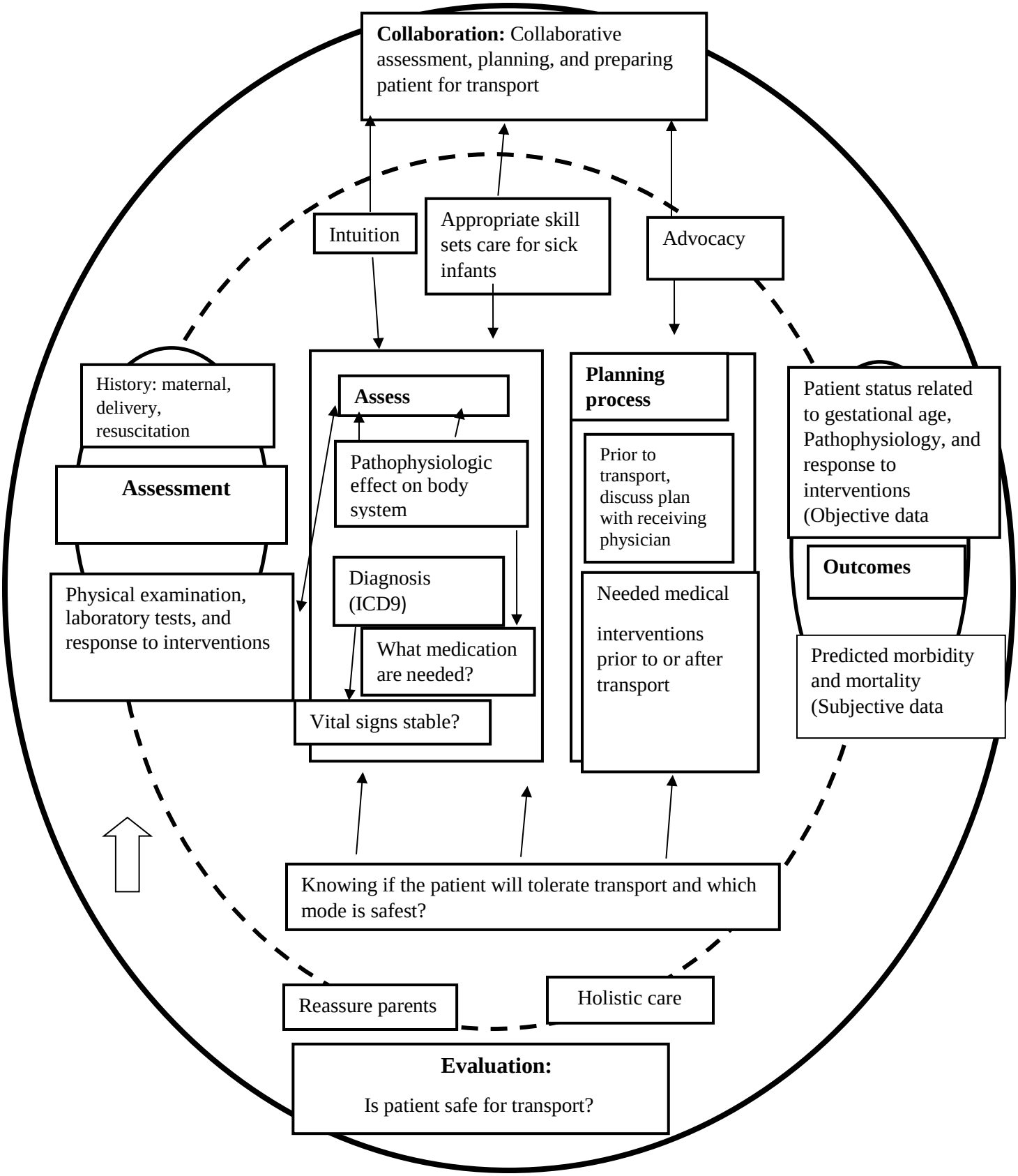


Figure 2.2 Circle for the caring model for neonatal transport adapted for intrahospital neonatal transport by authorization of the author



2.6 THE CONCEPTUAL FRAMEWORK AND THE STUDY OBJECTIVES

The objectives of this study met the concepts from this circle of the caring model for neonatal transport. The data collection tool was designed using the concepts from this framewok.

Table 2.1 Conceptual framework and the study objectives

Objectives	**Framework**	**Data collection tool**
To evaluate pre-transport stabilization	**Assessment and planning process** • Vitals signs stable? • Needed medications? • Needed medical interventions prior to transport	Question 12 What are pre-transport care received by neonate prior to transfer at NICU?
To evaluate pre-transport communication	**Planning process** Discuss plan with receiving unit	Question 11 Is there any communication between referring unit and receiving unit prior to transport of neonate?
To describe modos of intrahospital neonatal transport	**Evaluation** • Is patient safe for transport? • Knowing if patient will tolerate transport and which mode is the safest. • Appropriate skills of the transport team • Holistic care	Question13: transport team Question14: mean of transport Question15:newborn coverage Question16: transport equipment
To evaluate infant's stability upon admission in NICU	**Evaluation: outcomes** Patient status: objectives data	Question 17 Infant's stability on admission :Temperature, respiratort pattern, oxygen saguration, heart rate, perfusion status, random blood sugar

CHAPTER THREE: RESEARCH METHODOLOGY

3.1. INTRODUCTION

This chapter summarizes the tools and techniques that were used to assess intrahospital neonatal transport and infant's stability upon admission to Muhima District Hospital's NICU. It covers the research approach and design, study population, sample size, sampling procedures, data collection methods, data management, analysis and dissemination, ethical consideration and limitations of the study.

3.2. RESEARCH DESIGN

A research design is a plan that guides the researcher in implementing the study in order to achieve the objectives of the study (Burns & Grove, 2005, p. 40)

This study used a cross -sectional descriptive study design as it is the most suitable design to meet the objectives of the study. A descriptive study design is used to develop a theory, to identify problems of a current practice, to justify current practice, to make judgment or to describe what others are doing in similar situation (Burns & Grove, 2005, p. 232) A cross - sectional study design was used as the data was collected once in give time (Salkind, 2015, p. 2). Thus this design is appropriate to evaluate the practice of Intrahospital Neonatal Transport at Muhima District Hospital.

3.3. RESEARCH APPROACH

This study used a quantitative approach for assessing Intrahospital Neonatal Transport at Muhima District Hospital in Kigali, Rwanda. A quantitative descriptive design uses statistics to describe and examine the relationship that may exist among variables (Creswell, 2014, p. 4). Quantitative research is mainly intended to measure concepts or variables accurately and study the relation existing between variables by using numerical and statistical techniques (Parahoo, 2006, p. 49,51) This approach was chosen to provide answers to the research questions by using statistics and numbers.

3.4. RESEARCH SETTING

This study was conducted at Muhima District Hospital in Kigali city, Rwanda. Rwanda's health system has three levels composed of the central, intermediate, and peripheral levels. The central level is commanded by the authority of Ministry of Health and the national reference hospitals are under central level authority. The intermediate level is composed of one provincial hospital in each province in order to decrease the work overload at the national referral hospitals. The peripheral level is composed of health districts and consist of an administrative, a district hospital and a network of health centers (Rwanda Ministry of Health, 2014, p. 24,25).

Muhima District Hospital is a public district hospital located in Nyarugenge Administrative District in Kigali city. Muhima District Hospital was inaugurated in 2001 as a maternal and child health hospital, and has three operating departments: Gynecology and Obstetrics, Neonatology Intensive Care Unit and Pediatrics. Muhima District Hospital has the vision to become an excellent referral center for maternal and child quality health care in Rwanda.

Currently, Muhima District Hospital works as a level two of care in Rwanda and has 10 health centers in its catchment area. Muhima Hospital is geographically and financially accessible since all health insurance is accepted including community health based insurance which covers the majority of the Rwandan population.

According to a recent report from the hospital, Muhima district hospital has an average of 750 deliveries per month and an average of 120 neonates are admitted in NICU every month. This setting was chosen because Muhima District Hospital as a district hospital receives many women with high-risk pregnancies from health centers in its catchment area, and the number of neonates born at Muhima who require being transported to NICU is high.

3.5. POPULATION

Target Population is a whole set of subjects who have the same characteristics in which the researcher is interested in studying(Martinez-Mesa *et al.*, 2014, p. 609).

Inclusion criteria: is defined as features that subjects should have in order to be included in the target population (Burns & Grove, 2005, p. 243)

Thus inclusion criteria for this study are as follow:

- Sick term or preterm neonates born at Muhima District Hospital who require transfer

to NICU immediately after birth or later from the postnatal ward.

Exclusion criteria: Is defined as features that prohibited a subject to be a part of the target population(Burns & Grove, 2005, p. 343).

- Healthy term or preterm infants born at Muhima district hospital who don't require transfer to NICU.
- Sick term or preterm neonate born out of Muhima district hospitals and who are transferred to NICU.

The target population of this study consisted of monthly average of 120 neonates born at Muhima district hospital and required transfer in NICU.

3.6. SAMPLING

Sampling consist of obtaining a representative sample size from the study population by reducing systematic bias and sampling error that may occur (Burns & Grove, 2005, p. 341)

3.6.1. SAMPLING STRATEGY

The present study used a convenience sampling strategy. As defined by Endacott and Botti, (2007, p. 235) a convenience sampling strategy is sampling where every available individual or events in target population are chosen.

A convenience sampling strategy was used to get the desired sample size by including in the study all neonates who met inclusion criteria and who were available from March 13th ,2017 to April 23rd, 2017.

3.6.2. SAMPLE SIZE

Sample is defined as predetermined part of participants that is taken from the target population (Martinez-Mesa *et al.*, 2014, p. 609)

The sample size was computed using a statistical formula of Yamane (1967:886) as cite by Kasiulevičius, Šapoka and Filipavičiūtė, (2006, p. 227), which states that, for any given population, the required sample size is given by;

$n = \frac{N}{1 + N(e^2)}$, Where;

n = the required sample size; N = the known population size; and e = the margin of error, which is = 0.05. Given a total population of 120 neonates transfered on monthly basis in NICU at Muhima Hospital, a sample size was: $n = \frac{N}{1 + N(e^2)}$, $\mathbf{n = \frac{120}{1+120*(0.05)^2} = 92}$ neonates.

3.7. DATA COLLECTION

Data collection was done during from March 13th ,2017 to April 23rd, 2017

3.7.1. DATA COLLECTION INSTRUMENTS

Data for this study was collected by using an observational checklist which was designed, guided by the circle of the caring model for neonatal transport in order to provide answers to the research questions.

a. Tool description

The designed tool had questions intended to describe the clinical features of transported neonates by identifying the mode of delivery, APGAR score, history of resuscitation at birth, reason of the transfer, and demographic features including age at admission, maturity, gender, and birth weight. The tool is also designed to provide answers to research questions, it had questions regarding pre-transport care, pre-transport communication, transport modes and infant's stability.

b. Validity and reliability of the data collection tool

Validity: is defined as the degree to which tool measure what is intended to measure(Kimberlin and Winterstein, 2008, p. 2278).

