

Abstract

Neonatal Mortality in Nigeria: The Impact of Nurse Work Organization

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Background: The 4th Millennium Developmental Goal (MDG-4) commits the international community to reduce child mortality by two-thirds between 1990 and 2015. Neonatal mortality accounts for 30-40% of worldwide child mortality. Globally, 99% of these deaths occur in low and middle income countries, like Nigeria. In developing countries nurses are the backbone of the health care system, however, there is a scarcity of research examining how nurses contribute to reducing neonatal mortality. Although, nurse organization factors, such as nurse staffing and the nurse practice environment have demonstrated significant relationships with patient outcomes in resource rich countries, these findings cannot be generalized to the developing countries of Sub-Saharan Africa.

Purpose: The purpose of this study was to examine associations between nurse work organization factors with nursing care practices and inpatient neonatal mortality in Nigeria.

Methods: Utilizing Aiken's Work Organization and Outcomes Theoretical Framework, a cross-sectional, organizational study was conducted in 27 Nigerian hospitals. MCH nurses (n=223) completed anonymous surveys to collect data on their care processes, the practice environment, and staffing characteristics. Hospital administrators (n=27) were also surveyed using the WHO Safe Motherhood Assessment Tool to collect data on the availability of material resources and facility level in-patient neonatal mortality data.

Results: This study revealed extremely high patient to nurse ratios, a severe lack of neonatal material resources, and high neonatal mortality rates across the various levels of care. Staffing was found to be significantly associated with neonatal mortality. However, the direction was reversed from earlier studies using the Aiken model. The Nurse Practice Environment and the Nursing Care Processes scales both lacked variation in this sample and no significant relationships were detected between the scales and neonatal mortality.

Conclusions: This study provides descriptive data on the work environment of nurses and presents evidence of poor nurse staffing, lack of material resources, and significant variations in neonatal mortality across levels of care. This study was the first, to our knowledge, to assess the nurse work organization using the Aiken model in sub-Saharan Africa.

Neonatal Mortality in Nigeria: The Impact of Nurse Work Organization

By

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Acknowledgement

It is with pleasure that I write this portion of my dissertation. It has been quite a journey. It is by God's grace, I have come to the end of the dissertation. The process seemed protracted at times, but I made every effort to enjoy the journey. There is one thing; I know for sure, the journey would have been less gratifying without some very important people along the way.

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With love to all,

Yolanda

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CHAPTER I:
THE BACKGROUND

Introduction

Over 130 million neonates are born worldwide every year, yet almost 8 million die before their first birthday (WHO, 2010). For every newborn death in the first week of life, another is born already dead, and classified as fetal deaths and stillbirths. Most of these deaths are early neonatal deaths occurring in developing countries, such as Nigeria. The World Health Organization (2010) has identified Nigeria as having one of the highest neonatal mortality rates in the world and is among one of the five countries, which combined account for 80% of neonatal deaths. From a global perspective, the research literature examining neonatal health in developing countries has recently focused on community related causes of neonatal deaths. This may be due to the high occurrence of births at home without the benefit of a skilled birth attendant. However, insufficient attention has been given to the impact of skilled professional nursing on in-hospital neonatal mortality and whether modifiable nurse work organization factors, such as nurse staffing, the nurse practice environment, and nursing care processes, can help to improve neonatal mortality rates in developing countries. International research using the Nursing Organization and Outcomes Model (Aiken, Clarke, & Sloane, 2002) has assisted organizations in understanding the linkages between nursing and in-patient mortality.

However, this type of important research has not been done in areas of the world with some of the highest neonatal mortality rates. The current study will be among the first to advance the state of the science in nursing work organization by using The Nursing Organization and Outcomes Model (Aiken, Clarke, & Sloane, 2002) to examine the impact of nurse work organization in sub-Saharan Africa. Secondly, this study will add to the science of neonatal health care in developing countries by assisting in the identification of specific nursing work organization characteristics in Nigeria that may have an impact on inpatient neonatal mortality.

Significance of the Problem

The 4th Millennium Developmental Goal (MDG-4) commits the international community to reduce child mortality by two-thirds between 1990 and 2015 (United Nations, 2000). Neonatal mortality, defined as death within the first 28 days of life, accounts for 30-40% of worldwide child mortality. Every year 4 million babies, worldwide, die in the first 4 weeks of life (Lancet Neonatal Survival Steering Team, 2005). Globally, 99% of these deaths occur in low and middle-income countries, with 25% of babies dying within the first 24 hours of life, and 75% of infant deaths occurring in the 1st week of life (Lawn, et al, 2005, Darmstadt Lawn, Costello, 2003). Thus, without reductions in neonatal mortality in developing countries, it is unlikely that the MDG 4 goal will be achieved.

Strengthening the capacity of health care workers is an essential component of improving health care systems and addressing a specific major health crisis, such as neonatal mortality. This focus on healthcare workers is particularly important in sub-Saharan Africa, which suffers 24% of the world's disease burden, but has only 1.3% of

the world's healthcare workforce (WHO, 2004). There is a growing consensus among international agencies that nurses form the backbone of health systems. Nurses/nurse midwives also constitute the largest group of professional healthcare workers in sub-Saharan Africa (Ogilvie, Mill, Astle, Fannings & Opere, 2007; the Regional Network for Equity and Health for Southern Africa (EQUINET), Health Care Systems Trust (South Africa), and MEDACT (Tucker, 2002, Loewenson, 2003); the United States Agency for International Development (USAID), 2003; the International Council of Nurses (Buchanan & Calman, 2005); (Buchan, Parkin & Sochalski, 2003, WHO, 2006).

According to the Joint Learning Initiative (Chen et al, 2004), a consortium of more than 100 global health leaders convened in 2004, the health care worker is the most critical factor to health system performance, yet often the most neglected and overlooked. Joint Learning Initiative (JLI) was specifically charged with examining worldwide human resources for health. Their goal was to identify strategies to strengthen the workforce. At the time of JLI's data estimate, Sub-Saharan Africa faced a shortage of one million health workers and needed 600,000 additional nurses to meet the average worker density for low-income countries. This goal of obtaining additional nurses has not been achieved, likely due in part to the continuous exodus of nurses from African countries (Denton, 2006, Khaliq, Broyles & Mwachofi, 2008). Clemens and Pettersson (2008) reported that approximately 70,000 African-born nurses were working in eight western destination countries, including Great Britain, United States, Canada, France, Australia, Portugal, Spain, and Belgium. The largest number of African born nurses working overseas came from Nigeria (12,579), with Algeria (8,245), Morocco (5176), and Ghana

(4766) also losing thousands of nurses to nine recipient countries (Khaliq, Broyles & Mwachofi, 2008).

Despite issues with nurse migration, nurses continue to be available in developing countries at significantly higher numbers than all other health professionals. While some nurses are migrating to wealthier countries in search of better salaries, improved practice environments, and opportunities for further training (Nguyen, Ropers, Nderitu, Zuyderduin, Luboga, & Hagopian, 2008); many nurses remain in their native country and constitute the largest number of healthcare professionals available to provide services. In Nigeria there are nearly 6 times as many nurses/midwives (1.7/1000 patients) as physicians (0.3 physicians per 1000 patients) (WHO, 2007). These nurses can and likely do make significant contributions to improving neonatal survival; however, there is a scarcity of research examining specifically how they contribute to reducing neonatal mortality. This study will enhance our understanding of the nursing factors associated with neonatal mortality in one developing country, Nigeria, which may be critical to helping to improve neonatal survival.

The roles of nurses in Sub-Saharan Africa and the contexts under which they work are very different, and research findings from earlier studies of nursing system factors done in other countries may not be generalizable to this region. Newborn hospital deliveries in sub-Saharan Africa are primarily attended to by nurses/midwives (Ogunlesi, et. al, 2008, Biswas et al., 2004). Nurses are often the only professional healthcare providers present in the hospital setting in the crucial first minutes to hours of life and are well positioned for leadership roles in improving neonatal survival. Prompt and efficient initiation of nursing care is vital for newborns delivered in the hospital, and it is

imperative that nurses are well trained and knowledgeable in neonatal care, including emergency procedures, such as neonatal resuscitation, in order to make a significant impact on improving neonatal survival in the region. When professional nursing care is not available, clean delivery and immediate newborn care, including hygiene, warmth, and early initiation of breastfeeding, and other interventions that promote neonatal survival are severely compromised (WHO, 2003).

Purpose of the Study

There is over a decade of theoretical and empirical literature highlighting the importance of a positive nursing practice environment and quality nursing care processes on both patient and nursing outcomes. Higher nurse to patient ratios or better nurse staffing has been associated with positive patient outcomes and fewer adverse patient events. In addition, a nursing practice environment that provides nurses with a supportive management, adequate resources, good interdisciplinary relationships, and autonomy in practice has been shown to enhance the quality of nursing care interventions, and result in superior patient outcomes, including lower mortality. Since 1983, nurse researchers in developed countries have demonstrated that favorable nurse work organization factors are associated with lower inpatient mortality rates. Although severe international nursing shortages are well documented, the extent to which improving the nursing work environment may offset the detrimental effects of escalating nursing shortages and improve patient outcomes in African countries is largely unknown. Identification of the effects of specific inpatient nursing work and care practices associated with neonatal mortality in Nigeria will not only add to the science of nursing but can assist in the reduction of child mortality in this important area of the world. This

study will examine impact of nursing work organization, including nurse staffing and the nurse practice environment on both nursing care processes and in-patient neonatal mortality in Nigeria. Thus, the research questions for this study are:

1. What are the relationships between nurse staffing, characteristics of the nurse practice environment, and nursing care processes on in-patient neonatal mortality rates in government owned, in-patient facilities in Nigeria?
2. What are the relationships between nurse staffing and characteristics of the nurse practice environment on nursing care processes in government owned inpatient facilities in Nigeria?

Theoretical Framework

The Nursing Organization and Outcomes Model (Aiken, Clarke & Sloane, 2002) is grounded in organizational sociology and the work of Aiken & Hage (1968) and is the theoretical framework that informs this study. The assumption inherent in the model is that the key characteristics of organizations may be identified by surveying nurses who are in a unique position to identify key organizational characteristics of healthcare institutions, due to their interrelationships with all other members of the healthcare workforce. As a normal aspect of their practice, it is essential that nurses, in order to provide care to their patients, interact with nearly all other employees in the institution, including pharmacists, physicians, social workers, and housekeeping. Therefore, they are in an excellent position to be informants as to the nature and quality of the practice environment of which they are a part.

The theoretical model, as depicted in Figure 1, proposes that organizational factors, including nurse staffing levels, attributes of the nurse practice environment, and

nursing care processes impact patient outcomes. Specifically, the model posits that nurses are the surveillance system for the hospital for early detection and response to patient adverse events and that the effectiveness of nursing surveillance is influenced by nurse-to-patient ratios. The presence of lower nurse to patient ratios, or less nurse staffing, is predicted to jeopardize the surveillance system and increase the likelihood of negative patient outcomes. Conversely, the model predicts that higher nurse to patient ratios, or better nurse staffing will be associated with positive patient outcomes and fewer adverse patient events. Moreover, the model further hypothesizes that nurse practice environments that provide nurses with a supportive management, adequate resources, good interdisciplinary relationships, and autonomy in practice will support nurses in their work, enhance the quality of nursing care processes, and ultimately result in superior patient outcomes, including lower mortality. In addition, the model predicts that organizational characteristics, such as nurse staffing, attributes of the nurse practice environment, will also have an impact on nursing outcomes, such as job satisfaction, burnout, and intent to leave/ including intent to migrate.

In this model, nurse staffing is conceptually defined as nurse dose or nurse mix and operationally defined as nurse to patient ratios or nurse to support staff composition. The theoretical model proposes that nursing staffing levels and the nurse practice environment are two different, albeit related, concepts. A positive nurse practice environment (NPE) is conceptually defined as a work environment that is characterized by 1) supportive management; 2) nurse input into decision making and hospital affairs; 3) adequate resources to do the job; 4) good nurse/physician collaborative relationships; and

5) a strong foundation for quality care, including a good orientation and continuing education program (Aiken, Clark & Sloane, 2002, Lake, 2002).

Nursing care processes are conceptually defined as those interventions and activities in which nurses engage to improve the safety, health, and outcomes of their patients and have been operationalized using a nursing care processes scale, noting the number of nursing care processes omitted (Aiken et al, 2001). While nurses make every effort to provide quality patient care, key nursing care processes may be omitted under compromised working conditions and these omissions can have adverse implications for patient outcomes. Several nursing processes have been identified as core nursing care processes, include assessment, surveillance, patient teaching, skin care, and discharge planning.

The relationship between nursing care processes and the availability of resources is important and is likely to take priority when examining nurse work organization in developing countries. This linkage has been understudied, possibly because the lack of availability of material health care resources is a problem that may be specific to low or middle income countries. The healthcare system in sub-Saharan Africa is particularly challenged not only due to the healthcare worker shortage, but also because of the shortage of material resources, such as equipment, to provide even the most basic care. The lack of basic material resources, such as safe water, clean blankets, sterile devices for cutting the umbilical cord, and resuscitation bags, has serious implications for the delivery of adequate nursing care services and to the provision of safe and effective neonatal care. Translating nursing knowledge into practice may only be possible if the necessary material resources are present and is functioning at the best possible level.

Shortages of material resources have been shown to be negatively associated with the nurse practice environment in Africa (Nguyen, et al, 2008). Therefore, it is important that studies examining the relationship between nursing work organizational factors and patient outcomes in developing countries consider availability of material resources as a mediating factor. Thus, the standard Aiken model has been revised and extended to include the concept of material resource availability.

The Aiken model also contends that there are theoretical and empirical relationships between nurse education and qualifications with nursing care processes and patient outcomes. Some researchers have postulated that better educated nurses demonstrate better clinical judgment and professional behavior, which leads to better patient outcomes through education, exposure, and practice (Johnson, 1988). According to Aiken and Patrician (2000), highly educated nurses may be more critical in noting the organizational traits present in an organization. Recently, the National Quality Forum (Kurtzman & Corrigan, 2004) was unable to endorse education as a standard measure for nursing system research, citing that the empirical evidence was promising but not sufficient and encouraged researchers to continue to build the state of science.