Reliability is the extent of consistency with which an instrument measure what is intended to measure (Burns and Grove, 2005, p. 374).

To estimate the content validity of the tool, the researchers designed a research tool based on adapted conceptual framework guided by circle caring model for neonatal transport developed by Jessica Thomas in 2011 and sought opinions from neonatology experts. The six chosen experts were asked to review the draft of 26 questions to ensure its consistency to the conceptual framework. The experts rated the drafted questions using a 4- point scale(1: no relevant, 2: unable, 3: relevant, 4: very relevant). The question that was rated 3 or 4 was declared valid.

The researcher compiled the responses from experts and computed the Content Validity Index (CVI) to estimate the validity of the tool. The content validity was calculated as the proportion of the total number declared valid, and the estimation for validity was 0.83 and above, meaning that any value below it would make the tool invalid (DeVon et al., 2007, p. 158). The table below shows a summary of the experts' ratings.

Table below shows a summary of the experts' ratings.

$$CVI = \frac{Number\ of\ declared\ valid}{Total\ number\ of\ items}$$

Table 3.1 : Determination of Reliability and Validity of the tool

Variables	**Relevant items**	**Irrelevant items**	**Total**
Demographic and clinical features	9	1	10
Pre- transport communication	2	0	2
Pre- transport stabilization	1	0	1
Transport mode	4	1	5
Infant's stability	8	0	8
Total	**24**	**2**	**26**

CVI=24/26=0.92

The CVI of 0.92 was greater than 0.83, hence the tool was considered valid.

These experts also assisted in assessing the phrasing of the questions to avoid ambiguity. The researcher viewed each statement with the help of the supervisor, experts and assessed the extent to which the questions related to the topic of the study. A study pilot was conducted prior to data collection to ensure the reliability of the tool. During the pilot study, the designed tool was tried out on nine neonates that were admitted in NICU. The question was amended for mistakes and a final copy was presented to the supervisor for approval. Reliability analysis was calculated for allowing the researcher to study the properties of measurement scales and the items that compose the scales. The model of Alpha (Cronbach) is a model of internal consistency, based on the average inter-item correlation (DeVon et al., 2007, p. 162) The model of Alpha was computed using SPSS softaware version 22 on 48 variables that were entered in data base from the data collection tool.

Table 3.2. Reliability Statistics

Cranach's Alpha	N of Items
.795	48

The pretest of the questionnaire have indicated that Cronbach's Alpha is greater than 70% means that our questionnaire is valid and is up to standard of research instruments.

3.7.2. DATA COLLECTION PROCEDURE

Data was collected by the researcher and two research assistants. Researcher assistant was trained by the researcher about the data collection tool and data collection procedure prior to data collection.

The data was collected during a period of six weeks from March 13th, 2017 to April 23rd, 2017. The data were collected every day from Monday to Sunday, from 7:00 am to 5:00 pm.

An observation checklist was completed for every neonate who was admitted in NICU and who met inclusion criteria. The researcher and assistant recorded on the observation checklist the information about the neonates regarding demographic features and clinical features. They recorded on the checklist the transferring unit and if there was communication with receiving unit prior to transport of neonates in NICU. To evaluate the pre-transport stabilization the researcher and assistant recorded on the checklist the pre-transport care that infant received prior to transport.

The researcher and assistant observed the mode of transport by recording the transport team, means of transport, newborn coverage and other available equipment during transport including resuscitation kits, monitoring devices, radiant warmer, incubator and portable oxygen cylinder. Then at the end, reasercher and assistant assessed infant's stability upon admission by checking and recording temperature, respiratory rate and breathing adequacy, oxygen saturation, heart rate, random blood sugar. Also, infant's perfusion was evaluated by assessing peripheral pulses and capillary refill time.

The temperature was checked by using a digital thermometer in armpit for three minutes, respiratory rate was checked by counting chest rise for full one minute, other respiratory compromises were assessed by observing the presence of grunting or chest retraction, oxygen saturation and heart rate was checked by using a pulse oximetry. Random glucose was checked

by using a glucometer after performing a heel stick. Capillary refill time was assessed over infant's sternum and the peripheral pulses were checked by palpating radial artery.

3.8. DATA ANALYSIS

After data collection, the researcher did data coding and data entry in the database by using Statistical Package for Social Sciences (SPSS) version 22.

Descriptive statistics like frequencies, percentage, cross tabulation, and charts were used for demographic and clinical features, pretransport stabilization, pre-transport communication, transport modes and infant's clinical stability. Finally, the researcher used statistical test chi-square to test the association between modes of transport and upon admission.

3.9. LIMITATIONS AND CHALLENGES

This study was limited by a short time which resulted in small sample size that was obtained based on monthly admission instead of annual admission in NICU, thus this may hump generalization of findings. It could have been better if the researcher was able to assess pre-transport physiological and metabolic parameters and make a comparison with infant's physiological parameters upon admission in NICU. The short time for the study resulted in the inability of the researcher to follow the infant upon discharge and make a correlation between physiological changes due to transport and patient outcome.

3.10 ETHICAL CONSIDERATIONS

The study was conducted after getting approval from the University of Rwanda's Institutional Review Board (IRB). The permission to conduct the study at Muhima district hospital was obtained from the administration of the hospital. Participation in this study was voluntary and informed consent was obtained from the parents as the guardian of the neonates.

Confidentiality was respect by using anonymity on data collection tool and the data was accessible only to the researcher and was stored in computer protected by a password. Given the nature of this study, no harm was done to the neonates during the study.

3.11 DATA MANAGEMENT

Data was stored in SPSS database protected by a password, where every targeted variable from the study was coded and labeled in the database.

3.12 DATA DISSEMINATION

The findings from this study will be disseminated through presentation in organized local seminar and workshops. A feedback report of the data from this study will be given to Muhima district hospital.

Data obtained from this study will be released through publication via accredited journal . Data from this study will be also disseminated in national and international neonatal comferences.

CONCLUSION TO CHAPTER THREE

The present study was conducted at Muhima district hospital, a descriptive cross sectional study design was used , a convenience sampling strategy was used to get a sample size of 92 neoantes who met inclusion criteria. Data collection was done using an observation checklist. Descriptive and inferential statistics were used to analyze data. This study was approved by University of Rwanda's Institutional Review Board (IRB).

CHAPTER FOUR: RESULTS

4.1 INTRODUCTION

This chapter presents the findings from the study conducted on Intrahospital Neonatal Transport during March and April 2017. The data was analyzed using SPSS version 22 and are presented in tables and graphics. This study was intended to answer the following research questions:

1. How is pre-transport stabilization done at MDH?
2. How is pre-transport communication at MDH done?
3. What are the modes of Intrahospital Neonatal Transport at Muhima hospital?
4. What is the clinical status of infant upon arrival in NICU?

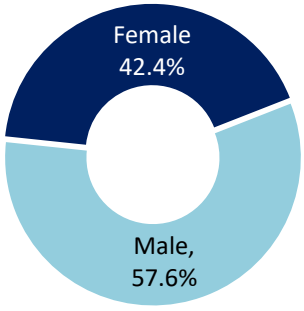
A total number of 92 neonates born at Muhima District Hospital were transported from delivery room, operating theatre and postnatal ward to NICU.

4.2 DEMOGRAPHIC AND CLINICAL FEATURES OF TRANSPORTED NEONATES

The variable under this section are gender, gestation age, birthweight, age at admission, mode of delivery, APGAR score at five minute, resuscitation at birth, and reason of transfer in NICU.

4.2.1 GENDER OF TRANSPORTED NEONATES

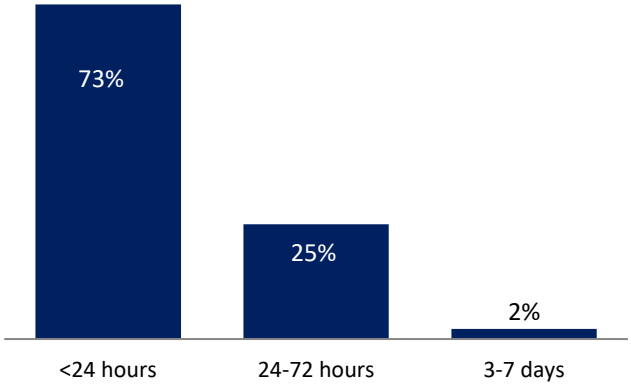
Figure 4.1 Gender of neonate



This study covered 92 neonates transported to NICU from delivery room operating theatre and postnatal ward; 57.6% of them were male while 42.4% were female.

4.2.2 AGE OF NEONATES ON ADMISSION IN NICU

Figure 4.2 Age of Neonate



All transported neonates to NICU covered in this study were aged within the first week of life;73 % of them were transported within their first 24 hours of life and 25% were aged between 24 and 72 hours. Few neonates about 2% were aged between 3-7 days of life.

4.2.3 GESTATION AGE AND BIRTH WEIGHT

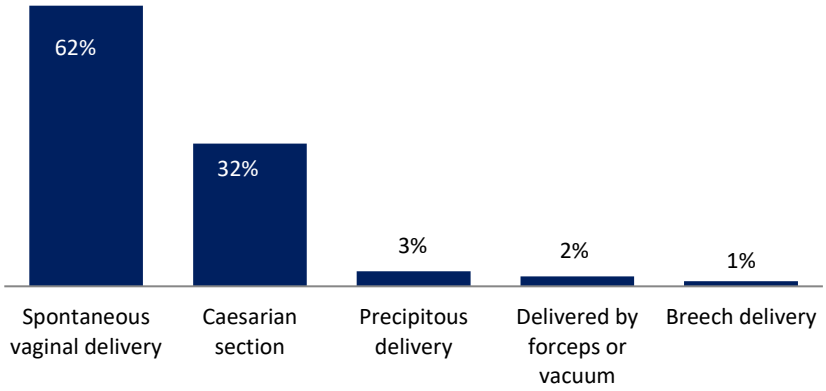
Table 4.1 Birth weight of neonate by gestation age

Gestation age	Birth weight of neonate				Total
	<1000gr	**1000-1500gr**	**1500-2500gr**	**>2500gr**	
Prematurity <28 weeks	0%	1.1%	0.0%	0%	1.1%
Prematurity 28-32 weeks	1.1%	4.3%	3.3%	0%	8.7%
Prematurity 32-37 weeks	0%	1.1%	20.7%	4.3%	26.1%
Term 37-42 weeks	0%	0%	3.3%	58.7%	62.0%
post-term>42 weeks	0%	0%	0%	2.2%	2.2%
Total	1.1%	6.5%	27.2%	65.2%	100.0%

Most of transported neonates (62%) were term babies with gestation age between 37 and 42 weeks and 65.2 % of the infants transported weighted greater than 2500 gr, 27.2% weighted 1000 to 15000 gr and 1% less than 1000 gr.

4.2.4 MODE OF DELIVERY

Figure 4.3 Delivery mode

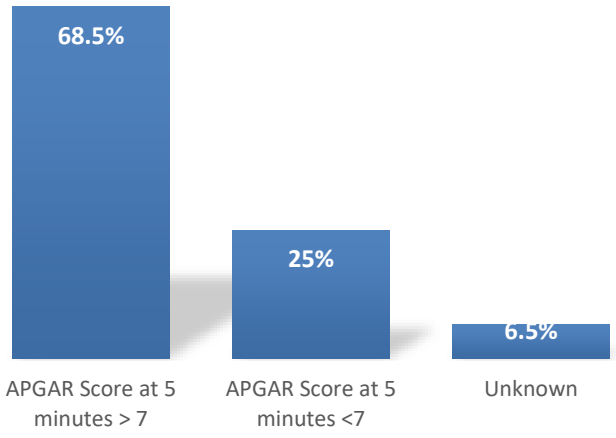


The reasercher looked on different delivery mode of neonates transported in NICU at Muhima Hospital and the results show that 62% of all transported neonates were delivered by spontaneous delivery, 32% by Caesarian section and the least delivered mode found in this reasearch were precipitous, delivered by forceps or vacuum and breech delivery respectively at 3%; 2% and 1%.

4.2.5 APGAR SCORE

The researcher recorded the APGAR score at five minute of transported neonates, APGAR at five minute indicate how the newborn is adopting to extra-uterine life.

Figure 4.4 Apgar score

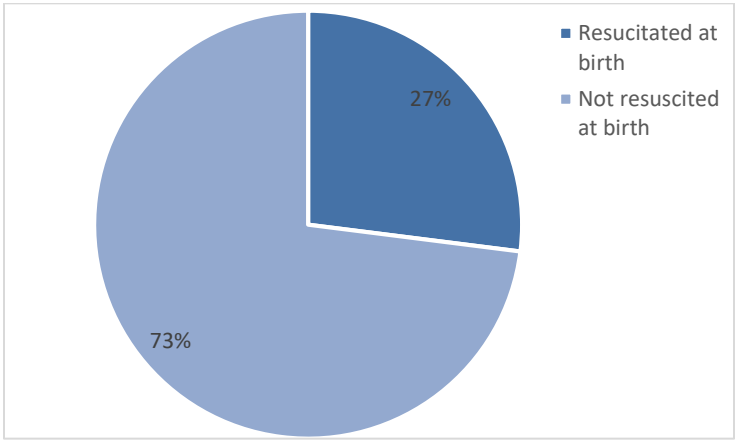


Most on neonates (68.5%) who were transported in NICU had a normal APGAR score equal or above 7 whereas 25% of neonates had a low APGAR Score below 7, and APGAR score was not identified in 6.5% of transported neonates.

4.2.6 RESUSCITATION AT BIRTH

Neonates that were transportred in NICU , some of them were resuscitated immediately after birth.

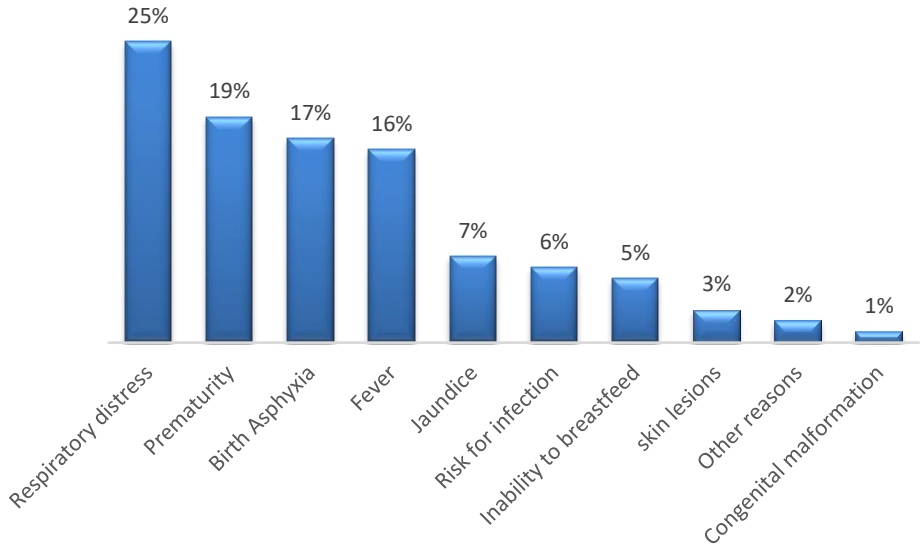
Figure 4.5 Resuscitation at birth



As presented on figure 4.5, about 27% of neonates were resuscited after birth while 73% were not resuscited.

4.2.7 REASON OF TRANSFER IN NICU

Figure 4.6 Reasons of transfer in NICU



Transfer a neonates in NICU depends on different reasons and while exploring those reasons, then researcher found that a big part of neonates were transferred because of respiratory distress at 25%, prematurity at 19% , Birth Asphyxia at 17% and Fever at 16%. The remaining neonates were transferred because of different reasons" Jaundice, risk for infection, inability to breastfeed, skin lesions, congenital malformation and other reasons" in the range of 1-7%.

4.3 RESULTS BY STUDY OBJECTIVES

The present study had four specific objectives: to evaluate pre-transport stabilization, to evaluate pre-transport communication, to assess modes of intrahospital neonatal transport and to assess infant's stability upon admission in NICU.

4.3.1 PRE-TRANSPORT STABILIZATION

The present study was intended to assess nursing and medical care that neonates received as pre-transport stabilization of their clinical status.

Table 4.2 Pre- transport care

Pre-transport care	Frequency	Percentage
Administration of Dextrose 10%	1	1%
Oxygen saturation checked	2	2 %
Oxygen supplement	19	19%
Respiratory rate checked	1	1%
Temperature checked	17	17%
Heart rate checked	0	0%
Peripheral pulses checked	0	0%
Capillary refill time checked	0	0%
Blood sugar checked	0	0%
Administration of volume expender	0	0%
Administration of drugs	0	0%
No pre transport care	60	60%
Total	100	100%

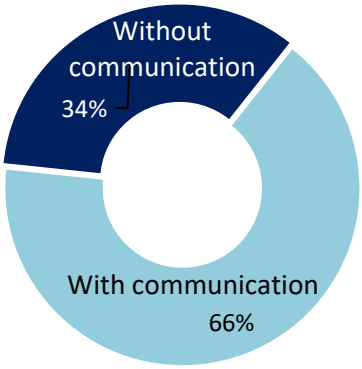
The table 4.2 illustrates pre-transport care received by neonates prior to transport in NICU where only 19% of transported neonates received an oxygen supplement, temperature was checked on 17% Neonates and Oxygen saturation at 2% while respiratory rate was checked in 1% and Dextrose10% given to 1%. A big part of 60% of neonates were transported without any pre-transport care.

Heart rate, peripheral pulses, capillary refill time, and blood sugar were not checked on any neonates before transport to NICU. No neonates received any medication or a volume expander prior to transport.

4.3.2 PRE-TRANSPORT COMMUNICATION

The present study sought to evaluate communication between the referring unit and receiving unit prior to transport of neonates in NICU.

Figure 4.7 Pre-transport communication

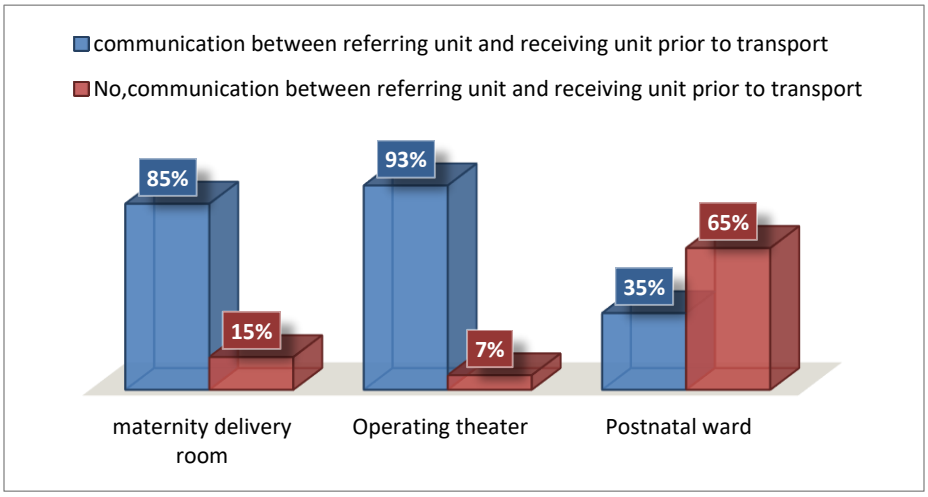


Communication between the referring and receiving unit before transport of neonates in NICU was done in 66% of transported neonates while 34% of neonates were transported in NICU without any prior communication between the referring unit and NICU

Pre-transport communication by referring unit

The neonates that were transported in NICU come from three unit: maternity delivery room, operating theathre and postnatal ward.

Figure 4.8 Pre-transport communication by transferring unit



As presented on the figure4.8, the operating theater was the first unit to communicate with NICU before transport as it communicated 93% cases of all neonates transferred and post-natal ward was the less communicating unit before transferring neonates to NICU as it communicated only 35% cases of transported neonates in NICU.

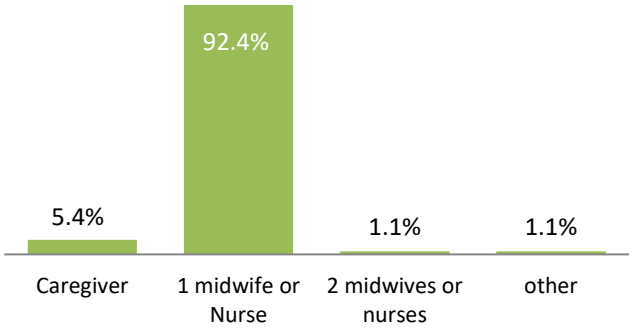
4.3.3 MODES OF INTRA-HOSPITAL TRANSPORT

The present study assessed the modes of intrahospital transport and the variables " transport team, means of transport, newborn coverage and available equipment during transport" were focused on and the results below were found.

a. TRANSPORT TEAM

The researcher looked at the people who transported the neonates to NICU.

Figure 4.9 Transport team

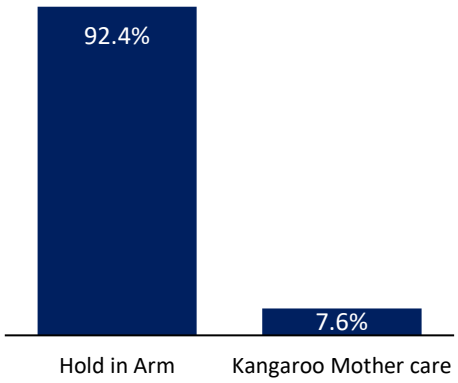


The researcher observed the ways neonates are transported to NICU and the results from figure 4.9 shows that 92.4% of transport team were made by single professional person " midwife or a registered nurse"; 5.4% of the team were caregivers who transported neonates without being accompanied by a health care professional and the last teams found which occupied 1.1% were made by 2 midwives/nurses and other person was a student.

b. MEANS OF TRANSPORT

The researcher observed the means used to transport neonates to NICU and found that only two means were used.