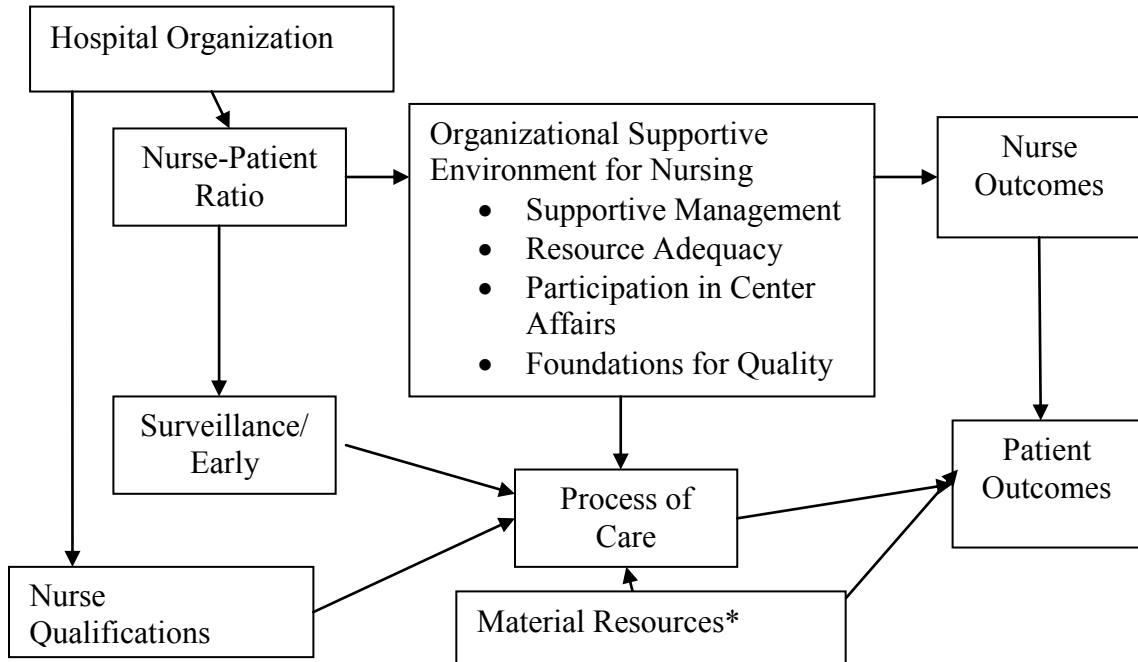
According to this model of nurse work organization, staffing and the nurse practice environment are also theoretically linked to both nurse and patient outcomes. Nurse outcomes have been empirically studied for at least a decade, including intent to leave, emotional exhaustion, burnout, job satisfaction, turnover, and retention. These nurse outcomes are generally operationalized via nurse survey questions and scales. Patient outcomes are the most widely studied outcome variable to be examined utilizing

this model and have included adverse events, such as medication errors, failure to rescue, pneumonia, pressure sores, and the most widely studied variable, in-patient mortality.

In summary, the five core propositions of the Nursing Organization and Outcomes Model that have been tested and supported include:

1. Higher levels of nurse staffing are associated with higher quality nursing care processes and better patient outcomes.
2. Higher quality nursing care processes are associated with better patient outcomes.
3. A supportive nursing practice environment is associated with higher quality nursing care processes and better patient outcomes.
4. Higher levels of nurse staffing and a supportive nurse practice environment is associated with better nurse outcomes.
5. Higher levels of nurse education are associated with better nursing care processes and patient outcomes.

Figure 1 The Nursing Organization and Outcomes Model (Aiken, Clarke & Sloane, 2002)



*= revision to model for this study

CHAPTER II: LITERATURE REVIEW

Overview

The sheer number of nurses in the workforce, the impact of the nursing shortage and nurse migration, and the proximity of nursing to patient care led nurse researchers in developed countries to empirically examine the relationship between nursing system factors and patient outcomes (Kurtzman & Corrigan, 2004). There is nearly two decades of studies, conducted primarily in developed countries, that have demonstrated significant relationships between nurse staffing, the nurse practice environment and mortality. In addition, there is empirical and theoretical research examining the relationships between nurse staffing and the nurse practice environment, on nursing care processes. However, the research literature examining the linkages between these nursing system factors and in-patient neonatal mortality in developing countries is very sparse.

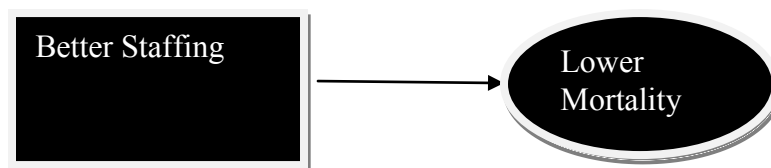
Study Hypotheses

The study hypothesizes that higher nurse staffing and positive nurse practice environments will result in lower in-patient neonatal mortality. Secondly, the study proposes that better staffing and supportive nurse practice environments will result in

nurses having less omitted nursing care processes. Thus, the following literature review will address the following specific hypotheses:

1. *Hypothesis 1. Higher levels of nurse staffing are associated with better quality nursing care practices, specifically less omitted nursing care processes. See Figure 2.*
2. *Hypothesis 2. Supportive nurse practice environments are associated with better quality nursing care processes. Specifically, higher nurse practice environment scores are associated with less omitted nursing care processes. See Figure 3.*
3. *Hypothesis 3. Higher levels of nurse staffing are associated with better patient outcomes, specifically lower in-patient neonatal mortality.*
4. *Hypothesis 4: A supportive nursing practice environment is associated with better patient outcomes, specifically lower in-patient neonatal mortality.*
5. *Hypothesis 5: Higher quality nursing care processes, less omitted nursing care, will be associated with lower neonatal mortality. See Figure 4.*
6. *Hypothesis 6. There is a relationship between availability of material resources and neonatal mortality.*

Figure 2 Hypothesis 1. Higher levels of nurse staffing are associated with better patient outcomes



Nurse Staffing and Mortality

Nurse staffing has been recognized as important to patient outcomes as early as 1885, when Florence Nightingale documented reductions in patient mortality following the placement of well-trained nurses in military hospitals in Crimea. Nurse staffing has been extensively studied for over two decades and is considered one of the most basic components of nurse work organization studies. Nurse staffing has been operationally defined in the research literature in a variety of ways including the dose or amount of nurse staffing and the nursing staff mix. Nurse staffing is predominantly operationalized as ratios, which have been expressed in two different ways: One method uses a ratio of full time equivalents (FTEs) of RNs per patient day, whereas the second uses the number of patients assigned to one RN per shift in the unit (Kane, 2007). Nursing skill mix is another National Quality Forum (NQF) endorsed nursing sensitive performance measure and is defined as the proportion of registered nurses to licensed vocational/practical nurses, and unlicensed assistive personnel (NQF, 2009). In addition, in-patient mortality has been the most commonly used indicator of patient outcomes in nurse work organization research (Pierce, 1997; Beurhaus & Needleman, 2000). It has been noted in multiple studies that nurse staffing has a direct impact on patient care, specifically on in-patient mortality. Researchers in Australia, Canada, Belgium, Germany, Korea, the United Kingdom, and United States, among others, have noted relationships between nurse staffing and mortality in many populations and settings.

Research examining the relationship between nurse staffing levels and adverse patient events, such as mortality, has increased tremendously over the last decade, particularly in developed countries (Aiken, Clarke & Sloane, 2002, Aiken, Sloane &

Lake, 1997, Aiken, Smith & Lake, 1994, Aiken, Clarke, Sloane, Lake, & Cheny, 2008, Flynn, 2007, Flynn, Thomas-Hawkins, & Clarke, 2009, Gardner, Thomas-Hawkins, Fogg, & Latham, 2007, Hartz, et al., 1989, Kane et. al, 2007, and Needleman et al, 2002); and internationally (Estabrooks, et. al., 2002, 2005, Tourangeau, 2002, , Flynn, Carryer, & Budge, 2005 & Van de Heede, et al, 2007). Various research study designs and publications have been used to examine the relationship between staffing and patient outcomes. In a recent systematic review, nearly three thousand publications included nurse staffing as an independent variable on patient outcomes. Among the reviewed publications were 60 case reports, 574 commentaries, 54 editorials, 21 letters, 3 guidelines, 24 interviews, 44 legal cases, 89 news reports, 1 web survey, and 112 secondary data analysis. The studies finally deemed appropriate and included in Kane's meta-analysis were 28 research studies with adjusted odds ratios for various outcome variables, including in-hospital mortality, hospital acquired pneumonia, cardiac arrest, and failure to rescue. Of the 28 research studies, various designs were noted, 17 were cohort studies, 7 cross-sectional, and 4 case control studies. All of these studies, provided support, and empirical evidence that nurse staffing have a negative impact on patient outcomes, including mortality.

Longitudinal and cohort studies are better models to use for examining causality in situations where manipulation of the independent variable is not feasible and these types of studies have been utilized to examine the impact of nurse staffing on adverse patient outcomes. Cohort and longitudinal studies have advanced the state of the science and have confirmed the results of the earlier studies with cross-sectional designs. These cohort and longitudinal studies have built further support for causal relationships between

nurse staffing and patient outcomes (American Nurses Association 1997; Amaravadi, Dimick, & Pronovost, Lipasett 2000; Dang, et al., 2002; Mark, et al, 2004; Mark et al, 2005; Cimiotti, Haas, Saiman, & Larson, 2006; Sales, Sharp, et al., 2008; Aiken et al, 2008; and Sochalski, Konetzka, et al, 2008). In another meta-analysis, however, it was noted that very few studies have done prospective examinations of the impact of nurse staffing on patient outcomes, specifically mortality (Lang, Hodge, Olson, Romano, & Kravitz, 2004). Moreover, no large randomized controlled studies to investigate causal associations with nurse staffing and patient outcomes were noted for this literature review. In two recent meta-analyses (Lang, Hodge, Olson, Romano, & Kravitz, 2004; Kane, Shamliyan, Mueller, Duval, & Wilt, 2007), the researchers argued that the ability to perform a study examining causality using a randomized controlled study was unlikely because nurse staffing is not an independent variable that can be easily manipulated or controlled. Both groups of researchers argued that due to the nature of staffing in the hospital setting and its close relationship with patient and hospital safety, it is unlikely that a randomized control study with manipulation of staffing could ever be done. While a randomized control study is unlikely, it has been argued that stronger research designs are needed to examine nurse staffing and its impact on mortality. In a recent summary report on nurse staffing from Washington State University, it was noted that forty-six percent of studies examining staffing and adverse patient outcomes have been cross-sectional (Mitchell & Mount, 2010).

In addition to improving study designs when studying nurse staffing and patient outcomes, researchers have also argued that there needs to be an inclusion of other variables related to competing explanations for the findings. Consideration of factors

could enhance the ability to establish causal links by identify mediating factors which may impact the relationships between nurse work organization factors and more favorable patient and nurse outcomes (Aiken et al, 2008; Mitchell & Mount, 2010).

In summary, research studies have begun to incorporate stronger designs that can examine causality. Based on the strength and consistency of the associations, the current state of the science does provides strong empirical evidence suggesting that there is a causal relationship between better nurse staffing and improved patient outcomes (Lang et al., 2004; Kane, Shamliyan, Mueller, Duval, & Witt, 2007; Agency for Healthcare Quality and Research, 2007; Mitchell & Mount, 2010). Finally, while stronger designs are better to examine causality, it is important to note that the results of the current cohort and longitudinal studies are consistent with results from the earlier cross-sectional studies.

The Nurse Staffing on Neonatal Mortality

The relationship between nurse staffing and neonatal mortality has been both directly and indirectly studied in the US, UK, Australia, Ghana, and Nigeria (Aiken, et al, 2002, Tucker, 2002 ,Callaghan, Cartwright, O'Rourke, & Davies, 2003, Cimiotti, Haas, Saiman, & Larson, 2006; Enweronu-Laryea, Nkyekyer, & Rodrigues, 2008, Lake & Patrick, 2008). In the United States and UK, the risk of neonatal mortality has been shown to be independently related to staffing levels in the neonatal intensive care unit (NICU) and high neonatal mortality has been associated with hospitals with higher patient to nurse ratios (Aiken, et al, 2002 & Parry, Tucker & Tarnow-Mordi, 2003). In a prospective longitudinal study done in the U.S., hospital acquired infections in newborns were noted to increase with lower nurse staffing levels (Cimiotti, Haas, Saiman, &

Larson, 2006; Lake & Patrick, 2008). In Australian studies, the odds of mortality were found to be significantly increased when one nurse cared for more than 1.7 newborns (Callaghan, Cartwright, O'Rourke, & Davies, 2003).

Nurse Staffing and Neonatal Mortality in Sub-Saharan Africa

While research on nurse staffing has escalated in the US and abroad, within sub-Saharan Africa, the literature examining the relationship between nurse staffing and other nurse work organizational factors, such as nursing care processes and the nursing practice environment on mortality and adverse outcomes, is sparse. However, several expert reports and important research studies have been done in sub-Saharan Africa and have indirectly examined the relationship between nurse staffing and neonatal mortality.

Expert reports from the Joint Learning Initiative and WHO have addressed the issue of nurse staffing in developing countries (Chen, 2004; WHO, 2003). According to the Joint Learning Initiative's worldwide examination of patient outcomes and health care staffing levels, it was determined; that staffing requirements needed to achieve minimal health care coverage should be at least 2.5 health workers per 1000 people (Chen et al, 2004). In addition, WHO (2003) reported in its examination of nurse staffing in developing countries that nursing skill mix may be an important factor to consider in developing countries. According to the WHO (2003), auxiliary, non-nursing staff may be present in developing countries at sufficient numbers and may be important to consider when examining nurse staffing. Skill mix may be particularly important in Sub-Saharan Africa, as "task shifting/sharing" is currently increasing and nurses are taking on additional physician responsibilities. This recent increase in the use of nurses for duties, which were initially designed as physician responsibilities, raises a concern related to the

availability of auxiliary staff needed to help nurses continue to provide high quality nursing services. Several studies and meta-analyses have focused on physician and nurse overlap; however, little attention has been given to the skill mix associated with providing quality nursing care in developing countries. WHO concluded that empirical examinations of the variations in nursing skill mix in developing countries is urgently needed to build the evidence base.

Research studies examining the relationship between nurse staffing and neonatal mortality in sub-Saharan Africa were sparse despite an extensive literature review. However, there are studies in neonatal settings in African countries that mention the relationship between staffing and neonatal mortality and are considered applicable to this literature review. Newborn survival has been noted to increase with lower patient to nurse ratios (Duke, Willie, Mgone, 2000; Enweronu-Laryea et al., 2008). In these studies discussing the establishment of neonatal care units in both Nigeria and Ghana, increasing the numbers of well-trained nurses was noted to have the potential of reducing in-hospital neonatal mortality. Enweronu-Laryea et al. (2008) in a retrospective study, described nurse to patient ratios in the neonatal care setting in Ghana, as one nurse caring for 11.7-25 patients. In this study, increases in neonatal survival was noted secondary to enhancements in material resources; however, the researchers speculated that if they had also provided concomitant investment in improving the number of nurses available to provide neonatal care, they would have yielded even better neonatal outcomes (Enweronu-Laryea et al., 2008).

Several Nigerian studies also identified factors related to nurse staffing and in-patient neonatal mortality. Nurse to patient ratios of 1 to 20, were observed in tertiary

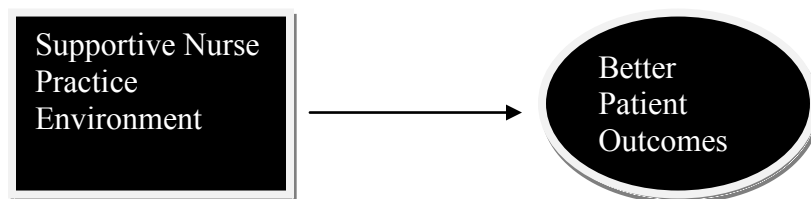
centers in Nigeria in a qualitative study examining the experiences of neonatal health care providers (Ogbolu, Johnson, & Iwu, 2009). Secondly, one hospital noted that the neonatal mortality rate (NMR) doubled from 125/1000 live births to > 250/1000 live births, in the complete absence of nursing staffing during an occupational strike (Adebami, Oyelami, & Owa, 2005). This study serves as an extreme example of what happens when nurses are not available in the hospital and clearly demonstrated that the role of nursing in reducing neonatal mortality is significant. However, it was not specific and did not identify the special characteristics of nursing that may have contributed to the lower NMR rates that exist when nurses are present. Another research study examined nurse-physician relationships in Southern Nigeria and provided insight and knowledge about the impact of both nurse staffing and the nurse practice environment on neonatal mortality. According to Ogbimi & Adebamowo's (2006), survey of 842 physicians and 1,532 nurses, it was noted that "staff shortages, lack of appreciation, particularly for nurse's work by physicians, activist unionism and government policies were perceived to be more favorable to doctors, were inimical to good working relationships between nurses and doctors in Nigeria" (p.5). The study concluded that lack of a healthy practice environment "contributed significantly to poor health care delivery and reduced efficiency of the health care system – problems that the traditionally weak health care system of a developing country like Nigeria can ill afford" (Ogbimi & Adebamowo, 2006, p.5).