Figure 4.10 Means of transport

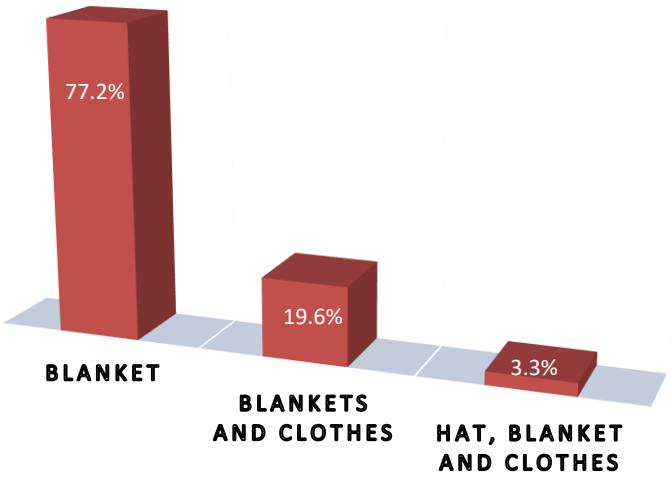


The means of transport in intra-hospital transport were dominated by holding neonates in arms at 92.4% while transporting them in NICU and 7.6% of neonates were transported by kangaroo care.

c. NEWBORN COVERAGE

The researcher observed how neonates were covered in blankets or clothes to prevent hypothermia. The statistical results were presented in figure 4.11

Figure 4.11 Newborn coverage



As presented on figure12 , majority of neonates 77.2% were wrapped in one blanket , only 3.3% of neonates had a full coverage of hat, clothes and blanket.

d. TRANSPORT EQUIPMENTS

The researcher observed the medical equipments that were used to transport the neonates to NICU and the results are illustrated in table 4.3 for details.

Table 4.3 Transport equipment

Transportation equipment	Frequency	Percentage
No equipment	92	100%
Portable oxygen cylinder	0	0%
Resuscitation kit	0	0%
Incubator	0	0%
Radiant warmer	0	0%
cardiac monitor	0	0%
Oxygen saturation monitoring device	0	0%
Other equipment	0	0%
Total	**92**	**100%**

During transport of neonates to NICU a totality of 92 neonates were transported without any medical equipment like incubator or radiant warmer ;.therewere any monitoring device neither cardiac monitor nor oxygen saturation device. Portable oxygen cylinder and resuscitation kit was not available in any case. There was any another equipment used to transport the neonates.

4.3.4 INFANT'S STABILITY UPON ADMISSION IN NICU

The present study sought to assess infant's stability upon admission in NICU; physiological parameters that were assessed, are the following: temperature, respiratory rate and respiratory effort, oxygen saturation, heart rate, capillary refill time, peripheral pulses and random blood glucose.

a. INFANT'S TEMPERATURE UPON ADMISSION

The researcher assessed the temperature of neonates upon admission in NICU. Most neonates had temperature instability as it is presented in fugure 4.12 , only 38% of neonates had normal temperature on admission, whereas 52.2% had hypothermia and 9.8% had hyperthermia.

Figure 4.12 Infant's Temperature upon admission in NICU

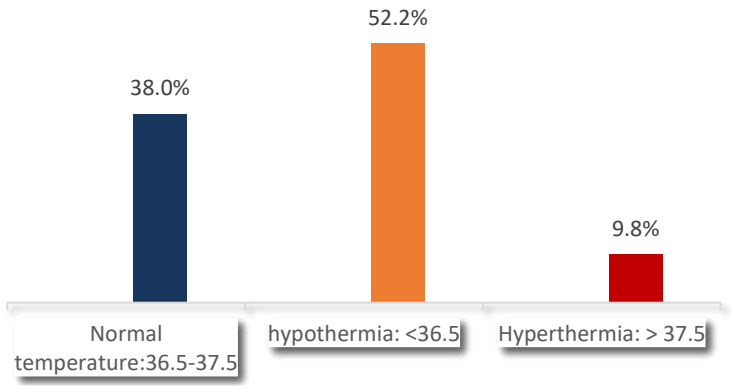


Table 4.4 Infant's temperature by transferring unit

Temperature	Transferring Unit			Total
	Maternity delivery room	Operating theater	Postnatal ward	
Normal temperature:36.5-37.5	8	7	20	35
hypothermia: <36.5	32	7	9	48
Hyperthermia: > 37.5	0	1	8	9
Total	40	15	37	92

As it is crosstabulated in table 4.4 , the results found in this study show that majority of infants(32) that were hypothermic come from maternity delivery room.

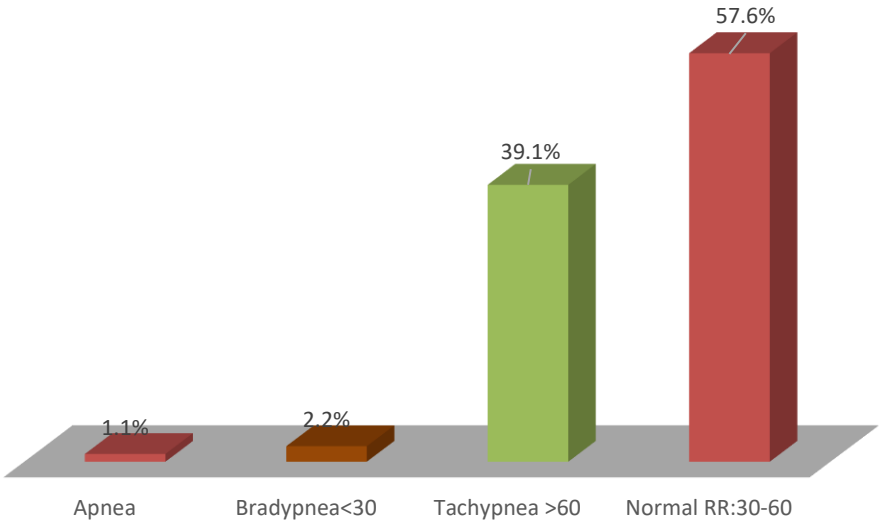
b. INFANT'S RESPIRATORY PATTERN AND BREATHING ADEQUACY

The researcher assesd the respiratort rate and breathing adequacy by observing presence of grunting and chest retraction.

i. Respiratory rate

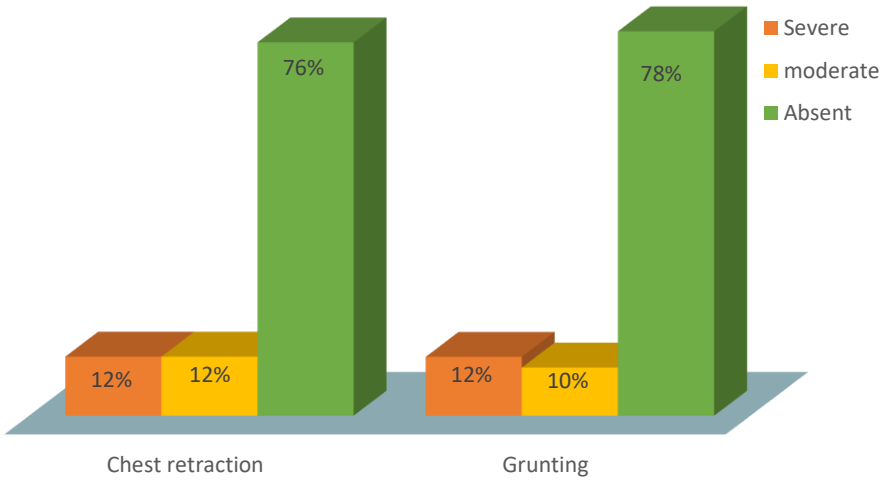
As presentented on figure 4.13, among 92 neonates who were transported in NICU of Muhima hospital, more than half (57.6%) had a normal respiratory rate with 30-60 breaths per minute, 39.1% of neonates had tachypnea ,2.2% had bradypnea while one (1.1%) neonate was apneic on admission.

Figure 4.13 Infant's respiratory rate upon admission in NICU



ii. Breathing adequacy

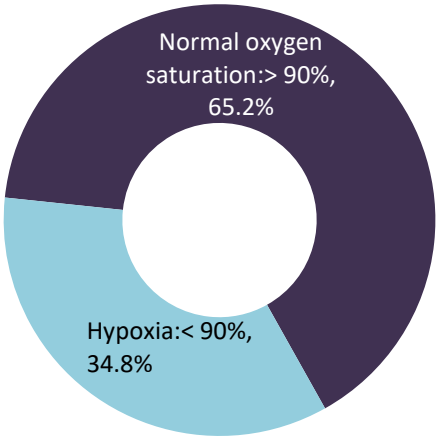
Figure 4.14 Chest retraction and grunting present on admission in NICU



Breathing difficulties were noticed on admission; severe chest retraction and severe grunting were present in 12% of transported neonates. Moderate chest retraction was present in 12% of neonates and 9.6 % of neonates had moderate grunting.

c. INFANT'S OXYGEN SATURATION ON ROOM AIR

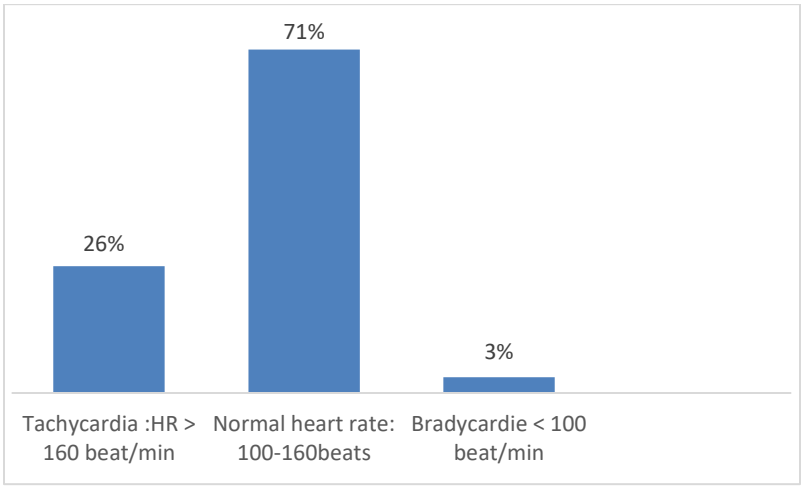
Figure 4.15: Infant's Oxygen saturation on room air upon admission in NICU



Oxygen saturation on room air below 90% was considered as hypoxia, 34.8% of transported neonates had hypoxia and 65.2% had normal oxygen saturation.