In summary, there is a consensus in the U. S. and other developed countries that poor nurse staffing has a negative impact on patient outcomes, including in hospital mortality. In developing countries, nurse staffing and neonatal mortality research has

been understudied. However, the available literature has identified poor nurse staffing as a barrier to improving neonatal survival. In addition, staffing not only has a relationship with neonatal outcomes in Nigeria, but the negative effects of staff shortages also have an impact on the nurse work environment.

Nurse Practice Environment and Patient Outcomes

Figure 3 Hypothesis 2: A supportive nursing practice environment is associated with higher quality nursing care processes and better patient outcomes



The state of the science related to the impact of the nurse’s work environment and patient outcomes has been growing tremendously nationally and internationally over the last three decades. In the 1980’s, the American Academy of Nurses (AAN) examined hospital practice due to the nursing shortage and noted that certain hospitals had higher rates of nurse recruitment and retention as well as good patient outcomes. These hospitals were considered “magnet hospitals” and were further studied to identify the key characteristics that led to the success of the institutions. The key attributes identified were related to administration, professional practice, and professional development. Administrative characteristics included participatory management style, communication between nurses and managers, quality of leadership, adequate staffing, competent co-workers, decentralized organizational structure, and promotional opportunities. Professional practice characteristics included autonomy, quality assurance programs, continuing education for nurses, image of nurses in the hospital and availability of expert

consults and resources. Professional development characteristics that were identified as resulting in superior nurse and patient outcomes included orientation programs for new nurses, in-service and continuing education, and support for formal education and career development. These characteristics were later used to develop the Magnet Recognition Program by the American Nurses Credentialing Center (ANCC, 2009).

These characteristics ultimately led to operationalizing the concept of the nurse practice environment. Shortly after the AAN study, nurse researchers developed a measurement tool, The Nurse Work Index (NWI) to help healthcare institutions track the relationship between the nurse work environment and quality patient care (Kramer and Hafner, 1989). From the NWI, other tools to examine the nurse work environment were derived and included the revised Nursing Work Index (NWI-R) (Aiken & Patrician, 2000); the Practice Environment Scale- Nursing Work Index (PES-NWI) (Lake, 2002); and the Practice Nursing Work Environment (PNWE) (Choi, Bakken, Larson, Du & Stone, 2004). Derived from earlier research related to magnet hospitals, favorable nurse practice environments have been conceptually defined as environments characterized as having high nurse autonomy, nurse control over their practice, strong leadership ability and support, collegial relationships with physicians, and active participation of nurses in hospital affairs (Aiken & Patrician, 2000). The nurse practice environment has also been defined as “the organizational characteristics of a work environment that facilitate or constrain professional nursing practice” (Lake, 2002, p. 178). There is a growing body of research indicating the importance of the attributes of the nursing practice environment to patient safety and quality outcomes (Aiken, Smith, & Lake, 1994; Aiken, Sloane & Lake, 1997; Aiken, Clark, & Sloane, 2002; Flynn, 2007; Flynn et al, 2009). It has been noted

that there are large variations in the characteristics of nurse practice environments of hospitals (Lake & Friese, 2006) and that magnet hospitals and other health organizations with a supportive nurse practice environment produce better patient and nurse outcomes. In addition, the research literature indicates that a supportive professional nurse practice environment is associated with a variety of positive patient outcomes, including higher level of quality inpatient care (Aiken et al, 2002; McCusker, Dendukuri, Cardinal, Leplante, & Bambonye, 2004; Flynn, 2007; Lake & Patrick, 2008; Aiken, Clarke, Sloane, Lake, & Cheny, 2008), fewer adverse events and safety outcomes (Laschinger & Leiter, 2006; Flynn, 2007), lower mortality and higher levels of patient satisfaction (Gardner, Thomas-Hawkins, Fogg, & Latham, 2007). Nurse practice environment studies have been performed in a wide variety of populations, including hemodialysis patients (Gardner, Thomas-Hawkins, Fogg, & Latham, 2007, Flynn, 2007; Flynn et al, 2009); home care patients (Flynn, Carryer & Budge, 2005); oncology nurses and various settings including nursing homes and government owned facilities (Li, et al 2007).

Nursing Care Processes and staffing on Patient Outcomes

Figure 4 Hypothesis 3: Higher quality nursing care processes are associated with better patient outcomes



Nursing care processes are those interventions and activities that nurses perform to improve the safety, health, and outcomes of their patient (Aiken et al, 2001). While

nurses make every effort to provide quality patient care, key nursing care processes may be omitted under compromised working conditions and have adverse implications for patient outcomes. Differences in clinical care processes have been long associated with differential outcomes in healthcare institutions and have been studied widely in the US and the UK. While it is impossible to examine all variations in nursing care processes, several core nursing processes, such as assessment, surveillance, patient teaching, skin care and discharge planning, have been identified. Omission of these key nursing care processes may have adverse effects on patient outcomes (Aiken, et al., 2002, Sochalski, 2001, Thomas-Hawkins, Flynn & Clarke, 2008).

In the US, empirical links between nursing care processes and outcomes has been enhanced by the utilization of the National Database of Nursing Quality Indicators (NDNQI). Research findings have indicated significant associations between nurse workloads, care processes left undone and reported adverse events in a sample of 9,545 RNs practicing in Pennsylvania hospitals (Sochalski, 2001). Two replication studies were done where RNs repeatedly reported core processes left undone during their last shift and significant relationships were noted with adverse patient outcomes (Sochalski, 2004). More recently, Thomas-Hawkins, Flynn & Clarke (2008) examined care processes and their relationship with adverse outcomes in hemodialysis patients. The key nursing activities examined included surveillance and monitoring, coordination of care, patient teaching, documentation in the patient record, and supervision of staff. Further data analysis has revealed relationships between nursing care processes and nursing outcomes, independent of the relationship with workload and the practice environment (Flynn, Thomas-Hawkins, & Clarke, 2009). In Flynn et al's study, it was noted that

when nurses must leave important care processes undone because they did not have time to complete them, the likelihood of burnout was nearly nine times greater. The researchers concluded that nurses make every effort to provide quality patient care, preferring to work in supportive organizations that enable and appreciate their quality efforts (Flynn et al, 2008; McClure, 2002).

When examining the relationships between nursing care processes and patient outcomes it is important to understand the meaning of the core nursing processes within the specific population and setting. In prior studies with hemodialysis patients, the specific care processes addressed were modified to represent the population of interest (Thomas-Hawkins, et al, 2008; Flynn, et al, 2009). The care processes related to neonatal mortality are specific to the setting and these differences are important considerations for examining core processes in the neonatal in-patient care setting in Sub-Saharan Africa. Babies who are receiving specialized care, especially premature infants in special care units, require constant nurse monitoring and surveillance to evaluate for complications such as infection, respiratory distress, and intraventricular hemorrhage, thus core nursing care processes need to specifically address these complications. Recently the National Data Base of Nursing Quality Indicators (NDNQI) examined newborn outcomes and noted significant associations between specific neonatal nursing care processes and outcomes, including a link between nursing care processes and pain and peripheral venous line infiltration in the neonatal intensive care setting (Lacey, Cox, 2009). Recently, Lake & Patrick (2008) examined the relationship between variations in nurse staffing, practice environment, and care processes in the neonatal setting, and found an increase in hospital acquired infections to be associated with staffing and omissions of

key nursing care processes. While the study results are preliminary, findings suggest an association between clinical care processes and higher levels of hospital acquired infections. In summary, there is a small, yet emerging body of literature that suggests that omission of core nursing care processes has an impact on patient outcomes. The omission of care processes may be particularly important in the neonatal care settings as newborns are especially vulnerable and rely on nurses for complete care if they are ill.

Special Considerations for the Context of Care

In Sub-Saharan Africa

It has been documented that international nurses, including African nurses, highly value the same organizational characteristics that support a professional nurse work environment as nurses in other countries (Flynn & Aiken, 2002). However, nursing work organization, as conceptualized for this study, may be affected by other special factors within sub-Saharan Africa, such as availability of equipment, the variations in the healthcare system and nurse education. Most research examining nurse work organization has been done in developed countries, with relatively resource rich healthcare systems. Sub-Saharan countries have differently organized health systems, therefore, it must be questioned whether the evidence from developed countries is applicable in the sub-Saharan African context. International studies have concluded that relationships between nurse staffing and the nurse practice environment and poor patient outcomes were congruent across countries (Aiken, et al, 2008), however these studies primarily focused on European countries, including United States, Canada, England, Scotland, and Germany. These countries had relatively similar availability of financial and material resources and did not include any African healthcare systems. In addition,

nursing education may be quite different and may have implications on the nurse practice environment and on the delivery or omission of core nursing care processes.

The Healthcare System in Nigeria

The healthcare system in Nigeria is not homogenous and has significant variations by facility type. Presently, modern health care services in Nigeria are provided by the federal, state and local governments as well as private and non-governmental (profit and non-profit) organizations. The three tiers of government operate through a network of primary, secondary, and tertiary level facilities. It is important to note that neonatal care, including births, stillbirths, and neonatal deaths, occur across all three tiers of the Nigerian healthcare system, including the primary health care setting. The primary aim of the tiered referral system is to enable Nigerian access to all levels of healthcare. Primary health care is largely the financial and administrative responsibility of the local government with support from the regional state's ministry of health and focuses on preventive, curative and health promotion services. Patients are referred from primary to secondary care services, which operates both in-patient, and outpatient care services and as needed to tertiary services, which are provided in teaching and other specialty hospitals. Ownership of hospitals is decentralized with each tier of government owning and operating hospitals within its area of jurisdiction. Trends in ownership have been rapidly changing over the last decade. Due to the emphasis on primary health care (PHC), local government ownership has increased dramatically and state and federal government ownership has sharply declined over the last decade. In 2000, there were 10,149 primary health care institutions, 937 state owned institutions and only 51 federal government owned health institutions (Amaghionyeodiwe, 2008). These trends and

shifts in ownership may be key factors in the variations noted in infrastructure, drug availability, the availability of healthcare providers and services, which has been noted within the current healthcare system.

Material Resources and Neonatal Mortality

Hypothesis 6. There is a relationship between availability of material resources and neonatal mortality.

As noted earlier, nurses employed in these healthcare systems in Sub-Saharan Africa are challenged not only due to the healthcare worker shortage, but also due to the shortage of material resources, which includes that equipment necessary for providing even the most basic care. In a recent study of nursing school graduates in Sub-Saharan Africa, students noted that lack of equipment was one of the major negative factors affecting the nurse practice environment (Nguyen, et al, 2008). The study concluded that the major push/pull factors were finances, safety, stability, and a sense of professionalism. The qualitative data in the study produced similar themes: “too little pay” “; inadequate equipment and supplies” “; poor benefits” “; not enough public sector jobs”; and “nurses treated badly” (Nguyen, et al., 2008). The relationship between nursing care processes and the availability of resources is complex. The availability of these resources at healthcare institutions has serious implications on the delivery of adequate nursing care services and to provision of the basic nursing care processes.

Nursing Education in Nigeria

An understanding of the Nigerian educational system for nurses is necessary in order to appreciate the nurse work organization context in this country. In addition, nurse education in Nigeria may serve as an important demographic variable in this study and may be helpful in understanding the relationship between nursing care processes and

patient outcomes. In Nigeria, formal apprenticeship for nurse training was founded in 1930, based on the nursing model initially developed by Florence Nightingale in the UK. Nursing guidelines and training were initiated in mission and governmental hospitals while Nigeria was under British rule (Adebanjo & Olubiyi, 2009). By 1972, the first Bachelor of Nursing Science program was established and currently there are 17 BSN programs in Nigeria, whose curriculum is accepted by the National Universities Commission (NUC) for university-based nursing programs. In addition, currently both Masters Degree and PhD degrees in Nursing are available in Nigeria at a small number of universities (Adebanjo & Olubiyi, 2009). Similar to boards of nursing in the US and UK, The Nursing and Midwifery Council, works to enhance the professionalism of nursing by advocating for promoting BSN as the basic entry requirement for the RN. While some major improvements in the development of BS prepared nurses has occurred, nursing education continues to be primarily based in the hospital setting and most of the nurses currently employed have only a basic diploma. (Matsu, 2009) Recently, the National Open University of Nigeria (NOUN), a distance learning program, was developed to assist hospital trained RNs receive a BSN degree (Adebanjo & Olubiyi, 2009). Currently 75% of practicing RNs in Nigeria are certificate and diploma holders (Adebanjo & Olubiyi, 2009). The curriculum for these diploma programs in Nigeria seem to be congruent with nurse education in the US and UK and include similar didactic, clinical and theoretical foundations. Thus, the foundation and understanding necessary for the practical delivery of core nursing care practices should be present.

Similar to the US, nurses in Nigeria have actively participated in advanced certification training over the last decade. Although the diploma is often used as an entry

point for most nurses in Nigeria, continuous participation in post-diploma certifications to obtain specialized training is common. According to the Education/Subgroup of the International Nurse Practitioner/Advanced Practice Nursing Network, nearly all nurses in West Africa have double certification and are dually certified as both registered nurse and registered midwives. According to the Nursing and Midwifery Council of Nigeria (2009), nearly all RNs have participated in at least one additional specialty nursing education program (Adebanjo & Olubiyi, 2009; Madubuko, 1985). In addition, there are at least 380 nurses who were trained as Nurse Intensivists and work in critical care units and within departments of anesthesia (Oguariri & Kabara, 2008).

From a global perspective, nurse education faces many challenges in its progression toward professionalism. Nurses in Nigeria seem to have some similarities with nurses in the US in terms of nurse education. The historical progression and challenges in the professionalism of nursing education in Nigeria is not unusual. For example, the progression from hospital based learning systems occurred in both countries during the same period, 1950's to 60's. In addition, the transition of nurses from diploma and associate degree trainings continues to be an issue for both countries. According, to the Bureau of Labor Statistics (2010), nearly 2.6 million nurses are employed in the US, with most nurses (59%) practicing with a diploma or associate, 2-year degree. According to the National Nursing Council (2010), only 31% of nurses in the US have a BS degree, and nurses with either a Masters degrees (9%) or a PhD (<1%) degrees in nursing are very limited (National Nursing Council, 2010). As noted earlier, nurses that are well educated may be able to better define the organizational traits of the healthcare system. Given that both the US and Nigerian healthcare systems have a predominance of nurses

that are trained below the BS degree level and with similar core curriculum subjects, suggest that there may be some similarities in their performance of core nursing care processes and their description of the nurse work environment.