d. INFANT'S HEART RATE UPON ADMISSION IN NICU

Figure 4.16 Infant's Heart rate upon admission in NICU

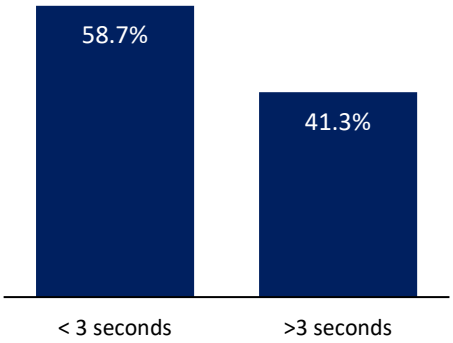


Among 92 neonates reached in this study,a normal heart rate was found in 71% of transported neonates whereas 26% had tachycardia with a heart rate above 160 beats per minute. Few neonates (3%) had bradycardia with a heart rate below 100 beats per minute.

e. INFANT'S PERFUSION UPON ADMISSION IN NICU

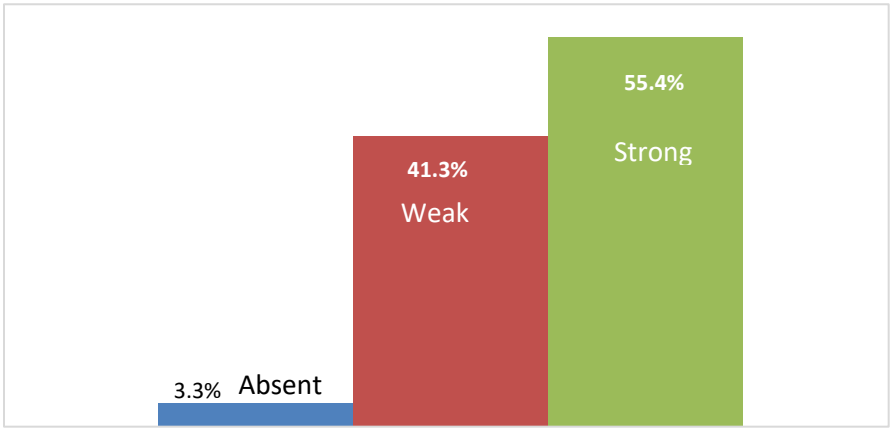
Neonates that were transported in NICU had compromised perfusion which was evidenced by delayed capillary refill time (capillary refill time above three seconds) and weak or absent peripheral pulses.

Figure 4.17 Capillary refill time upon admission in NICU



Among 92 neonates that were transported, 58.7% of them had a normal capillary refill time and 41.3% had a delayed capillary refill time (capillary refill time above three seconds)

Figure 4.18 Peripheral pulses upon admission in NICU

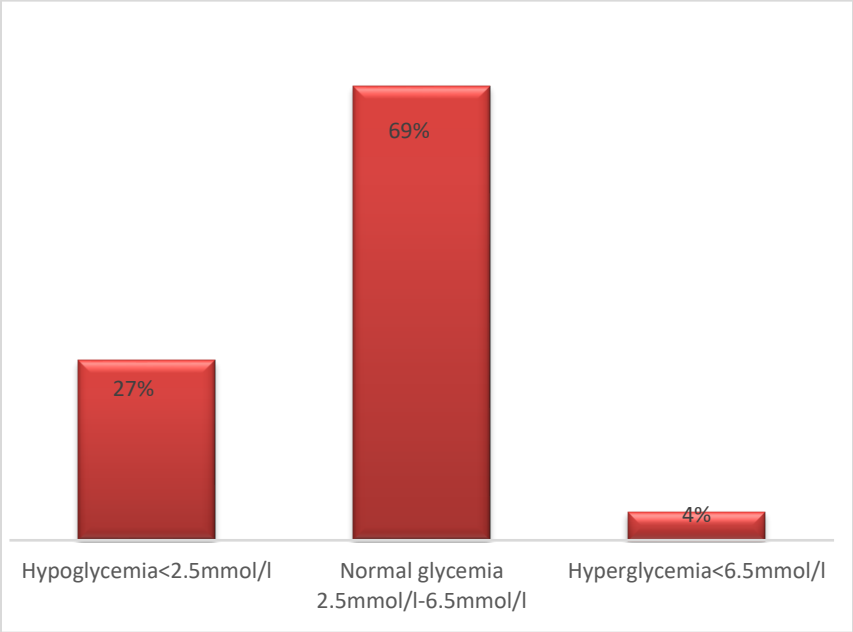


Peripheral pulses were weak in 41.3% of neonates and 3.3% had absent peripheral pulses upon arrival in NICU.

f. INFANT'S RANDOM BLOOD SUGAR UPON ADMISSION IN NICU

In the present study, the rearcher assessed the random blood sugar of infants upon admission in NICU and findings are presented in Figure 4.18.

Figure 4.19 Random blood sugar upon admission in NICU



Reasercher analysed infant's blood sugar and found gylcemia instability in neonates that were transported in NICU; out of 92 neonates transported in NICU, 27% of them had hypoglycemia with blood glucose below 2.5 mmol/L and 69% had normal glycaemia whereas 4% had hyperglycemia.

4.4 ASSOCIATION BETWEEN MODES OF TRANSPORT AND INFANT'S TEMPERATURE

The researcher used crosstabulation and chi-square test to analyze if there is association between means of transport and temperature. Also the researcher analyzed association between newborn coverage and infant's temperature.

4.4.1 ASSOCIATION BETWEEN TEMPERATURE AND MEANS OF TRANSPORT

Table 4.5 Infant's temperature by means of transport

Infant's Temperature	Means of transport		Total	Chi-square test with α =0.05
	Hold in arm	Kangaroo Mother care		
Normal temperature:36.5-37.5	28	7	35	Chi-Square=12.339 P-Value=0.002
Hypothermia: <36.5	48	0	48	
Hyperthermia: > 37.5	9	0	9	
Total	**85**	**7**	**92**	

In this study, all neonates who were hypothermic i.e. 48 neonates were carried in arms and where Kangaroo method was used, the infant had normal temperature.

To determine whether a systematic association exists between the two cross tabulated variables" *infant's temperature and means of transport*" are statistically significant, the researcher used Chi square test above with 5% significant level.

The Pearson Chi Square with 0.002 P-value which is less than 5% (0.05) significant level, show that there is an association between infant's temperature and mean of transport.The conclusion is that this sample shows evidence at 5% significant level that there are an association between neonates' temperature and the way transported. The more you hold neonates in arm while transporting them in NICU,the more they became hypothermic while the more you use kangaroo care, neonates will have a normal temperatures.

4.4.2 ASSOCIATION BETWEEN NEWBORN COVERAGE AND INFANT'S TEMPERATURE

Table 4.6 Association between temperature and newborn coverage

Temperature	Newborn coverage			Total	Chi-square test with α =0.05
	blanket	blankets and clothes	Hat, blanket and clothes		
Normal temperature:36.5-37.5	21	11	3	35	Chi-Square= 31.362 P-Value= 0.000
Hypothermia: <36.5	47	1	0	48	
Hyperthermia: > 37.5	3	6	0	9	
Total	**71**	**18**	**3**	**92**	

This study found that the infant's temperature was influenced by how newborn were covered through transportation to NICU. Based on the results from Table4.6 , almost all neonates 47(98%) who were hypothermic were wrapped in one blanket while all neonates who were wrapped in Hat, blanket, and clothes had normal temperature.

To determine whether a systematic association exists between the two cross-tabulated variables" infant's temperature and newborn coverage" are statistically significant, the researcher used Chi-square test with 5% significant level.

The Pearson Chi-Square with 0.000 p-value which is less than 5% (0.05) significant level, show that there is an association between infant's temperature and newborn coverage. As a conclusion, this sample shows evidence that the two variables are statistically significant at 5% significant level. The well-covered neonates with Hat, blanket, and clothes had chances to have a normal temperature and vice versa

CHAPTER FIVE: DISCUSSION

This chapter presents a summary of key findings and discussion by providing their clinical implication.

During the period of March and April 2017, a totality of 92 neonates who met inclusion criteria was transported from maternity delivery room (43.5%), operating theater (16.3%) and postnatal ward (40.2%) to NICU.

Pre-transport stabilization of neonates

The present study was aimed to evaluate pretransport stabilization of neonates.

Ninety- two (92)neonates were transported to the NICU. Out of the 92 (19%) received oxygen supplement prior to transport, but they were not transported with oxygen and arrived in the neonatal unit with a saturation less than 90%. It is also evident that supplemental oxygen was not given to all neonates in need after birth and during transport as 34.8% of neonates arrived in NICU with a saturation less than 90%.

The transport of infants that require oxygen at birth without supplemental oxygen may affect the overall physical appearance of the infant at the time of admission.

If there had been a policy in place that all infants that need oxygen at birth are to be transported to the neonatal unit on oxygen would these infants have arrived with a higher saturation?

The Rwandan Neonatal Guidelines have a recommendation of performing a physical examination including vital signs of newborn right after birth, but the study findings shows that temperature was checked in only 17 neonates (17%) prior to transport, oxygen saturation was checked in (2%) neonates respiratory rate was checked only in 1 neonates (1.%).

Other important physiological parameters such heart rate, peripheral pulses, capillary refill time and blood sugar were not checked in any neonates prior to transport. This demonstrates that there is a poor evaluation of neonates that are going to be transported to the NICU.

Among 92 neonates that were transported in NICU; none of them received any volume expander prior to transport, thus 41.3% of transported neonates had delayed capillary refill time and weak pulses upon arrival in NICU. This should have been prevented if capillary refill time and peripheral pulses were checked before transport and volume expander administered to neonates in need. No neonate has received any drug before transport; if 6% of neonates were referred in NICU because they ruled out sepsis, antibiotics should have been started early

before transport but it is evident that there was a delay in initiating treatment. It may be helpful if a neonatal nurse with knowledge and skills to care about neonates, is present before transport and be responsible for stabilization and transport.

These findings are similar to a study from Nigeria by Abdulraheem et al.(2016) who noted that supplemental oxygen, intravenous fluids or oral feeding were not well given to neonates before transport. He also noted that blood sugar, temperature, oxygen saturation and respiration were not checked well in the transported neonates; the transported neonates had poor outcomes and 4.7% were dead upon arrival in NICU. In contrast in Iran, in a study by Borimnejad et al., (2013), the transported neonates had their blood sugar, airway and temperature completely stabilized and arrived at the NICU in better condition.

In the present study, it is shown that the components of S.T.A.B.L.E program which consist, blood sugar, temperature, airway, blood pressure, laboratory work and emotional support, were not appropriately addressed and given attention prior to transport. The S.T.A.B.L.E program has been initiated and used in many high-income countries such as Canada, United States of America(USA), Mexico and Panama. It has been shown to be effective in post resuscitation care and in the pre-transport stabilization of sick newborn that requires transport to NICU(Kendall, Scott, & Karlsen, 2012, p. 147). If a such a program is initiated in Rwanda it is evident that it would be effective in the pre-transport stabilization of neonates by improving outcomes of transported neonates.