Literature Review Summary

There is a significant body of research, which has been done to help organizations understand the impact of nurse staffing on negative patient outcomes, such as mortality, including neonatal mortality. In addition, the nurse practice environment has been examined for nearly three decades and linkages between the nurse practice environment and patient outcomes and nursing care processes have been demonstrated. There is a growing body of evidence that omitted nursing care processes are associated with patient outcomes. In addition, Nigeria has several special, contextual nursing characteristics that are important to understand for this study. While many of the concepts within the Nurse Work Organization and Outcomes Model could be deemed appropriate for examining neonatal mortality in Nigeria, this study is limited to the following specific research questions.

1. What are the relationships between staffing, characteristics of the nurse practice environment and nursing care processes on in-patient neonatal mortality rates in government owned, in-patient facilities in Nigeria?
2. What are the relationships between staffing and the nurse practice environment on nursing care processes in government owned facilities in Nigeria?

CHAPTER III: METHODOLOGY

This chapter summarizes the methodology used to address the research aims. The design, setting, sample, data collection process, measures and data analysis plan are described in detail.

Design

The current study is a cross-sectional, multicenter, organizational study of twenty-seven healthcare institutions in Nigeria. Cross-sectional designs are ideal for initial examinations of associations between variables and to describe their distribution patterns. Since this is among the first studies to examine nurse work organization in sub-Saharan Africa, the design was considered ideal. Cross-sectional studies are generally survey studies; however, in this study the design was enhanced to also examine organizational characteristics, which were thought to potentially have an impact on neonatal mortality or nurse work organization. The study utilized mixed methods with predominantly quantitative methodologies and minor qualitative components, in the form of open-ended questions and remarks, and on site visual inspection of the facility. This study was designed to examine maternal child health nursing and neonatal mortality across various levels of care, tertiary, secondary and primary care.

The study was performed after review and approval from both the University of Maryland Baltimore and the Institute of Human Virology Nigeria Federal Institutional

Review Board. In addition, several participating institutions reviewed and approved the protocol via their institutional review boards. The sample unit was the healthcare organization, however two groups of participants were surveyed; both nurses and hospital administrators. The WHO Safe Motherhood Assessment Tool (SWAT) (WHO, 2001), specifically the facility administrator form, was completed with the administrator at each participating facility. Health care providers in Nigeria speak English, thus language translations of documents were not necessary for this study. Nigerian nurses from IHV-N and University of Maryland piloted and reviewed the nurse survey and provided direct input into the language and terminology used.

Setting

The study was set in Nigeria, a West African country bordering the Gulf of Guinea between Cameroon and Benin. Nigeria is the most populous country in Sub-Saharan Africa with a population of 149 million (CIA factsheet, 2010). While some progress has been made in decreasing neonatal mortality in Nigeria, the rate of decline has been sluggish, one percent over the last 10 years (WHO, 2010; Rajaratnam et al., 2010). Nigeria continues to have one of the highest birth rates in the world 36/ 1000; one of the highest infant mortality rates 94/ 1000 live births; and one of the highest neonatal mortality rates 49/1000 live births (WHO, 2010). Neonatal mortality in Nigeria has been documented as accounting for 60% of child mortality and thus research to specifically address neonatal mortality is urgently needed.

Study Sample

In the current research study, the sample unit was the healthcare organization. Access to this sample was feasible due to collaborations with the Institute of Human

Virology-Nigeria; The University of Maryland School of Medicine; The Office of Global Health at the University of Maryland's School of Nursing, and the researcher's prior experiences teaching Neonatal Resuscitation in Northern Nigeria. The goal was to obtain a minimum of 20 institutions, which was a similar sample size utilized in earlier studies examining the similar nursing work organization factors and mortality (Aiken & Patrician, 2000).

Governmental institutions, primarily in the north central geographical zone of the country, were purposely chosen to participate in the study. The facilities included in this sample, were primarily those within the Federal Capital Territory (FCT), Abuja and the north central region of the country; however a few healthcare facilities in the southern region of the country also participated. The FCT region was identified a priori, as important because it was thought to represent most developed healthcare resources within Nigeria. Regional considerations in the sampling are important when examining neonatal mortality rates in Nigeria, because clear differences have been noted both by specific geographical zones. Urban to rural differences have also been found to be significant. According to the most recent Nigerian Demographic and Health Survey (National Population Commission Federal Republic of Nigeria, 2008 NDHS), recently, WHO (2010) documented the rate as 49/1000 live births. In Nigeria, neonatal mortality has been noted to account for nearly 60% of child mortality. Child mortality has also been consistently lower in urban areas (38/1000 live births), than in rural areas (49/1000 live births) (National Population Commission Federal Republic of Nigeria, 2008). Within Nigeria, there is also variation in mortality levels across geographical zones, with the highest neonatal mortality rates (53/1000 live births) in the Northeast zone; the lowest

NMR in the Southwest zone (37/1000) live births; and the North-central zone with a NMR of 41/1000 live births (National Population Commission Federal Republic of Nigeria, 2008).

In this study, invitations to participate were sent to thirty-four healthcare facilities all of which were associated with the Institute of Human Virology- Nigeria (IHV-N). IHV-N, is a non-governmental organization which collaborates with the National Federal Ministry of Health Nigeria and other development partners, the IHV-N has been supporting infrastructural upgrades and capacity building for over 100 primary, secondary and tertiary healthcare institutions in Nigeria for the treatment and care of people living with HIV/AIDS under the President Bush's Emergency Plan for AIDS Relief (PEPFAR) ((Institute of Human Virology-Nigeria, 2010). In addition to providing antiretroviral drugs to treat and prevent HIV, within the context of Nigerian National HIV/AIDS strategic framework, the Institute provides continuing education to health providers involved in HIV care in developing an evidence-base for guiding policy on treatment.

Of the thirty-four facilities invited to participate, twenty-seven hospital administrators agreed to participate in the study. The administrators participated in an in-person survey, were therefore identifiable, and completed an informed consent form. See Appendix C. Individual informed consent was obtained for the administrator survey prior to completion of the in-person survey. The administrator was made aware that the hospital would remain anonymous and that participation in the survey was voluntary. The administrator completed the survey in approximately 1 hour. The administrators often solicited assistance from additional hospital personnel to retrieve information,

specifically data related to the number of healthcare workers per facility and the data on neonatal mortality from the health records department or nursing departments. The WHO Safe Motherhood Assessment Survey, specifically the facility administrator form was completed.

All participating facilities were government owned facilities that were geographically located in 10 different states, which surrounded the Federal Capital Territory within Nigeria. Most facilities were secondary hospitals (42.9%), followed by tertiary (39.3%), and primary health care (17.8%). Most primary health facilities (60%) and secondary care facilities (83.3%) were in rural regions, while most tertiary facilities (72.7%) were in urban areas.

Key Informant Surveys with Nurses

While individual nurses are not the unit of analysis, data was collected for each institution by the use of nurse surveys. See Appendix D. Nurses are considered key informants in this study with regard to examining the organizational features of their workplaces. The use of nurse surveys is a key methodological approach in nursing organization and outcomes model. The target nurses for this study were maternal child health nurses, specifically staff nurses providing direct patient care. All of the nurses in the following maternal child health units: special baby care units/ neonatal intensive care units; labor and delivery; postpartum/maternity and pediatrics were invited to participate and 231 nurses participated. The cross-sectional surveys were implemented in 72 different maternal child health units across the 27 hospitals, which were geographically located in 10 states in Nigeria.

Most of the 231 nurses who participated in the study were assigned to maternity (labor & delivery) units (34.1%); the second highest number of nurses were employed in special care baby units (17.5%); followed by antenatal clinics (14.3%); pediatric units (14.2%); rotating units (13.5%); and the smallest number of nurses were from postpartum units (5.8%). Nurse Matrons, senior administrators of these specialty units, were witnessed providing direct nursing care in addition to their administrative duties. These nurses, providing direct patient care, were allowed to participate in the study. According to the nurse matrons who participated in this study, their active departure from their administrative duties to participate in direct patient care was not unusual due to the severe nursing shortage and the high numbers of patients in maternal child health settings.

There were wide variations in the number of nurses per facility based on the level of care. On average, tertiary centers had greater number of nurses, $M=351/SD= 206$; than secondary centers, $M=36.5/SD= 20.1$; and primary health care with an average of 13 nurses per facility. An ANOVA was done and these differences were significant, Brown Forsythe ($F=23.9, p < .001$). The Games Howell post hoc tests, revealed significant differences between primary and secondary, $p = .037$. Tertiary centers had significantly higher number of nurses than both primary ($p = .002$) and secondary center ($p = .002$).

By design, a target of five nurses per facility were to participate in the survey however, less nurses participated in this study. Given the nature of the nurse work force shortages within the Nigerian healthcare system, this target number of five maternal child health nurses was impossible to achieve at all times. In order to obtain representation of group opinion in nurse work organization, recommendations suggest having at least

greater than 50% nurse participation at time of data collection (Ferketich and Verran, 1991). The number of nurse respondents in this study ranged from 1-17nurses per facility. Facilities that participated in this study had 87-100% response rate, with most nurses at all sites participating unless they were involved in emergencies. The facility with only one nurse had a 100% response rate; however this facility was deleted due to inability to aggregate a nurse group response.

The overall response rate for the nurse survey ranged from 87-100% for participating facilities, with only three facilities with less than 100% participation. Most nurses present at the facility on the day of data collection did participate in the study. However, the nurses that did not participate were unable to do so because they were acutely involved in direct neonatal and maternal care emergencies. Two of the nurses were rushed to operating room for emergent newborn deliveries. Yet, another was providing both nursing and medical care to a newborn with seizure activity in the absence of a physician. The others were simply overwhelmed with the sheer number of patients in the maternal health units, especially in the antenatal care clinic, where one nurse was caring for as many as 150 patients, at the time of the survey.

In summary, the final components of the sample included 27 governmental hospitals in 10 states in Nigeria. Nurse surveys were implemented in 72 different maternal child health units, within 27 hospitals, resulting in the collection of 231 nurse surveys. In the final analysis, one hospital was deleted and eight nurse surveys were deleted. In the final report, all participants were anonymous and neither individual hospitals nor individual nurses were identified.

Data Source

Primary data collection occurred over a 5-week period in Nigeria from March 22nd – April 30th 2010. In an attempt to minimize cultural and communication misunderstandings one investigator collected all data. The data collection was done using cross-sectional surveys and resulted in the collection of two sets of primary data. The first group of data was derived from hospital administrators (n = 27). The hospital administrators completed the WHO Safe Motherhood Assessment Tool (WHO, 2001) facility administrator form, including a physical examination of the facility to identify available resources for neonatal care. The SWAT instrument was revised slightly to focus specifically on neonatal mortality and was used to collect administrative data on facility level in-patient neonatal mortality and stillbirths, and both self-reported and observed data on material resource availability were collected. See Appendix E.

The administrator retrieved from the delivery logbooks in the maternity and special care baby units and/or from the health records department of the facility as deemed appropriate the neonatal mortality data. The most recently available in patient neonatal mortality data was for the year 2009. Data collection on in-patient neonatal mortality across facilities was valid and congruent primarily because due to governmental reporting requirements within Nigeria. Hospital level in-patient neonatal mortality data is generally collected and reported by the nurses in the delivery or special care baby units in logbooks, the data is then reported to the hospital administration and then verified by health medical records department. The health medical records department also collects data on mortality directly from the patient charts and this data is compared to the data collected by the nursing staff in the logs. After verification the medical records office

compiles and then forwards the data to the facility medical director who is responsible for providing annual reports of the data and information to the state and federal governments. For most participating facilities, hospital level data on in-patient neonatal mortality was readily available and had already been collected and recorded by the facility three months prior to the study in January 2010, for the 2009 hospital annual reports. The final data on in-patient neonatal mortality was provided by the medical director or hospital administrator who was directly interviewed in this study.

Nurses were the second group of participants, who completed self administered, anonymous surveys. These surveys provided data related to nurse staffing, the nurse practice environment, nursing care processes and other key demographic data related to nurses and nursing care to newborn. The nurses were made aware that participation in the survey was voluntary. This anonymous survey was used to collect facility level data on nurse staffing, the nurse practice environment, and nursing care processes. In addition, the nurse survey included basic demographic data on gender, education, and years of experience, and job satisfaction. The time to complete the survey varied with an average of 30 minutes. Some nurses, particularly those in the farthest Northern region of the country, needed more time to complete the survey, nearly 45 minutes on average; and also need more explanation of the questions. The maternal child health nurses completed the survey in a private location where possible and all nurses returned the survey directly to the researcher. Many nurses did complete the survey while in patient care areas, as they were extremely under-staffed and did not have the opportunity to leave and complete the survey in a completely private location. A small token of appreciation,

a phone card, was distributed to all nurses who were given a survey, whether they completed it or not.

Study Measures

The Outcome Variable: Neonatal Mortality

The inclusion and classification of neonatal deaths followed the WHO (2010) definitions as defined in the International Classification of Diseases, 10th edition (ICD-10), Chapter 5. Neonatal death is defined as “Death of a newborn within the first 4 weeks of life”, (WHO, 2006; 2010, p. 7). Neonatal death is further classified as early neonatal deaths and late neonatal deaths. Early neonatal death is defined as “death of a newborn within the first week of life”. Late neonatal deaths occur “after the first week of life, but prior to the 28th day of life”. Neonatal deaths are generally operationalized as neonatal mortality rates (per 1000 live births) with the numerator being the number of neonatal deaths and the denominator the number of births per 1000 live births. Both the numerator and the denominator must occur within the same time. In-patient neonatal mortality was defined for this study as, neonatal death within the hospital in the first four weeks of life.

Recently WHO (2010), perinatal mortality has been reported to be a better indicator of early deaths in the newborn period in developing countries. Perinatal death is defined as the combination of early neonatal deaths and stillbirths. As noted earlier, for every neonatal death in the world, another newborn is born already dead and classified as a fetal death or stillbirth. In developing countries many neonatal deaths have been noted to be misclassified as stillbirths, thus the current report suggest using perinatal death as an additional indicator of neonatal mortality.

According to WHO (2006; 2010) many countries have been underestimating perinatal deaths, especially in developing countries. The reports state, “It is likely that the decision whether to classify a delivery as long before term, as a spontaneous abortion or as a birth, which must be registered, may be affected by the circumstances in which the birth occurred and by the cultural and religious backgrounds of the people making the decision,” (WHO, 2006, p.6). Stillbirth is noted to be a professional and lay term that refers to a deadborn fetus. Intrauterine death occurs either before onset of labor (ante partum death) or during labor (intrapartum death). Fetuses may die intra utero, before onset of labor, because of pregnancy complications or maternal diseases. Complications arising during birth are the main cause of death among almost all infants who were alive when labor started, but were born dead. Thus, it is important to know at what point before birth the baby died, so that appropriate interventions can be planned.

It is important when measuring concepts in developing countries to ensure that the researcher and the participants have congruent operational definitions. In this study, nurses were asked to define stillbirth and neonatal death to identify inconsistencies and to decrease potential threats to construct validity. The ICD 10 report defines a stillbirth as, “death prior to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy; the death is indicated by the fact that after such separation the fetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles,” WHO, 2006, p.12. However, in this study, nurses in the participating hospitals, reported various definitions of stillbirths, including –“living with a heart rate for a few minutes and then dying” or being “too small to live”. This report of

the presence of a heart rate and simply being too small to live indicate some evidence of initial life. This information should have resulted in these infants being classified as neonatal deaths instead of stillbirths, and it is possible that some reported stillbirths were neonatal deaths. In addition, WHO recommends, if possible, all fetuses and infants weighing at least 500 g at birth, whether alive or dead, be included in the statistics. According to WHO, the inclusion in national statistics of fetuses and infants weighing between 500 g and 1000 g is recommended both because of its inherent value and because it improves the coverage of reporting at 1000 g and over. For international comparison, 1000 g and/or 28 weeks gestation is recommended. The weight of newborns that died at the facilities that participated in this study was consistently not recorded, and collection of this data would be helpful in future prospective studies. In addition, clarity of terminology related to stillbirths, neonatal and perinatal deaths was needed and provided to nurses and other healthcare professionals who were actively practicing in the field. Therefore, it is likely that the in-patient neonatal mortality data, which had been collected months earlier, is higher than reported, as some nurses reported misclassifying neonatal deaths as stillbirths. Nurses, particularly those in primary health care settings, also reported less risk of criticism from managers and other authorities, if stillbirths rather than neonatal deaths were reported. As noted in the descriptive table, very few neonatal deaths were noted in the primary care setting, this low number of neonatal deaths might also be partially related to Nigeria's hierarchical referral system that requires that ill infants be referred immediately from primary health care to secondary or tertiary settings.

In this current study, in-patient neonatal mortality is the outcome variable and was operationally defined as the number of newborn deaths within the first 28 days of life

in the hospital to the total number of newborn births per 1000 live births in the hospital within the same time period. The in-patient NMR was calculated using the total number of hospital deliveries and the total number of in-hospital neonatal deaths within the first 28 days of life. Inpatient neonatal mortality data were retrieved via one of two mechanisms: 1) Administrative hospital data, logbooks of deliveries and neonatal deaths or 2) the health records office of the facility. In addition, the number of fetal deaths and stillbirths were collected to assess perinatal mortality as an additional outcome variable.

Several methodological limitations are noted with the use of in-patient neonatal mortality as an outcome variable. In this study, as with most nurse work organizational studies, social determinant and health system factors normally associated with in-patient neonatal mortality were present and could not be completely controlled.

The study was limited and was only able to collect data that was available in the hospital logs and the health records departments of the participating facilities. In developed countries, researchers examining in-patient neonatal mortality, generally use risk assessment measures to help to control for neonatal risk factors. Additional measures such as Apgar scores, birth weight, gestational age, place of birth (inborn vs. out born), and attendance at least one prenatal care visit are generally collected concurrently. These variables were considered a priori, however the data was consistently unavailable in the records of the participating facilities. While the death of the neonate was recorded, there was often no weight, gestational age, or Apgar score noted. Only two of the twenty-seven hospitals in the study had collected data on birth weight and place of birth for neonatal deaths. In addition, due to the lack of data collection on place of birth, treatments and care that newborns received inside versus

outside of the hospital could not be fully distinguished and tertiary centers may have appeared to have more deaths due to the referral of sicker infants to those centers. The ability to risk adjust mortality rates is important because it allows for better understanding of the additional factors that may be associated with neonatal mortality within facilities. This lack of data collection for newborns dying within the hospital setting is alarming and should be addressed in future prospective studies examining in-patient neonatal mortality.

In summary, it can be argued that in-patient neonatal mortality is a more reliable indicator than the community level neonatal mortality rates that are well known to be inaccurate, due to the many births and neonatal deaths that are known to occur and to remain completely unregistered. In-hospital neonatal mortality is also a specific and objective measure that can be retrieved directly from the facility and/or derived from the medical records of patients. Finally, in-hospital mortality data is also a better indicator of the nurse's work in the hospital and therefore was deemed the most appropriate outcome variable for this study.

Staffing Measure

As noted in the literature review the relationship between nurse staffing and mortality has been one of the most frequent relationships examined using the Nurse Work Organization and Outcomes Model. Staffing is an important indicator affecting patient outcomes. Nurse Staffing, specifically nurse to patient ratios, has most commonly been defined using two methods. "One method uses a ratio of full time equivalents (FTEs) of RNs per patient day, whereas the second uses the number of patients assigned to 1 RN per shift in the unit", Kane, et al (2007, p. 1175).

Methodological challenges have been noted with measurement of nurse staffing in nurse work organization studies. In a 2004 systematic review of nurse staffing, researchers reported that no standardized operational definition for nurse to patient ratio (NPR) had been used in nurse work organization research (Lang, Hodge, Olson, Romano, & Kravitz, 2004). They argued that the ratio had been presented predominantly as a static measure, although staffing is generally dynamic in nature (Lang, et al, 2004; Numata, Schulzer, van der Wal, Globerman, Semeniuk, Balka, & FitzGerald, 2006). Other studies have used cutoff points for the NPR to determine high versus low staffing (Lang, et al., 2004). However, it has been noted that there is no clear criteria which would allow one to decide on an appropriate cutoff point to define high or low staffing for certain populations. Most studies also sampled only day shift nurses and thus, did not account for the well-known fluctuations in staffing of the evening and night shift.

Acuity and intensity of patient care are additional factors, which have not often been captured in studies. For example, three patients in the antenatal clinic are not equivalent to three newborns in the special baby care unit or three women delivering simultaneously in the labor and delivery unit. Nurse staffing has also been noted to vary by facility and unit type. Facilities with lower acuity generally have higher patient to nurse ratios and higher acuity units have lower patient to nurse ratios and have the sickest patients with the most risk for mortality. Unit type is particularly important as nurses working in labor and delivery, pediatrics, and special care baby units are those that are more likely to have a direct impact on neonatal mortality. The objective measure NPR may not capture details related to acuity and intensity, which may be important in this population of maternal child health nurses.

A self-reported measure of nurse staffing, the Staffing and Resource Adequacy Subscale of the Total PES, has been noted to have high correlation with the nurse patient ratios in several studies (Aiken, 2004; Aiken et al, 2008). This multicollinearity between nurse patient ratios and the staffing and resource adequacy subscale of the PES-NWI suggest that these variables may be measuring the same concept and are conceptually linked. In some studies, the most salient aspects of nurse staffing may not captured by the objective nurse measure of nurse patient ratio. Given the conceptual linkages noted in earlier research, one could consider utilizing the more subjective measure as defined in the PES Staffing and Resource Adequacy Subscale, as it is likely to embody the context specific aspects of staffing and variations by units.

The National Quality Forum has endorsed the use of standardized definitions for research examinations of nurse staffing and skill mix (NQF, 2009). Thus, for this study, nurse staffing was measured as a nurse to patient ratio. This measure has been endorsed as consistently predictive of a variety of patient outcomes including mortality (NQF, 2009). Staffing ratios are based on a question in the nurse survey: *How many patients did you manage on the last day that you worked?* Aggregated data from multiple nurse surveys for the facility were collected to measure nurse staffing ratios by facility. In addition, the staffing and resource adequacy subscale of the PES-NWI will also be considered in the analysis, as a subjective measure of nurse staffing.

Measuring the Nurse Practice Environment

A positive nurse practice environment has been conceptually defined as environments characterized as having high nurse autonomy, nurse control over their practice, strong leadership ability and support, collegial relationships with physicians,

and active participation of nurses in hospital affairs (Lake, 2002). The nurse practice environment has also been defined as “the organizational characteristics of a work environment that facilitate or constrain professional nursing practice”, (Lake, 2002, p. 178). According to Lake (2002), the goal of the PES-NWI scale is to enhance the examination of the independent contribution of the practice environment to nurse and patient outcomes and to allow institutions the opportunity to compare their scores in order to target aspects of the nurse practice environment that require improvement.

The nurse practice environment has been operationally defined for this study using the original format of the PES-NWI (Lake, 2002), which has been endorsed by the National Quality Forum (Kurtzman & Corrigan, 2004) as the standard measure of the nurse practice environment to ensure comparability across studies. The PES- NWI is a 31-item scale with five subscales and good internal consistency has been demonstrated in multiple prior studies. However, the scale had not been used with Sub-Saharan nurses, thus reliability was re-examined in this study. The Total PES scale demonstrated good reliability ($\alpha = .929$). The five subscales also had reasonably good reliability with the nurse participation in hospital affairs subscale ($\alpha = .82$), nursing foundations for quality of care subscale ($\alpha = .793$), nurse manager’s ability, leadership and support of nurses subscale ($\alpha = .65$) (slightly lower than in other studies), staffing and resource adequacy subscale ($\alpha = 0.752$) and collegial nurse-physician relations subscale ($\alpha = .735$). Construct validity was supported in an earlier study that reported significantly higher means for nurses in magnet hospitals compared to nurses of non-magnet hospitals (Lake, 2002). The PES-NWI was also validated in a large descriptive correlation study using data from >10 thousand nurses and 232,342 surgical patients in 168 Pennsylvania hospitals (Aiken

et al, 2008). In this study, the likelihood of patients dying within 30 days of admission was 14% lower in hospitals with better care environments than hospitals with poor care environments. See Table 1. for PES-NWI scale details.

Table 1 Nurse Practice Environment Scale and Subscales

	No. Items	α	Scores (M)
Total PES-NWI Scale	31	0.929	31-99 (59.3)
Nurse Participation in Hospital Affairs Subscale	9	0.822	9-33 (17.2)
Items	M	SD	Min-Max
1 Staff nurses are involved in governance of the hospital	2.078	.938	1-4
2 Opportunity for staff nurses to participate in policy decisions	2.44	1.11	1-4
3 Opportunities for advancement	1.99	1.01	1-4
4 Administration that listens and responds to employee concerns	2.00	1.06	1-4
5 A chief nursing officer who is highly visible and accessible to staff	1.37	0.635	1-4
6 Career development and clinical ladder opportunity	2.08	0.938	1-4
7 Nursing administrators consult with staff on daily problems and procedures	2.00	1.06	1-4
8 Staff nurses have the opportunity to serve on hospital and nursing committees	1.68	.969	1-4
9 A chief nursing officer equal in power and authority to other top level hospital executives	2.04	1.04	1-4
Nurse Foundations for Quality of Care Subscale	10	0.793	10-33 (19.0)
1. Use of nursing diagnosis	1.72	1.02	1-4
2. An active quality assurance program	2.10	1.05	1-4
3. A preceptor program for newly hired RNs	2.46	1.15	1-4
4. Nursing care is based on nursing, rather than a medical model	1.61	.852	1-4
5. Patient care assignments that foster continuity of care; the same nurse cares for the patient from one day to the next	2.45	1.45	1-4
6. A clear philosophy of nursing that pervades the patient care environment	1.88	.811	1-4
7. Written up to date nursing care plans for all patients	1.94	1.09	1-4
8. High standards of nursing care is expected by the administration	1.47	.704	1-4
9. Active staff development or continuing education programs for nurses	1.86	1.01	1-4
10. Working with nurses that are clinically competent	1.42	.604	1-4
Nurse Manager Ability, Leadership and Support Subscale	5	0.645	5-17 (8.7)
1. A nurse manager who is a good manager and leader	1.44	0.670	1-4
2. A nurse manager that backs up the nursing staff in decision making, even if the conflict is with the physician	1.81	0.921	1-4
3. Supervisors (nurse matrons) uses mistakes as learning opportunities, not criticism	2.2	1.0	1-4
4. A supervisory staff that is supportive of nurses	1.45	0.665	1-4
5. Praise and recognition for a job well done	2.05	1.05	1-4
Staffing and Resource Adequacy Subscale	4	0.752	4-16 (9.1)
1. Enough staff to get the work done	2.47	1.21	1-4
2. Enough registered nurses to provide quality patient care	2.42	1.17	1-4

Source: Data Source: Ogbolu Dissertation Data: Nurse Work Organization and Neonatal Mortality in Nigeria. Original PES NWI Scale as defined by Lake, 2002

Measuring Nursing Care Processes

Nursing care processes are conceptually defined as those interventions and activities in which nurses engage to improve the safety, health, and outcomes of their patients. While nurses make every effort to provide quality patient care, key nursing care processes may be left undone under compromised working conditions and have adverse implications for patient outcomes. Several nursing processes have been identified as core nursing care processes including assessment, surveillance, patient teaching, skin care, and discharge planning. Research findings have indicated significant associations between nurse workloads and the number of care processes omitted. The total number of nursing care processes left undone were measured using a nursing care processes scale, developed by Aiken, et al, 2001) and revised slightly in this study to be appropriate for neonatal care. The questions included in a core processes scale for this study were incorporated into the nurse survey. The specific questions were related to surveillance and monitoring, coordination of care, patient teaching, documentation in the patient record, feeding the newborn, and supervision of staff on the last day that the nurse worked. The total impaired processes scores were computed as a sum of all care activities left undone. Construct validity for Aiken's general nursing care processes scale has been demonstrated in its use in earlier studies (Sochalski, 2001; 2004; Flynn, 2007; Thomas-Hawkins, et al, 2008). Since this scale had no prior use with this population, the scale was examined in this study for reliability and was noted to have a Cronbach $\alpha=$ 0.671, which was considered satisfactory for this study, since the total number of items on the scale was 7.

In addition, further descriptive data was collected on other nursing care processes that may be related to neonatal mortality. These questions provide only descriptive data and are not included in the summation scale for the core nursing care processes scale. Specific questions related to nursing care procedures associated with perinatal events, severe perinatal asphyxia, infections, and prematurity were incorporated into the study. In addition, specific questions were asked related to maternal to neonatal transmission of HIV. There are specific tasks that have been identified as necessary to prevent HIV transmission from mother to child including collection of information related to maternal HIV status, administration of antiretroviral prophylaxis to the pregnant mother during labor and delivery, early bathing of infant prior to injections, early administration of antiretroviral medications to the infant, and monitoring of newborn feeding practices. This information may add to the knowledge related to infection in the neonatal period but was not directly included in the core nursing care processes scale. See Table 2 for nursing care, processes scale details.

Table 2 Nursing Process Scale: Reliability and Item Description

	No. Items	α	Scores (M/ SD)
Nursing Care Processes Scale	7	0.671	0-7 (2.43/***)
	<i>% RNs providing essential care processes</i>		
1. Surveillance of newborns	65.0		
2. Teaching of parents	53.7		
3. Comforting and talking to parents	63.8		
4. Coordination of patient care	75.2		
5. Documentation	75.2		
6. Feeding a newborn	59.3		
7. Supervision of auxiliary staff or parents	64.2		

Measurement of Material Resources

Translating nursing knowledge into practice may only be possible if the necessary material resources are present and or functioning at the best possible level. The lack of basic material resources such as safe water, clean blankets, sterile devices for cutting the umbilical cord, and resuscitation bags, has serious implications on the delivery of adequate nursing care services and to provision of safe and effective neonatal care. Therefore, in this study examining the relationship between nursing work organizational factors and patient outcomes in developing countries availability of material resources will be considered.