The circle of the caring model for neonatal transport developed by Thomas Jessica in 2011 that guide this study; in its part of assessment prior to transport put emphasize on physical examination, stabilizing vital signs and identifying which medication or intervention needed before transport.It is crucial to perform a full physical exam and stabilization of neonates to prevent further deterioration of transported neonates. Ineffective pre-transport stabilization is not explained by the fact that Rwanda is a low resource-limited country because stabilization may be done with minimum resources available. In the present study, even vital signs were not taken for infant prior to transport thus taking vital signs is a basic care.

The poor pre- transport stabilization in the present study was perhaps due to lack of knowledge and training about pre-transport stabilization of neonates. In Rwanda, there is no program in place about neonatal transport. The program like S.T.A.B.L.E may be helpful in pre-transport stabilization and post-resuscitation care of neonates. Use of the circle of the caring model for

neonatal transport also may improve neonatal transport. It is important that neonatal transport should be done by neonatal trained individuals. A policy of change needs to be centered around allowing people that work with neonates be the one transporting them.

Pre-transport communication

The communication between the referring unit and receiving unit prior to transport was evaluated.

The findings from the present study show that communication between the referring unit and receiving unit before transport of neonates in NICU was done in 66% of transported neonates while 34% of neonates were transported in NICU without any prior communication between the referring unit and NICU. The postnatal ward was the less unit to communicate(65%), followed by maternity delivery room(15%). Communication before transport was not done may be due to lack of an organized system of neonatal transport.

As stated in the study by Abdulraheem et al., (2016) a totality of 401 of neonates were transported to University College Hospital of Ibadan, were transported without communication before transport between referring facility and receiving hospital, most neonates were hypothermic, hypoglycemic, apneic and even 4.7% were dead upon admission in NICU. When there is no communication between a receiving neonatal person and the transporting people the unit is not ready which delays admission process and it doesn't allow for an experience neonatal person to help the people transporting to stabilize the infant which may result in deterioration of transported neonates.

The circle caring model for neonatal transport in its part of the planning process, highlight the necessity of communication between the referring unit and receiving unit where management is discussed and needed medical and surgical interventions are identified. Effective communication before transport allows for the neonatal person to make suggestions to transport people on how to stabilize the infant.

Lack of effective communication during the process of neonatal transport reflect poor neonatal transport practice, and in this present study where communication was not done it may be attributed to lack of attention in the process of neonatal transport as in intrahospital transport it is easier to communicate between unit within the same hospital. It is important that neonatal nurses are involved and present during neonatal transport.

Modes of intrahospital neonatal transport

The present study intended to assess modes of intrahospital neonatal transport; under this objective transport team, means of transport, newborn coverage, and availability of transport equipment was assessed.

The study results revealed that transport team was composed by one single professional person in 92.4% of cases, that professional person was either a registered midwife or a registered nurse who does not work in the neonatal unit and if they graduated prior to 2014 they have not had the advanced neonatal Healthcare class offered at the University of Rwanda. They are not trained to care or recognize the quick changes that a neonate will go through. It was also found that 5.4% of neonates were transported in NICU by the caregiver without being accompanied by a health professional.The study findings concur with the results of previous research conducted in Iran by Borimnejad et al., (2013) on the interhospital neonatal transport of patients hospitalized in NICU; where 80.4% of transport, the team was composed by one single health care provider.

Rwanda is like many developing countries that transport an infant with one single health care provider or even just a caregiver in contrast to the higher income countries where transport is done by specialized neonatal transport team. A study in India by Pankaj et al.,(2012) only 11.4% were transported by a skilled attendant whereas the remaining neonates were transported by parents, relatives or another unskilled attendant. In a recent study in Nigeria by Abdulraheem et al., (2016) only 7% of referred neonates were transported by a nurse or a health care professional.

In high-income countries where neonatal transport is well organized, transport team is composed of skilled health professionals; According to American Academy of Pediatrics, in the USA, the neonatal transport team is composed of the Physicians, Registered Nurses, Neonatal nurses practitioners, Respiratory therapist and paramedics(Stroud et al., 2013, p. 362). In the United Kingdome(UK) they have trained neonatal transport nurses and their presence in every neonatal transport improves outcomes of transported neonates(Fenton and Leslie, 2009, p. 488).

In the present study, neonatal transport is not done accordingly to international guidelines of intrahospital transport of critically ill patient as the majority of neonates were transported by one single health professional and other neonates were transported by caregivers without the

presence of a health care professional. The international guidelines for intrahospital transport recommend that transport should be done by minimum two skilled persons (Alamanou & Brokalaki, 2014, p. 171). In our settings in limited resource country, it is important that at least a neonatal nurse or a nurse with experience of working in neonatal unit is part of the transport team in order to improve neonatal outcomes.

Poor transport team may be due to lack of established neonatal transport system in our settings and lack of established protocols and guidelines about intrahospital neonatal transport. Improvement need to be done as neonatal transport by a skilled organized team improves neonatal outcomes by reducing neonatal morbidity and mortality(Pankaj et al., 2012)

Means of transport, Newborn coverage, and transport equipment

The study results revealed that neonates were transported without the use of any medical equipment such as transport incubator, radiant warmer, portable oxygen cylinder; most of the neonates (92.4.%) were transported in NICU carried in arms by a care provider or caregiver. The kangaroo care method was to carry only seven neonates.

The neonatal unit at Muhima district hospital is not close to delivery room or operating theater, it is located downstairs which expose newborn to heat loss and risk of fall during transport. Use of arms to carry the neonates is the unsafe mode of transport and may be associated with risk of fall, lack of monitoring infants and exposure to heat loss, unfortunately in the present study kangaroo care was only used to carry few neonates, even though helped to maintain the temperature of neonates. In the present study, the means used to carry the neonates was statistically significant (P-value 002, confidence level:95%) to be associated with changes in temperature, where all neonates carried in arms were hypothermic compared to neonates carried in kangaroo care who had normal body temperature.

Newborn loses heat easily and neonatal transport impair temperature stability it is advised to cover the neonate with hat, clothes, and blanket to prevent heat loss, in the present study the majority of neonates (77.1%) were wrapped in one blanket, 16.5% had blankets and clothes, only 2.7% of neonates had a full coverage of hat, clothes, and blanket. In the present study, newborn coverage was statically significant (P-value 0.00, confidence level 95%) to be associated with temperature instability as all hypothermic neonates were wrapped in blanket compared to neonates with full coverage who had normal temperature.

During transport of neonates, continuous monitoring and care should be given to ensure the stability of neonate during transport; the findings from this study shows that during transport of newborn there was not a monitoring device such as cardiac monitor nor oxygen saturation device. Resuscitation kit that may be used in case of emergency resuscitation during transport was not available in any case during transport.

The findings from this study are very different from other studies conducted on intrahospital neonatal transport in Brazil and Iran. In the study conducted in Brazil by Vieira et al.,(2011) all neonates were transported in transport incubator equipped with pulse oximeter and infusion pumps. In a recent study in Iran by Borimnejad et al., (2013) almost all neonates were transported in transport incubator, only a few neonates were carried in arms and cuts.

In the study in Iran by Borimnejad et al., (2013) 37.7% of neonates were wrapped in clothes and blankets and 34% had a full coverage of hat, clothes, and blanket while in our study only 5.4% had full coverage. Even though in this study transport equipment were not available in all transport, at least oxygen was present in 66%, Ambu bag in 73.6% and Pulse oximetry was present in 43.4% whereas in our study portable oxygen cylinder was not used to deliver oxygen during transport. It is recommended to use portable oxygen cylinder deliver supplemental oxygen during transport to all neonates who required immediate oxygen after birth or who are in respiratory distress in order to improve outcomes.

Lack of appropriate equipment during neonatal transport are associated with neonatal mortality and morbidity, in a study by Abdulraheem et al., (2016) on interhospital neonatal transport majority of neonates, 93% were transported without medical equipment and resuscitation kits, thus in this study 4.7% were dead on arrival in receiving hospital.

It is well known that effective neonatal transport require appropriate transport staff and adequate transport equipment; studies revealed that use of appropriate equipment and effective transport system reduce significantly neonatal mortality among transferred neonates(Kong et al., 2014, p. 252)

The circle caring model of neonatal transport by Thomas (2011) put emphasize on transport team skills and knowledge about management of sick neonates and choosing a safe mode of transport for the sick neonates in order to maintain the stability of the neonate during transport.

In the present study lack of appropriate equipment during transport may be attributed in one hand on the lack of equipment such transport incubators and radiant warmers given a country with limited resources. But in other hand lack of some equipment like resuscitation kit, oxygen supply, monitoring devices may be attributed to ineffective neonatal transport system in place.

Use of kangaroo mother care should be encouraged and used during neonatal transport as does not cost and effective to keep the normal temperature of infants. It is important to include the nurses from the neonatal unit in transport as they have knowledge and skills to manage neonates, resuscitation kits, and portable oxygen should be present during transport. Hospital infrastructures should be in favor of neonatal wellbeing where the neonatal unit should be close to delivery room and operating theater and don't have NICU downstairs or anywhere, where the infant has to go outside to arrive at the neonatal unit.

Infant's stability upon admission in NICU

The study findings revealed that 52.2% of neonates were hypothermic at a temperature below 36.5 degrees Celsius but as the hypothermia worsened other symptoms worsen; 27.2% had hypoglycemia and hypoglycemia was found to be associated with hypothermia in this study. 41.3% had poor perfusion with delayed capillary refill time and weak peripheral pulses. Desaturation with oxygen saturation below 90% was present in 32%, among neonates that were transported 39.1% had tachypnea with a respiratory rate above 60 breaths per minute, 21.6% had grunting and 23.9% had chest retraction.

In this present study hypothermia was significantly associated with means of transport (P value;0.02 confidence level:95%) where all neonates who were hypothermic were transported carried in arms by either a health care provider or a caregiver and newborn coverage was significantly associated with hypothermia (P value:0.00 confidence level 95%) as all hypothermic neonate were covered in one layer of blanket. All neonates who had desaturation were transported without portable oxygen cylinder to deliver oxygen supplement. It is important to highlight that all infants that have needed oxygen in the delivery room or in respiratory distress should be given oxygen supplement during transport.

The findings from the present study are similar to findings from several studies on interhospital transport done in India where neonatal transport was not well organized. Hypothermia was the first physiological changes to occur all studies and was associated with high mortality in

transported neonates.A study on interhospital transport by Narang et al., (2013) where, among the 300 outborn neonates who were admitted to NICU, 47% of them were hypothermic, 29.9% were hypoglycemic, 32.6% had hypoxia with oxygen saturation below 90% and 69.3% had prolonged capillary refill time above three seconds. Hypoglycemia, hypothermia and prolonged capillary refill time were found to be the predictor of mortality in transported neonates. In a study by Pankaj et al., (2012) on interhospital neonatal transport; among transported neonates who died, 79.1% were hypothermic at admission, 14.6% were hypoglycemic, 63.8% presented grunting and 45.8% had a delayed capillary refill time. Thus, hypothermia, hypoglycemia, grunting and delayed capillary refill time were associated with high mortality.