Material resource availability will be operationally defined for this study using a tool commonly used to assess maternal child health resources in developing countries. The WHO Safe Motherhood Assessment Tool, specifically the facility administrator instrument, was utilized to assess the availability of basic equipment, human resources, drugs, supplies, and total number of births and newborn deaths. According to WHO, this tool is designed to provide researchers, managers, policy-makers, and other interested parties at the district level with the necessary tools to undertake a rapid survey. The purposes include:

- To describe the availability, use and quality of antenatal, delivery and postpartum care provided to women and newborn babies at all levels within the health care system
- To identify gaps in the provision of this care with particular emphasis placed on assessing the skills and training of health care providers and their capacity to provide the services for neonates

- To identify gaps in the availability of appropriate drugs, supplies, equipment, facilities and transport for emergent referrals.

In this study, the SWAT (WHO, 2001) form was completed by the hospital administrator. Consistent with the recommendations on the SWAT tool, the surveyor also directly examined the facility to assess availability of materials.

Data Analysis

Overview

As noted in Section 3.3, the hospital or organization is the unit of analysis. Data results will be aggregated and by hospital type, bed size, or geographical region. Data were analyzed using SPSS Version 17. Prior to data analysis, the data was cleaned and data files were constructed. Missing data was evaluated and multiple imputation techniques were used as needed. Exploratory analysis was used detect potential outliers and data collection errors. Standard descriptive statistics (mean, median, standard deviation, frequency, and distribution of responses) were used to describe all key variables and to determine how responses differ by facility characteristics. Nurse respondent data were aggregated at the organizational level data and therefore data were not treated as individual level data. Facility level measures of nurse staffing, practice environment, and care processes were constructed from the nurse survey data. During the data collection phase, each survey was coded to indicate the facility in which the nurse respondent practices. Therefore, once nursing structure and process measures were constructed, responses of nurses in each facility were aggregated and a mean facility level measure was obtained. Individual nurse responses were not used in the analysis and only the scores obtained aggregated at the facility level were used in the final regression

analysis. Facility level nursing structure and process variables will be analyzed using the standard descriptive methods noted above. An analytic file was constructed from facility level data derived from nurse surveys and patient level data derived from the in-person surveys with health facility administrators.

Finally, regression analyses were performed to analyze relationships between aggregate staffing, aggregate PES-NWI scale, aggregate Nursing Care Process Scale on in-patient neonatal mortality. The PES-NWI scale was examined as a total scale and several of the five subscales were examined. To answer the research questions hierarchical multiple linear regressions was performed since the outcome variables are interval level data (the number of care processes left undone and the proportion of neonatal deaths/newborn births per 1000 live births). Staffing was the first variable entered into all of the regression models due to its importance as noted in both the theoretical model and its strong empirical linkages noted in the research literature, followed by the aggregate score for the total PES-NWI scale. This study consisted of a small sample size of 27 healthcare facilities. According to Field (2009), a minimum sample size of 10-15 is needed for each predictor. Thus for this study, the regression analysis was limited to a simple regression with either one or two predictors.

Data Files

The data was collected initially in two separate data files. The first data set was consisted of the facility level data collected from the WHO Safe Motherhood Assessment form and included the following facility level variables: in-patient neonatal mortality rate, as well as other contextual variables including number of beds, number of health care workers per facility, facility type-primary, secondary or tertiary, urban vs. rural, and

total number of stillbirths. This data set also included including a list of observed material resources at the facility. The second data set was consisted of the nurse respondent data, which was collected from the nurse surveys and later aggregated to the facility level. The following variables for this analysis were in the nurse respondent data file: nurse staffing (patient/nurse ratios); the nurse practice environment scale (PES-NWI), the nursing care processes scale (NCP), as well as additional demographic variables for the nurses including- age, gender, years of experience, level of education and type of maternal child health unit employed. See both surveys, Appendices A and B.

Data Cleaning

The data was closely examined for obvious errors in documentation, missing values, outliers, and normality. There were 231 nurse participants in the study; however, eight cases were deleted upon closer evaluation of the data. Some participants were busy with patients, were unable to complete the entire survey, and were excluded and others were suspected to have presented flawed data and were excluded from the final analysis. One respondent circled the number one for every question on the survey; another nurse reported taking care of 5000 patients on her last day of work and was considered an outlier; and the other six cases had > 80percentage missing data on the survey. The final number of facilities was 27 and the number of nurses in the final data analysis was 223.

Missing Analyses and Statistical Assumptions

The univariate analysis was performed on the data prior to aggregation and development of the facility level file. The frequencies on the variables were done simultaneously and less than 10% missing responses were noted for each variable. The first outcome variable, in-patient neonatal mortality rate ($M=34.5/SD=24$) was normally

distributed (z-skewness= 2.75). The second outcome variable, nursing care processes scale had to be computed from seven items in the nurse data set and will be discussed later. The first independent variable nurse staffing was computed from one item in the nurse survey, “How many patients did you manage on your last day of work?” The individual nurse respondent data for staffing was coded to the facility and later aggregated to become a facility level nurse staffing measure. The aggregate nurse staffing, patient to RN ratio was normally distributed with z skewness= 1.5. The second independent variable was the nurse practice environment scale and once it was aggregated to the facility level, it was also normally distributed with a z-skewness 1.3. A detailed explanation of the scale development follows.

Nurse Practice Environment Scale Development

Two variables, the nurse practice environment scores, and nursing care processes required development of scales prior to their use. As noted in the literature review and methods section; the Practice Environment Scale of the Nurse Work Index (PES-NWI) has shown good internal consistency and construct validity in prior studies. However, this is the first study to use these scales in sub-Saharan African nurses; internal consistency for this sample was examined. The scales were developed using the following steps. First, the data was visually examined to look for inconsistencies that may have occurred in the data entry process. Univariate statistics (frequencies, means, medians, mode, skewness, kurtosis, and range) were done on all items in the scales to examine for missing data, note distributions, outliers, and eliminate variables with low reliability. The direction of the associated items was verified and the items consistently matched theoretical framework for the study and no reverse phrasing was noted. The

scales were composed by creating a summation variable for the nurse practice environment scale and the nursing care processes scale. Frequencies were done to look at distribution of new scale variable to ensure that it was coded correctly. Reliability analyses were done on the new scale and subscale variables and the alpha reliability could not be enhanced by deleting any items on the scale. Finally, correlations between the total scales and subscales and the outcome variables were done. See Table 3.

Table 3 Nurse Practice Environmental Scale and Subscales: Reliability

	No. Items	<i>a</i>	Scores (M/SD)
Total PES Scale	31	0.929	31-99 (59.3/16.9)
5 Subscales:			
Nurse Participation in Hospital Affairs	9	.0.822	9-33 (17.2)
Nurse Foundation for Quality of Care	10	0.793	10-33 (19.0)
Nurse Manager Ability, Leadership and Support	5	.0645	5-17 (8.7)
Staffing and Resource Adequacy	4	0.752	4-16 (9.1)
Collegial Nurse-Physician Relationships	3	0.735	3-12 (5.5)

Source: Data Source: Ogbolu Dissertation Data: Nurse Work Organization and Neonatal Mortality in Nigeria. Original PES NWI Scale as defined by Lake, 2002

The Total PES scale ($\alpha=0.929$) and all five subscales (range 0.645-0.822) had good reliability. The Total PES scale ($M=59.3/SD=16.9$) was normally distributed with z -skewness= 1.72. However, the Total PES scale had significant amount of data missing (29.7%). A missing variable analysis was done. Patterns of missing data were examined and no consistent pattern of missing was noted. The analysis of missing values for the PES revealed that 157 of 223 usable cases (70%) had responses for all 31 items. Of those cases with missing items, only one item was missing for each study participant. By item, the most commonly missing variable was noted with one of the most sensitive items, “Supervisors (nurse matrons) uses mistakes as learning opportunities, not criticism”, with 6 of 223 participants, (2.7%), failing to report a response for this item. It was noted that the data was not missing completely at random (Little's MCAR test: Chi-Square =

1175.757, DF = 1094, Sig. = .043). However, this was disregarded because of the extremely low rate of missingness by item, and missing values were imputed using the expectation maximization procedure. Thus, all participants were included in the PES analysis.

Expectation maximization (EM) was the appropriate method for imputing missing values for this variable. It is generally used for cases of randomly missing data that is normally distributed because it bases its inferences on the missing data on the likelihood of that distribution. The assumption of normal distribution is very strict with EM and in this study, the Total PES scale was normally distributed with a z-skewness of 1.72 and thus EM was an appropriate method for this variable. Inferences made with this type of imputation can be biased towards the assumption of normal distribution, which is generally evident in the Z skewness being taken closer to zero after imputation. However in this dataset, the mean (SD) were similar before and after imputation, (M=59.4 /SD=16.9) and M = (59.7 /SD=16.4), respectively. In addition, the skewness for the Total PES before and after imputation were similar, z skewness= 1.7 before imputation compared to z skewness = 2.1 post imputation.

Nursing Care Processes Scale Development

The second summation scale was the nursing care processes scale with seven items. In this sample, the nursing care processes scale was noted to have good reliability ($\alpha = 0.67$). The mean score was 2.4/ SD= 1.9 and the scale was not normally distributed and was mildly positively skewed (z-skewness= 5.3). The missing data on this scale was not significant (5.4%). This variable is an outcome variable and normal distribution was ideal for parametric tests. However, arithmetically transforming the variable was thought

to alter the interpretation significantly and it was thus deemed inappropriate for transformation. The nursing care processes scale was re-coded into 3 categories (0= very little missed care (nurses may have omitted 1 core nursing care process; 1= some missed care (nurses omitted 2-3 core nursing care processes); and 2= a lot of care missed (nurses omitted 4 or more of the 7 core nursing processes). In this sample, most nurses (42.9%) reported missing very little care, 32.4% missed some care, and 24.8% missed a lot of care. See Table 4

Table 4 Nursing Care Processes Scale Reliability

	No. Items	A	Scores (M)
Total Nursing Care Processes Scale	7	0.67	0-7 (2.43)
	<i>% RNs providing essential care processes</i>		
1. Surveillance of newborns	65.0		
2. Teaching of parents	53.7		
3. Comforting and talking to parents	63.8		
4. Coordination of patient care	75.2		
5. Documentation	75.2		
6. Feeding a newborn	59.3		
7. Supervision of auxiliary staff or parents	64.2		

Source: Data Source: Ogbolu Dissertation Data: Nurse Work Organization and Neonatal Mortality in Nigeria

CHAPTER IV:

THE RESULTS

Overview

This chapter presents the results of the data analysis using the methods described in Chapter 3. The first part of the chapter describes the sample and includes a section for the facilities as well as a section on the nurse data. The second part of the chapter presents descriptive statistics for neonatal mortality to the facility level. The third section presents descriptive statistics for the aggregated facility level data. The final part of the chapter presents the correlation and regression analyses used to analyze relationships between aggregate staffing, aggregate PES-NWI scale, aggregate Nursing Care Process Scale, and in-patient neonatal mortality and on nursing care processes. This chapter will conclude by providing the results for the following research questions:

- 2 What are the relationships between nurse staffing, characteristics of the nurse practice environment, and nursing care processes on in-patient neonatal mortality rates in various types of public health care facilities in Nigeria?
- 3 What are the relationships between nurse staffing and characteristics of the nurse practice environment on nursing care processes in various types of public health care facilities in Nigeria?

Facility Descriptive Data

Descriptive Statistics for the Sample – Facility Level

Although, the facility was described briefly in the sample section of this dissertation, the following analysis describes the individual facilities with a detailed description by facility type, a description of the availability of human resources, and the availability of material resources across facilities type.

The facility is the unit of analysis in this study and twenty-seven public healthcare facilities in Nigeria participated in the study. Most participating facilities were secondary hospitals (46.4%), followed by tertiary centers (35.7%), and primary health care facilities (17.9%) See Table 4. Most primary and secondary care facilities were in rural regions, 60% and 84.6%, respectively, and most tertiary facilities were in urban areas (80%).

Human resources, specifically the number of nurse and physicians, varied widely across facility types. Nurses were witnessed as they were performing medical consultations primarily because some primary and secondary healthcare facilities had either one or no physician in the entire hospital. Facilities with the largest number of nurses were the tertiary centers, (M=351/206), followed by secondary centers having nearly 10 times less nursing staff (M= 37/20); and primary centers (M= 13/13) having significantly less nurses than secondary or tertiary centers. The number of physicians was also positively skewed towards the tertiary centers. Primary centers had an average of five doctors per facility, while secondary had an average of seven doctors. This was grossly different from tertiary centers, which had an average of 135 doctors per facility. Many secondary and tertiary centers had similar number of beds and newborn births per year, yet tertiary centers had nearly 20 times as many doctors and 10 times the amount of

nurses, on average. In closing, there were gross disparities noted between tertiary centers and all other facility levels. See Table 5

Table 5 Description of Sample of Nigerian Health Facilities by Level of Care

	Primary Health	Secondary Care	Tertiary Care
	<i>Frequency %</i>		
Urban (%)	2(40)	2 (15.4)	8 (80)
Rural (%)	3 (60)	11 (84.6)	2 (20)
Total No. of Hospital Beds	9-25	22-250	150-740
No. of Neonatal Beds	0-6	0-15	10-60
	<i>Mean/SD (Min-Max)</i>		
No. Nurses/Facility	13/13 (3-36)	37/20 (17-85)	351/206 (132-698)
No. Physicians/Facility	4.6/8.6 (0-20)	7.3/8.7 (1-30)	135/108 (40-350)

N=27*

Neonatal Mortality Data by Urban and Rural and Facility Types

Because of differences in health care professionals by type of facility, and knowing that facilities are segregated by urban or rural status, it was necessary to examine the primary criterion (neonatal mortality) by the geographic area where care was delivered. An independent T-test was done to examine geographical differences in neonatal mortality rates. The assumption of homogeneity of variance was met, Levine = .077 and equal variances were assumed. The differences in neonatal mortality between urban (x per 1000 births), and rural (y per 1000 births) approached significance ($t=2$, df 26, $p= .056$).

When examining variations in neonatal mortality among various facility types, it is important to note that neonatal care, including births, stillbirths, and neonatal deaths, occur across all three tiers of the Nigerian healthcare system, including the primary health care setting. As noted in the earlier literature review, primary health care facilities refer babies to secondary hospitals and secondary facilities refer acutely ill newborns to tertiary centers. In this sample, neonatal mortality rates varied widely across facility

types. On average, neonatal mortality rates were lowest in primary health care centers (M= 0.4/0.8) and highest in tertiary centers (M= 43/26). See Table 6

Table 6 Description of Neonatal Deaths and Stillbirths by Facility Type

	Primary Health	Secondary Care	Tertiary Care
	<i>M/SD</i>		
	<i>(min-max)</i>		
No. of Births/Yr	190/216 (69-566)	769/675 (167-2214)	2165/1080 (1001-4332)
Stillbirths	4.2/7.3 (0-17)	54/96 (0-289)	152/176 (11-531)
Neonatal Deaths /Yr ^a	0.2/0.4 (0-1)	15/21 (1-83)	88/51 (14-151)
All Deaths per 1000 live births ^b	4.4/7.7 (0-18)	69/111 (8-328)	237/203 (34-659)
Neonatal Mortality Rate per 1000 live births ^c	0.4/0.8 (0-0.88)	22/14 (2-43.7)	43/26 (8.1-88.9)

a. Neonatal deaths per year include deaths in the hospital in the 1st 28 days of life

b. All deaths per year include both neonatal deaths and stillbirths

c. Neonatal mortality rate : the number of neonatal deaths/1000 hospital births

On average, neonatal mortality rates were lowest in primary health care centers and highest in tertiary centers. To statistically examine these differences, ANOVA and independent T tests were done to compare group differences in neonatal mortality rates by facility level, unit level, and urban rural region. Assumptions for each statistical test were assessed. The dependent variable, in-patient neonatal mortality rate was continuous and normally distributed. The independent variables, facility level, unit level and urban vs. rural regions were nominal with 2-4 categories. Assumption of normality was met with the dependent variable with all z-skewness scores <3.0. There was no missing data and hospital scores were independent. For the initial ANOVA comparing differences in neonatal mortality among various levels of care for the facilities, homogeneity of

variance was violated (Levine= $< .001$). In violation of homogeneity of variance, ANOVA is robust when sample sizes are equal (Field, 2009). However, in this analysis, the sample sizes were small and not equal. With unequal sample sizes in groups, ANOVA is not robust to violations of homogeneity of variance; therefore, the Brown-Forsythe statistic was interpreted for the F statistic. On average, in-patient neonatal mortality rates were highest for tertiary facilities, Mean=46.4 /22.9, 95% CI (42.3-50.4) followed by secondary facilities, Mean= 23.2/ 14.3, 95% CI (19.9-26.4), and lowest for primary health centers, Mean=0.31/0.7, 95% CI (-.05-.67). See Table 7 for summary of means. The ANOVA of neonatal mortality rates showed a significant difference in mortality among various levels of care, $F(13.5)$, $p < .001$. No a priori assumption of differences in neonatal mortality by facility level was made in the hypothesis for this study. Therefore, post hoc tests were done, to examine how groups differed. The Games-Howell procedure was used because sample sizes were small and unequal (Field, 2009). The differences in means between all facility types were significant, $p < .001$, in-patient NMR was significantly higher in tertiary centers when compared to secondary and primary centers; and secondary centers had significantly lower NMR than tertiary centers and significantly higher NMR than primary health centers when examining the post hoc analysis. See Table 7

Table 7 Analysis of Mean Neonatal Mortality Rates Among Facility Types

	Primary		Secondary		Tertiary		F
	Mean	SD	Mean	SD	Mean	SD	
NMR per 1000 live births	39.17	1.03	34.67	1.79	38.17	1.56	2.51

* p < .05 ; ** p < .01

Material Resources by Facility

As noted in earlier chapter, the availability of material resources was perceived as having a major impact on the nurse’s ability to deliver safe, high quality, patient care. Thus, the facility level data also included an assessment for essential newborn material resources, using the Safe Motherhood Assessment form. The items that were considered the bare essentials for neonatal care included; at least one newborn resuscitation bag, oxygen, one functioning isolette to provide treatment for hypothermia, a functioning ambulance, and telephone for emergency transport. These five items were included in a summation scale and used to examine material resources.

In this sample, material resources did vary widely across facility types with primary health care facilities having a significant lack of material resources to care for neonates (mean score= 1.8), compared to secondary (mean score = 2.4) and tertiary centers (mean score = 4.8). On average primary health care centers had 1-2 of the 5 essential items needed for neonatal care, while nearly all tertiary centers had nearly all five essential items. Most primary (80%) and secondary facilities (67%) did not have at least one functioning isolette. When examining the ability to provide services to infants in acute distress, many primary healthcare (40%) and secondary care facilities (33%), did not have a newborn resuscitation bag to provide emergency CPR to newborns. In addition, most primary (60%) and secondary facilities (50%) did not have a functioning ambulance to refer and transfer newborns from primary care to secondary care and from

secondary care to tertiary care. Even if newborns with acute respiratory distress successfully reached the highest tier of care, the tertiary center, only 40% of tertiary centers had functioning devices such as ventilators to assist with respiratory distress. Surprisingly, most facilities that participated in this study did not have a functioning landline telephone (51.9%) and professional health care workers used their personal funds and cell phones in order to organize care within facilities and to refer patients for care outside of the facility. Even if newborns with acute respiratory distress successfully reached the highest tier of care, the tertiary center, only 40% of tertiary centers had functioning devices such as ventilators to assist with respiratory distress. While most tertiary centers were fairly homogeneous in their availability of resources, variations in material resources were noted both among and within primary and secondary care settings. Several primary and secondary facilities were much better equipped with newborn supplies than their counterparts, primarily due to donations from local non-governmental organizations (NGOS), community, and corporate partners (i.e., MTN phone Card Company). A noteworthy example of the benefits of such affiliations is represented in the 100% presence of antiretrovirals for HIV exposed mothers and newborns at all twenty-seven of the facilities due to their affiliation with The Institute of Human Virology- Nigeria. See Table 8.

Table 8 Availability of Material Resources by Facilities Level

	Primary	Secondary	Tertiary
	<i>Mean/SD</i>		
Material Resource Scale	1.8/1.6	2.4/1.6	4.8/0.42
	<i>Frequency/ %</i>		
Materials Available			
Isolette	1 (20)	4 (33)	10 (100)
Newborn resuscitation Bag	3(60)	8 (67)	10(100)
Oxygen	2 (40)	7 (58)	10 (100)
Ambulance	2 (40)	6(50)	10(100)
Telephone, landline	1 (20)	4(33)	8 (80)
Ventilator	0	1 (8)	4 (40)
Phototherapy lights	0	5 (41)	10 (100)
Antiretrovirals for mothers and newborns	5 (100)	13 (100)	10(100)

N=27* *N varies due to missing data

An independent T test was done to statistically examine mean differences in material resources by facility type. Assumptions for each statistical test were assessed. The dependent variable, the material resource scale was continuous and normally distributed. Assumption of normality was met with the dependent variable with all z-skewness scores <3.0. There was one hospital with missing data and all hospital scores were independent. An independent T test was done and on average, tertiary centers (M= 4.2/ 1.3) had more resources than non-tertiary centers (M= 2.6/1.6). Levine's test for homogeneity of variance was 0.32 and equal variances were assumed. The differences in essential newborn material resources between tertiary and non-tertiary facilities was significant (T=-2.5, df 23, p = .019).

In summary, the facility level data revealed wide variations in human and material resources, as well as neonatal mortality for the healthcare institutions that participated in this study. Gross disparities were noted among facility types with tertiary centers having greater numbers of material and human resources and primary and secondary facilities

having significantly less resources. Importantly, there were very few differences between resources in the primary and secondary setting.

Individual Level Nurse Respondents- Descriptive Data

Descriptive Statistics- Individual Nurse Survey Results

Nurses are key informants in this study and provided data on nurse staffing; the nurse practice environment and nursing care processes. Registered nurse/midwives (N=223), who were employed at the 27 participating facilities at the time of the study, completed an anonymous, self-administered survey with basic demographic data and data on nurse staffing, the nurse practice environment, and nursing care processes. These nurses had a significant amount of nursing experience (M=16.5 years/SD 8.9), and were predominantly direct care nurses (72.4%), diploma prepared nurses (96.4%), who were employed in various maternal child health units within the healthcare facilities. While all nurses worked within MCH most nurses worked in labor and delivery (34%), followed by the special baby care unit (17%), antenatal care/prenatal care (14.3%) and pediatrics (14.2%). See Table 9.

Table 9 Individual Nurse Demographic Characteristics, N= 223*

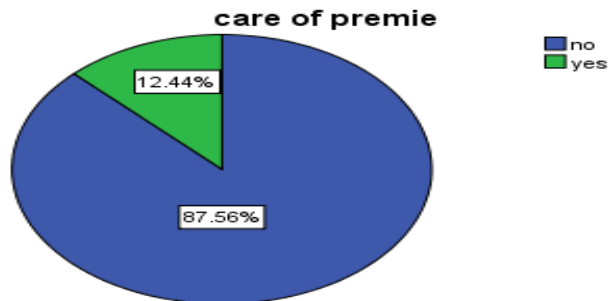
	<i>Mean/SD</i>	<i>Range</i>
Age (years)	40.7/8.8	22-68
RN experience (years)	16.5/8.9	<1- 44
	<i>Frequency</i>	<i>Percent of Nurses</i>
Registered Nurse/Midwives		
Staff nurse, direct care	160	72.4
Staff Nurse, direct & indirect	26	11.8
Nurse Matron	27	12.2
Nursing Education		
Diploma prepared	214	96.4
BSN	7	3.2
MCH Specialty (Assigned Unit)		
Maternity (L&D)	76	34.1
SCBU (Neonatal ICU)	39	17.5
Antenatal Clinic	32	14.3
Pediatric Unit	32	14.2
Rotating MCH Nurses	30	13.5
Postpartum	13	5.8

Note: *N varies due to missing data

As noted in the theoretical model for this study, there is a linkage between nurse education and patient outcomes, such as neonatal mortality. Most nurse participants in this study lack the educational training in neonatal care practices that would lead to improved newborn survival. As depicted in Figure 5, only 12 % of nurses who participated in the study had received prior training in care of the premature infant; only 22% of nurses had training in neonatal resuscitation while many, 43%, had received training in the prevention of maternal to child transmission of HIV. See Table 9 and Figure 5.

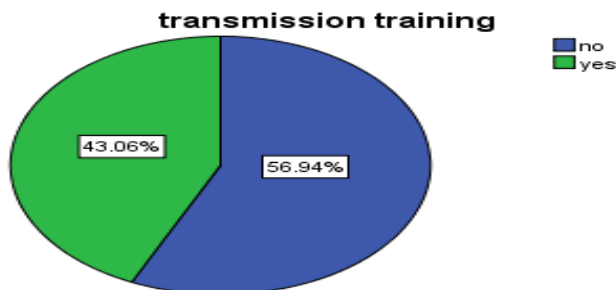
Figure 5 Percent of Nurses Trained in Neonatal Care over the last 2 years

Percentage of Nurses that have Received training in the Care of Premature Infants in the last 2 years



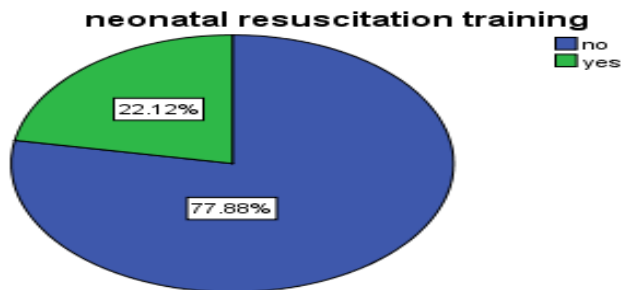
Data from Ogbolu Study: Nursing Work Organization and Neonatal Mortality in Nigeria (July,2010)

Training in the Prevention of Maternal to Child Transmission in the last 2 years



Data from Ogbolu Study: Nursing Work Organization and Neonatal Mortality in Nigeria (2010)

Percentage of Nurses that have received NRP training in the last 2 years



Data from Ogbolu Study: Nursing Work Organization and Neonatal Mortality in Nigeria (July 2010)

Nurse Staffing by MCH Specialty Unit

Patient/RN ratios varied widely by specialty unit and within the various unit types. Higher patient/nurse ratios were noted in outpatient settings, including the antenatal clinic and primary health care. While inpatient settings with acute care patients,

such as labor and delivery, pediatrics and the special care baby unit; had lower patient to RN ratios. See Table 10.

Table 10 Patient Nurse Ratios by MCH Specialty Unit

Specialty Units	Patient: Nurse Ratio	
	<i>Mean/(SD)</i>	<i>Min-Max</i>
ANC Units	30.0/(31.3)	1.82-150
Maternity (L& D Units)	7.1/(8.90)	0.67-55
SCBU (NICU)	4.7/(2.50)	1.14-13
Postpartum	6.5/ (2.3)	3-11
Primary Health Care	21.5/(13.9)	6-40
Pediatric Units	9.7/(10.9)	0.85-55

Nurse Practice Environment Scale by MCH Specialty Unit

There was very little variation in the total nurse practice environment scores among this sample of nurses with scores ranging from 55-62 by specialty unit. On average nurses working in postpartum care units (M= 57/15) rated their nurse practice environments less favorable than nurses working in other specialty units and nurses in the pediatric units rated their nurse practice environment more favorable (M= 63/ 16). See Table 11.

Table 11 Nurse Practice Environment Scores by MCH Specialty Unit

Specialty Units	Nurse Practice Environment (PES-NWI) Scale	
	<i>Mean/(SD)</i>	<i>Min-Max</i>
ANC Units	57.5 (17.4)	31-97
Maternity (L& D Units)	61.8 (16.0)	35-99
SCBU (NICU)	58.0 (16.3)	32-98
Postpartum	57.0 (15.0)	34-82
Primary Health Care	55.0 (15.4)	36-82
Pediatric Units	62.9 (16.0)	36-102

Nursing Care Processes Scale by MCH Specialty Unit

A summation scale, the nursing care processes scale, with 7 items was used to examine whether nurses omitted essential nursing care processes, such as feeding a newborn, documentation, supervision and coordination of care for auxiliary staff and parents, and comfort and educate parents. There were variations in the amount of omitted nursing care processes reported across specialty units. On average, nurses working in pediatric units had the highest amount of omitted key nursing care processes (M= 3.0/2.2); and nurses working in post-partum and primary health care settings missing the least number of nursing care processes. See Table 12

Table 12 Nursing Care Processes Scale Scores by MCH Specialty Unit

Specialty Units	Nurse Care Processes Scale	
	<i>Mean/(SD)</i>	<i>Min-Max</i>
ANC Units	2.5 (1.8)	0-7
Maternity (L& D Units)	2.5 (1.8)	0-7
SCBU (NICU)	2.1 (2.1)	0-7
Postpartum	1.7 (1.3)	0-3
Primary Health Care	1.6 (2.2)	0-7
Pediatric Units	3.0 (2.2)	0-7

Facility Level- Aggregated Nurse Measures

Overview

In the preceding section, individual nurse responses were described, however this section of the chapter illustrates the statistical results of the aggregated hospital level nurse measures for nurse staffing, the nurse practice environment scale, and nursing care processes scale. A key methodological approach used in examining nurse work organization and facility level patient outcomes is to aggregate the individual nurse level data into facility level measures for the final analysis. During the data collection, process

individual responses were coded to the facility and then aggregated to develop facility level measures for the data analysis. In the following analysis, one hospital was deleted because there was only one nurse response and aggregated data could not be provided. Thus, the final number of facilities in this analysis was 26. These facility level nursing structure and process variables are described in detail using the standard descriptive methods.

Facility Level Nurse Measures Descriptive Data

There were wide variations in-patient to nurse ratios, the nurse practice environment and nursing care processes omitted noted within individual healthcare institutions. The numbers of nurses per facility were 1-17 with tertiary centers having more nurses participate. Most facilities had at least three maternal child health nurses present on the day of the survey. This resulted in a sample size of 26 for the final analysis. See Table 13.