The study results concur with the findings from another study by Dalal, Vishal, and Solanki,(2013) where, 300 neonates who were enrolled in the study, 55% presented with hypothermia on admission, 27.4% were hypoxic, 23.4% had poor perfusion, and 20.6% had low blood sugar levels.The findings from a study by Rao, Bajaj, and Rawat, (2015) among 200 neonates who were transported 27% were hypothermic, 38% were in shock and 19% had cyanosis. It was found that hypothermia, respiratory distress, poor perfusion and central cyanosis was associated with high mortality.

The findings from our study are different from a study on intrahospital neonatal transport by Vieira et al. (2011) where hypothermia occurred in only 15.3% compared to our study where hypothermia occurred in 52.3%.

In the present study, hypothermia may be due to lack of stabilization of neonates prior to transport as only 17% had their temperature checked before transport, also it may be due to non-effective immediate newborn care as most of the hypothermic neonates were from maternity and delivery room. Also, hospital infrastructure may contribute to hypothermia as the delivery room and operating theater are not close to NICU. Hypothermia also was due to the way neonates were transported carried in arms and covered with one blanket. In the present study, kangaroo care method was found to be effective to keep the normal temperature of infants, but it was used only for few neonates.

Several methods may be used to keep infant’s temperature stable during transport including the use of transport incubators, resuscitation, and stabilization on radiant warmers, and plastic bags as well as full infant coverage hat, clothes and blankets as neonates loses heat easily.

Altered parameters in this study may also be attributed to lack pre- transport stabilization, in this present study vital signs were not given attention before transport, equipment used during transport was not effective; lack of oxygen during transport. Neonatal transport modes and system were ineffective contributing to altered physiological parameters in transported neonates.An organized transport system is needed with skilled personnel, equipment, and effective communication.

CHAPTER SIX: CONCLUSION AND RECOMMENDATION

6.1 CONCLUSION

The main objective of our study was to assess intrahospital neonatal transport and infant's stability upon admission in NICU; the findings from this study shows that the practice of intrahospital neonatal transport was not appropriate and was found to contribute to altered neonatal stability upon admission in NICU.

The pre-transport stabilization of neonates prior to transport was not effective; 60% of transported neonates didn't receive any care prior to transport in NICU. In the present study pre-transport communication was not done in all cases. About 38% of neonates were transported without prior communication with referring unit and receiving unit, lack of effective communication during transport of neonates, delays care and admission process of transported neonates.

Modes and equipment used to transport neonates were not effective; the majority(92.4%) of neonates were transported carried in arms by a single health care provider or caregiver. Even though kangaroo mother care was found to keep the temperature in normal range was used to carry few neonates(7.6%), transport incubator and radiant warmers were not used in any case during transport. Use of arms to carry the neonates in were associated with hypothermia upon admission in NICU. During transport of neonates, essential equipment like monitoring devices, resuscitation kits, and portable oxygen cylinder was not available.

The clinical status of neonates was altered upon admission in NICU and many factors like poor pre-transport stabilization, lack of communication, ineffective modes of transport and lack of appropriate equipment possibly contributed to the altered clinical status of neonates. Hypothermia was the most clinical adverse to be present at 52.2%, followed by poor perfusion in 41.3%, tachypnea in 39.1, hypoxia in 32% and hypoglycemia in 27%. Finally, intrahospital neonatal transport at Muhima district hospital was not effective and infant's stability upon admission was altered.

6.2 RECOMMENDATION

The practice of intrahospital neonatal transport was found ineffective and improvement needs to be done in order to enhance outcomes of transported neonates.

Recommendations for clinical settings

- It is evident that there isn't any established neonatal transport system in the study area; it is highly recommended to elaborated protocol and guidelines of intrahospital neonatal transport in the hospital and to incorporate the circle caring model of neonatal transport by Thomas (2011) into the current practice of intrahospital neonatal transport.
- Transport team should have knowledge and skills about the care of neonates thus is recommended at least to have neonatal nurses and doctors be at deliveries or called quickly when a neonate is bad and participate in the transport process.
- In consideration of a poor stabilization of neonates; continuous training of staffs involved in neonatal transport is recommended, with the focus on neonatal resuscitation, post resuscitation care and pre-transport stabilization of neonates. It is recommended to elaborate policies and guidelines about stabilization of neonates before and during transport.
- Effective communication in during transport process improves the outcome of transported neonates, therefore; it is recommended to elaborate policy regarding communication process during transport and encourage and strengthen effective communication.
- Lack of appropriate equipment during transport should be overcome by elaborating policy regarding mandatory equipment and availing appropriate needed equipment for neonatal transport such as portable oxygen cylinders, transport incubators and warmer, resuscitation kit, monitoring devices.
- Given resource-limited settings, it is recommended to use kangaroo mother care to transport neonates.

Recommendation for Nursing Education

- Neonatal transport is not thought in nursing schools; it is recommended to incorporate neonatal transport in the curriculum of nurses and midwives students in all nursing school across the country.

Recommendation for Research

- There is a huge gap in the literature in neonatal transport; this study has been the first study to examine the practice of intrahospital neonatal transport in the country; more studies need to be done on intrahospital neonatal transport in different hospitals to reinforce the current study.
- More research are needed on interhospital neonatal transport.

Recommendation for Ministry of health

- There is a lack of established neonatal transport system for both intrahospital and interhospital transport, it is recommended for the ministry of health to elaborate policies about neonatal transport and to include neonatal transport concept in the existing national neonatal guidelines and protocols.
- Given a lack of appropriate equipment during transport it is recommended to the ministry of health to provide financial support for appropriate equipment during neonatal transport.
- In consideration of hospital infrastructures where the neonatal unit is far from delivery rooms and operating theater, it is recommended to the ministry of health to assist hospitals in infrastructures in order to have neonatal units close to delivery rooms and operating theater.

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APPENDIXES

Code:……

APPENDIX 1: DATA COLLECTION TOOL" OBSERVATION CHECKLIST"

1. Date and Time of birth:
2. What APGAR Score at 5minute does neonate have? (*Circle the letter correspond to the score and a single answer allowed)*
   a. Less than 7
   b. Greater or equal than 7
   c. Unknown

3. Which one is the mode of delivery of neonate? *(Circle the mode you observed and a single answer allowed):*
   a. Spontaneous vaginal delivery
   b. Precipitous delivery
   c. Breech delivery
   d. Caesarian section
   e. Delivered by forceps or vacuum

4. Was a neonate resuscitated at birth? Yes ◯ No ◯
5. Gender: Female ◯ Male ◯
6. Age of neonate (*Circle the corresponding age)*
   a. Less than 24 hours
   b. 24 -72 hours
   c. Between 3 - 7 days
   d. Between 7 - 14 days
   e. Between 14- 28 days
7. Maturity of neonate (*Circle the corresponding gestation age*):
   a. Prematurity of less than 28 weeks
   b. Prematurity of 28 - 32 weeks
   c. Prematurity of 32- 37 weeks
   d. Term: between 37 -42weeks

e. Post term: greater or equal to 42 weeks

8. Birth weight of neonate (*circle and single answer allowed*):
   a. Less than 1000gr
   b. Between 1000gr -1500gr
   c. Between 1500gr-2500gr
   d. Greater or equal to 2500gr

9. The reason for transfer to NICU recorded on transfer note (*circle where applicable/multiple answers allowed):*

   a. Respiratory distress
   b. Birth Asphyxia
   c. Fever
   d. Inability to breastfeed
   e. Jaundice
   f. Congenital malformation
   g. Hypothermia
   h. Convulsions
   i. Prematurity
   j. Skin lesions
   k. Infection risk
   l. Other

If other reasons of transferring to NICU, please specify …….

10. Where does neonate transferred from? (*Circle the corresponding unit*)
    a. Maternity delivery room
    b. Operating theater
    c. Postnatal ward

11. Is there any communication between referring unit and receiving unit prior to transport of neonate? Yes ◯ No ◯

12. What are pre-transport care received by neonate prior to transfer at NICU? (*Circle all provided care*)
    a. Temperature checked
    b. Respiratory rate checked
    c. Oxygen saturation checked
    d. Heart rate checked
    e. Peripheral pulses checked
    f. Capillary refill time checked
    g. Blood sugar checked
    h. Oxygen supplement
    i. Administration of volume expander
    j. Administration of Dextrose 10%
    k. Administration of drugs
    l. Lack of any pre-transport care
    m. Other

If other than above cited care, please specify……

13. Transport team is made by *(Circle the corresponding team and single answer allowed)*
    a. Caregiver
    b. 1 midwife or Nurse
    c. 2 midwives or nurses
    d. 3 midwives or nurses
    e. 1 midwife and neonatal nurse
    f. 1 midwife nurse and 2 neonatal nurses
    g. 1 midwife and physician
    h. Other

If other transportation team, please specify……

14. What are the means of transport used (*circle where applicable*)
    a. Transport incubator
    b. Radiant warmer
    c. Hold in arms
    d. Kangaroo mother care

15. How a newborn was covered during transportation to NICU (*Circle the single way observed)*
    a. Without coverage
    b. Use of plastic bag or wrap
    c. Blanket
    d. Blanket and clothes
    e. Hat, blanket, and clothes
    f. Other

If other way(s), please specify

16. What are medical equipment used while transporting infant to NICU? (*Circle where applicable)*
    a. Portable oxygen cylinder
    b. Resuscitation kit
    c. Cardiac monitor

d. Oxygen saturation monitoring device
e. Incubator
f. Radiant warmer
g. Lack of any equipment
h. Other

If other, please specify……

17. Infant's clinical stability upon admission

17.1. What is infant's temperature? (*circle where match)*

a. Axillary temperature: 36.5 -37.5 degrees Celsius

b. Axillary temperature <36.5 degrees Celsius

c. Axillary temperature >37.5 degrees Celsius

17.2. What is infant's oxygen saturation on room air? (*Tick the corresponding rate*)

a. oxygen saturation: below 90% ◯

b. oxygen saturation Spo2: greater or equal than 90% ◯

17.3. What is the infant's heart rate? (*Tick the corresponding rate*)

a. Less than 100 beats per minute ◯

b. Between 100-160 beats per minute ◯

c. Greater than160 beats per minute ◯

17.4. What is the infant's respiratory rate (*Tick the corresponding rate*)

a. Less than 30 breaths per minute ◯

b. Between 30- 60 breaths per minute ◯

c. Greater than 60 breaths per minute ◯

d. Apnea ◯

17.5. What is the infant's grunting grade you observe? (*Tick the corresponding grade*)

a. Severe grunting ◯

b. Moderate grunting ◯

c. Mild grunting ◯

d. Absence of grunting ◯

17.6. What is the infant's chest retraction grade you observe? (*Tick the corresponding grade*) ◯

a. Severe chest retraction

b. Moderate chest retraction ◯

c. Mild chest retraction ◯

d. Absence of chest retraction ◯

17.7. What is the infant's perfusion status? (*Tick the corresponding status*)

a. Capillary refill time: less or equal than 3 seconds ◯
b. Capillary refill time: greater than 3 seconds ◯
c. Strong peripheral pulses ◯
d. Weak peripheral pulses ◯
e. Absence of peripheral pulses ◯

17.8. What is the infant's random blood sugar? (*Tick the corresponding glycaemia*)

a. Glycaemia: less than 2.5 mmol/l ◯
b. Glycaemia: between2.5mmol/l – 6.5mmol/l ◯
c. Glycaemia: greater than 6.5mmol/l ◯

APPENDIX 2: INFORMATION LETTER FOR THE PARENTS (English version)

Dear Parent,

My name is Pacifique Umubyeyi. I am from the University of Rwanda. I am conducting a research study to fulfill the requirements for a master's degree specializing in neonatal nursing. The University of Rwanda's Institutional Review Board, a committee whose task is to make sure that research participants are protected from harm has approved this study.

Role of the researcher: I am a registered nurse in Rwanda and have practiced nursing for six years. Currently, I work in the Neonatal Intensive Care Unit (NICU) at the Rwandan Military Hospital. Caring for preterm and high-risk newborns is my area of expertise and passion. It is my desire to see all babies in need to have safe and competent nursing care.

Purpose: I am conducting research on how high-risk newborns are transferred from where the baby is born such as the delivery room or from the operating theater to the specialized newborn care unit in this hospital and how the baby tolerates the transfer. It is hoped the information learned in this study will help to improve neonatal transport in this hospital and other hospitals throughout Rwanda, by providing the best possible nursing care to newborns before, during and after transport.

Invitation of participation: It is my understanding you are the parent of a newborn that was born in this hospital and that requires transport to the NICU for specialized medical care. For this reason, I am inviting you to allow your newborn to participate in this study. Involvement in this study is voluntary so you may choose for your child to participate or not. Your infant will receive the same care as the other infants regardless of participation without any adverse consequences. It is understandable that you may be worried and stressed about your infant's status.

Risks or discomfort: There is no increased risk to your infant from participating in this study, as the researcher will only be observing. The researcher will only observe the way the infant will be transported from the unit to the NICU and the infant's clinical status upon admission to NICU.

Benefits: Your infant and you will not benefit directly from this research, but your infant's participation in this research will help to find gap in Intrahospital Neonatal transport in this Hospital and this will help to improve neonatal transport in this hospital and elsewhere.

Incentives: You will not receive any payment for the participation of your infant in this study

Confidentiality: Information gathered from your infant will be kept in confidence and your names will be anonymous as the infant will identified with a code number.

Voluntary participation: You have right to let your infant participate in this study or not, your participation is voluntary. Your choice will not have any adverse effect on care that you and your infant will receive in this hospital.

Contacts for further information: If you wish to ask any questions later about this research you may contact Pacifique umubyeyi on the following phone number: +250788837209 or at umupaci2020@gmail.com

And if you have any other concern about your rights in this study you may contact the chairperson of the CMHS/UR Institution Review Board Professor Kato NJUNWA at: njunwa@khi.ac.rw or 0788490522, or the secretary Mr. Francois Xavier Sunday at: fsunday@khi.ac.rw or 0788563311

Publication: The research findings from this study will be shared to this hospital and through publication so that other interested people may benefit from this research but the names of your infant will not be used.

Consent: A consent form is available for you to sign for your voluntary permission to include your infant in the study.

APPENDIX 3: INFORMATION LETTER FOR THE PARENTS (Kinyarwanda version)

URWANDIKO RUGAMIJE GUTANGA IBISOBANURO

Babyeyi,

Nitwa Pacifique Umubyei, ndi umunyeshuli muri kaminuza y' u Rwanda mu ishami ry'ubuvuzi n'ubuzima; ndi gukora ubushakashatsi mu rwego rwo kurangiza icyiciro cya gatatu cya kaminuza. Ubu bushakashatsi bwemewe ni ikigo gishinzwe ubushakashatsi muri Kaminuza y'u Rwanda ishami ry'ubuvuzi n'ubuzima.

Ubusanzwe ndi umuforomo mu Bitaro bya Gisirikare by'u Rwanda , nkaba nita ku bana bi impinja barwaye, nifuza ko abana bi impinja barwaye babasha kubona ubuvuzi bukwiye

Intego y'ubu bushakashatsi; Ndimo gukora ubushakashatsi ku bijyanye ni uburyo abana b'impinja barwaye bakivuka bajyamwa muri serivisi yita ku mpinja , ibizava muri ubu bushakashatsi bizafasha kurushaho kwita ku bana b' impinja barwaye mu gihe babajyanye muri serivisi yita ku bana b' imbinja barwaye muri ibi bitaro ndetse no mu bindi bitaro byo mu Rwanda.

Ubutumire bwo kugira uruhare mu bushakashatsi: Umwana wanyu ararwaye kandi akeneye kujyamwa muri servisi yita ku bana b'impinja, nifuzaga kubasaba uburenganzira bwo kureka umwana wanyu agakorerwaho ubushakashatsi tureba uburyo abanganga bamutwara bamujyana muri serivisi yita ku mpinja. Ni ubushake kwemera ko umwana wanyu akorerwaho ubushakashasti. Icyemezo icyo ari icyo cyose mwafata ntabwo cyahindura ubuvuzi umwana wanyu cyangwa se mwebwe mwabonera muri ibi bitaro.

Ingorane n'ingaruka bishobora kuvuka : Ubu bushakashatsi ntangaruka bufite ku mwana wanyu, tuzareba uburyo umwana wanyu atwarwa muri serivisi yita kumpija ndetse ni uko agera muri iyo serivisi ameze.

Inyungu zishoboka :kwitabira ubu bushakashatsi nta nyungu muzahita mubugira mo wowe n'umwana, ariko ibizavamo bizafasha kurushaho kwita neza ku bana b' impinja igihe babajyanye muri serivisi yita ku bana b'impinja barwaye.

Ibihembo: Nta bihembo biteganyijwe kwemera ko umwana wanyu akorerwaho ubushakashatsi

Ubushake mu kwitabira ubushakashatsi : Kwemera ko umwana wanyu akorerwaho ubushakashatsi ni ubushake, ushobora guhakana ko umwana akorerwaho ubushakashatsi; icyemezo wafata ntabwo gishobora kugira ingaruka k'ubuvuzi umwana wanyu yahabwa muri ibi bitaro.

Ibanga: Ibizava muri ubu bushakashatsi bizabikwa neza, nta mazina yanyu cyangwa amazina y'umwana azagaragaraho.

Abo ushobora kubaza : Mu gihe mukeneye andi makuru ku bijyanye n'ubu bushakashatsi, mwampamagara kuri izi numero za telephone igendanwa:0788837209 . Mu gihe ufite ikibazo ku burenganzira bw' umwana wawe muri ubu bushakashatsi, ushobora kuvugana n'ubishinzwe muri biro by'ubushakashatsi CMHS/UR kuri : fsunday@khi.ac.rw cyangwa kuri telephone igendanwa 0788563312.

Gutangaza Ibizava muri ubu Bushakashatsi:

Mu gutangaza ibizava muri ubu bushakashatsi nta zina ryawe cyangwa iry'umwana

Kwemera k'Ubushake: mbere yo gutangira ubushakashatsi urasabwa gusinya urwandiko rwo kwemera ku bushake ko umwana akorerwaho ubushakashatsi.

APPENDIX 4: PARENTAL RELEASE INFORMED CONSENT (English version)

I _____ the legal parent or guardian of baby _____ have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I voluntarily consent for my infant to participate in this study on intrahospital neonatal transport. I understand that I have the right to withdraw my child from the study at any time without in any way affecting our care at this hospital.

Print Name of Parent or Guardian _____

Signature of Parent of Guardian_____

Date _____

Day/month/year

Name of Investigator: _____

Signature of investigator: _____

Date _____

Day/month/year

APPENDIX 5: PARENTAL RELEASE INFORMED CONSENT (Kinyarwanda version)

Kwemera ko umwana akorerwaho ubushakashatsi

Njyewe……..umubyeyi w’ umwana,

Maze gusobanurirwa ibijyanye n’ ubu bushakashatsi ntanze uburenganzira ku ubushake ko umwana wajye akorerwaho ubushakashatsi ku bijyanye ni uburyo atwarwa muri serivisi yita ku bana bi impinja barwaye. Numvise ko mfite uburenganzira bwo kuba ntakwemera ko umwana akorerwaho ubushakashatsi kandi ntibigire ingaruka ku buvuzi umwana yahabwa muri ibi bitaro.

Amazina y’
Umubyeyi……..

Italiki……
…..

Umukono
w’umubyeyi…….

Amazina y’ukora ubushakashatsi……..

Italiki…….

Umukono……

REPUBLIQUE DU RWANDA

VILLE DE KIGALI
DISTRICT DE NYARUGENGE
HOPITAL DE MUHIMA
B.P : 2456 KIGALI
Tél. /Fax : +252 50 37 7
E-mail : muhimahospital1@gmail.com

ETHICS COMMITTEE/ COMMITTEE D'ETHIQUE

06 January, 2017

Review Approval Notice

Dear Pacifique UMUBYEYI

Re: Your request to conduct a research at Muhima hospital.

During the meeting of ethic committee of Muhima District Hospital that was held on 03 February 2017 to evaluate your demand we are pleased to inform you that the Muhima Hospital Ethic Committee has approved your request.

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

Yours sincerely,

Dr MANIRAGUHA YEZE Aimée Victoire

Chair Person, Ethics Committee

MUHIMA HOSPITAL
ETHIC COMMITTEE

UNIVERSITY OF RWANDA

COLLEGE OF MEDICINE AND HEALTH SCIENCES

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 16/01/2017
Ref: CMHS/IRB/066/2017

UMUBYEYI Pcifique
School of Nursing and Midwifery, CMHS, UR

Dear Umubyeyi Pacifique

RE: ETHICAL CLEARANCE

Reference is made to your application for ethical clearance for the study entitled ***"Intra-Hospital Neonatal Transport At Muhima District Hospital".***

Having reviewed your protocol and found it satisfying the ethical requirements, your study is hereby granted ethical clearance. The ethical clearance is valid for one year starting from the date it is issued and shall be renewed on request. You will be required to submit the progress report and any major changes made in the proposal during the implementation stage. In addition, at the end, the IRB shall need to be given the final report of your study.

We wish you success in this important study.

For Professor Kato J. NJUNWA
Chairperson Institutional Review Board,
College of Medicine and Health Sciences, UR

Prof. JB Gahutu
IRB Vice-Chair

Cc:
- Principal College of Medicine and Health Sciences, UR
- University Director of Research and Postgraduate studies, UR