Table 13 Descriptive Statistics: Hospital level Aggregated Nurse Measures by Facility type, N=26

Hospital level variables	Tertiary	Non-Tertiary
	<i>M/SD</i>	
Staffing (Pt to RN ratio)	19.4/ 7.3	34.0/17
Staffing controlling for Unit type (Pt to RN ratio)	25.7/7.1	25.7/7.8
Nurse Practice Environment	3.1/.62	2.9/0.3
PES-NWI Total Score		
Nursing Care Process Scale	2.3/0.5	2.5/0.9
Essential Newborn Resource Scale	4.2/1.3	2.6/1.7
Neonatal Mortality Rates per 100 live births	43.9/24.9	17.7/15.6

Source: Data Source: Ogbolu Dissertation Data: Nurse Work Organization and Neonatal Mortality in Nigeria *only one nurse working at this site on day of visit, this facility was deleted from final analysis.

Aggregate Facility Level Nurse Staffing

Patient/RN ratios from individual nurse respondents were aggregated to the facility level. On average, higher patient/nurse ratios were noted in non-tertiary settings, (M= 34/17) than tertiary centers (M= 19/7), using the individual nurse respondent data. To statistically examine these differences, an independent T test was done. The Levene's test of homogeneity of variance was significant and equal variances were not assumed. The differences in staffing by facility type were significant at the individual level (T = 3, df 21.9, p = .007). See Table 13

The facility level aggregate staffing measures also demonstrated significant differences in staffing. On average, tertiary centers had better staffing, fewer patients per nurse, (M= 19.4/7.3), than non-tertiary facilities (34/17.1). An independent T test was done and the Levene's test was not significant, thus, equal variances were not assumed. The mean differences were significant at the facility level aggregated level, (T= 3.0, df =21.9, p = .007). These similar findings for the independent T tests suggest congruency between the individual and facility level aggregated scores. See Table 13.

According to Aiken, et al (2002), staffing may be systematically different across units, especially specialty units such as labor and delivery and antenatal care. Therefore, it has been suggested that the individual nurse respondent scores be aggregated to unit level to develop a mean score for the unit. These mean unit measures could then be used to compute the overall facility level staffing score, controlling for unit type. When this method was performed, the staffing ratios were no longer significantly different by facility type. Once the data was aggregated to the facility level, the variation in the staffing measure decreased significantly. The mean staffing for both tertiary centers and

non-tertiary centers averaged 25.7. Using this measure, controlling for unit, there were no significant differences between this staffing variable by facility type. This lack of correlation with the individual level data, suggested a threat to validity. When data is aggregated from the individual to the organizational level, both variance and covariance can be lost resulting in decrease reliability for the aggregated variable (Rousseau, 1985). When the staffing variable was aggregated from the individual level to the unit level and then to the organizational level, the relationships that were present at the individual level were lost, therefore, the variable was deemed unreliable and not used in subsequent analyses. Future analysis of the data, using advanced statistical procedures, such as GEE that can control for covariances may be examined in the future.

Aggregate Facility Level Nurse Practice Environment Scale

The PES-NWI scale, used to measure the nurse practice environment in this study, is a 31-item summation scale with a 4-point Likert scale and five subscales. The five subscale means were used to develop a mean total PES score for each facility. After computing the scale from the individual nurse level and adjusting for the number of items in the scale, the highest possible maximum score on the scale was four. The mean PES scores for this sample of healthcare facilities were 3.0/ .29 and ranged from 2.1 to 3.4 on a scale of 1-4, with one being a less favorable environment. Overall nurses rated the nurse practice environment fairly well and the overall variance in the nurse practice environment scores was very low, .083. There was no significant variation in the nurse practice environment scores by facility type with tertiary centers (3.1/.16) compared to nurse practice environments at non-tertiary centers (2.9/.34).

Aggregate Facility Level Nursing Care Processes

In this sample, the aggregate facility level nursing care processes scores had minimal variability. On average for the entire sample, nurses reporting missing fairly little care, $M= 2.5/ 0.81$. When examining by facility level, on average nurses in tertiary center omitted the least nursing care ($M=2.3/ 0.5$) compared to non-tertiary centers ($M= 2.5/0.9$). Nurses in tertiary care settings reported missing slightly less care, ($M= 2.3/ .5$). However, there was very little variation (variance = .65) in these means and these differences were not significant.

A more detailed examination of individual items within the scale did reveal interesting variations in the specific nursing care processes that were missed. Most nurses (75%) reported not omitting documentation of patient care and coordination of patient care. This was expected since documentation and coordination of care are clearly key nursing care processes. However, teaching parents about newborn care was omitted by 46% of nurses and feeding a newborn was omitted by 40% of nurses. These findings were questioned and it was noted that one item in the scale was not appropriate for nurses working in the antenatal care setting (14% of the total sample). Nurses working in antenatal care did not have opportunities to feed a newborn and therefore would have reported not feeding infants. In addition, Nigerian nurses working in the other MCH units often rely on parental or family involvement for feeding and are not directly involved in feeding a newborn. Therefore, the item related to feeding infants was deleted from the scale. In the NCP scale without feeding, the mean number of omitted nursing care processes was very low ($M= 1.7/SD 1.4$). For the subsequent analyses, using the

nursing care processes scale the variable without the feeding item removed was utilized.

See Tables 13 and 14.

Table 14 Percent of Omitted Nursing Care Processes

Nursing Care Process	<i>% of RNs Omitting</i>
1. Surveillance of newborns	35
2. Teaching of parents	46
3. Comforting and talking to parents	36
4. Coordination of patient care	25
5. Documentation	25
6. Feeding a newborn*	40
7. Supervision of auxiliary staff or parents	36

Note: *Item omitted in final analysis

Test of Study Hypotheses

Overview

The tests of study hypotheses are discussed in this final section of the results chapter. These correlation and regression models utilized aggregated facility level measures of nurse staffing, the nurse practice environment, and nursing care processes, to examine relationships with in-patient neonatal mortality rates. The hypotheses are grounded in the Aiken model and the statistical results will be discussed in reference to the hypothesis noted in the preceding literature review. In the first section, the first research question examining the impact of nurse work organization on nursing care processes will be addressed; and in the final section of the results chapter the second research question examining the impact of nurse work organization on neonatal mortality will be addressed.

The facility level aggregated nurse measures, the nurse practice environment, nurse-staffing, and nursing care processes, were all normally distributed, as evidenced in

the histograms, Q-Q plots, and the z-skewness of less than two for all variables. Thus, parametric tests were used for the bivariate analysis.

Research Question One

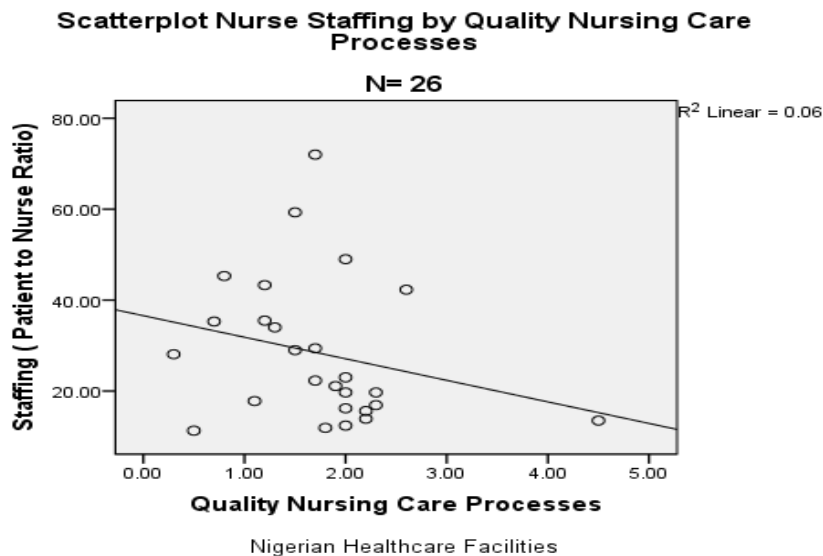
What are the relationships between nurse staffing and characteristics of the nurse practice environment on nursing care processes in various types of public health care facilities in Nigeria?

Nurse staffing and Nursing Care Processes

Hypothesis 1. Higher levels of nurse staffing are associated with better quality nursing care practices, specifically less omitted nursing care processes

In this sample of health care facilities, there was no significant relationship between staffing and nursing care processes ($r = .06$, $p = 0.78$) See Figure 6

Figure 6 Scatterplot of Nurse Staffing and Missing Nursing Care Process Scale by Hospital (N=26).



The Nurse Practice Environment and Nursing Care Processes

Hypothesis 2. Supportive nurse practice environments are associated with better quality nursing care processes. Specifically, higher nurse practice environment scores are associated with less omitted nursing care processes.

No significant relationships were noted between the nurse practice environment and omitted nursing care processes, $r = .27$, $p = 0.2$

See Figure 7.

Figure 7 Scatterplot of The Nurse Practice Environment and Missing Nursing Care Process Scale by Hospital



Research Question Two

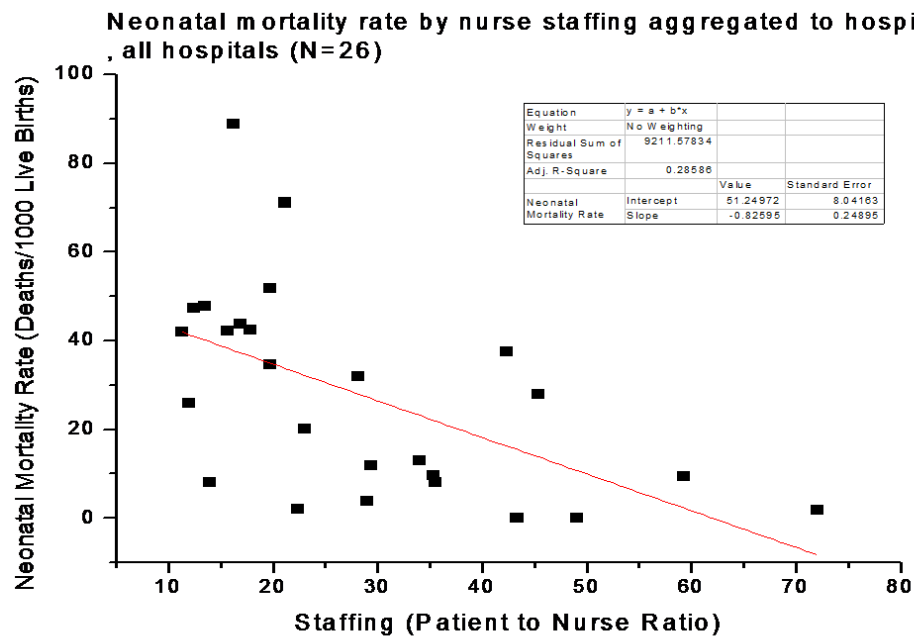
What are the relationships between nurse staffing, characteristics of the nurse practice environment, and nursing care processes on in-patient neonatal mortality rates in various types of public health care facilities in Nigeria?

Nurse staffing and Neonatal Mortality

Hypothesis 3. Higher levels of nurse staffing are associated with better patient outcomes, specifically lower in-patient neonatal mortality.

In this study, it was hypothesized that higher nurse staffing would result in better patient outcomes, specifically lower in-patient neonatal mortality. To examine the relationship between nurse staffing and neonatal mortality, a bivariate analysis was done using the aggregate facility level nurse-staffing variable and the facility level in-patient neonatal mortality variable. There was a significant relationship between nurse staffing and neonatal mortality, $r = -.56$, $p = .003$. As the number of patients per nurse decreased neonatal mortality rates increased. See Figure 8.

Figure 8 Scatterplot of Nurse Staffing and Neonatal Mortality by Facility



When nurse staffing was regressed on neonatal mortality, the simple linear regression model was significant ($F = 11.0$, $p = .003$) and explained 29% of the variance in neonatal mortality rates. Nurse Staffing was a significant negative predictor of neonatal mortality per 1000 live births in this model, ($\beta = -.561$, $p = .003$). As the number of patients decreased by one, neonatal mortality increased in this study. According to the model, for every one less patient the nurse managed, the neonatal mortality rate increased

by 0.8 deaths per live births. From a practical perspective, if a nurse is caring for 200 patients, a reduction in the number of patients may not necessarily lead to a reduction in neonatal mortality, but the increase rate was definitely unexpected. Given the extremely high number of patients per nurse seen in this sample of Nigerian hospitals and the high in-patient neonatal mortality rates, it seems logical that reducing the patient load by 1 (for example from 200 to 199 patients), would likely not be sufficient to make any significant difference in the neonatal mortality rate. However, this does not explain why mortality increased in the presence of better staffing. See Regression Model in Table 15

Table 15 Regression Model of Nursing Staff on NMR per 1000Live Births

Model	B	SE B	B	P
Constant	51.30	8.0		
Mean Patient to RN	-.83	.25	-.561	.003*

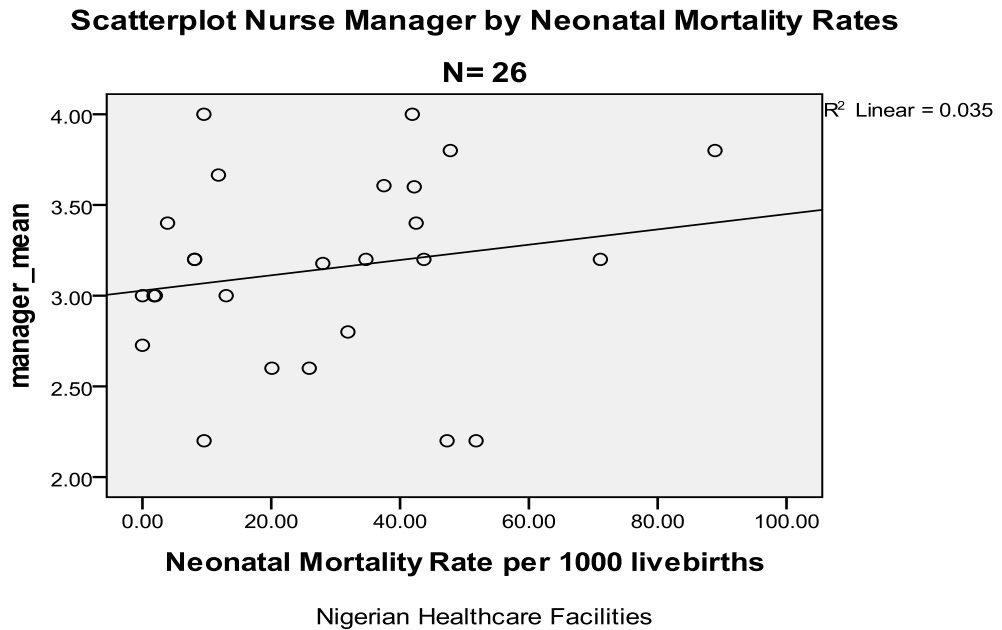
Note. Adjusted R² = .29; p-values: * < .01; Dependent variable: Neonatal mortality rate per 1000 live births, N=27

The Nurse Practice Environment and Neonatal Mortality

Hypothesis 4: A supportive nursing practice environment is associated with better patient outcomes, specifically lower in-patient neonatal mortality.

There was no significant relationship between the total nurse practice environment scale and neonatal mortality, $r = 0.14$, $p = .51$. Secondly, relationships between neonatal mortality and the other PES subscales were examined and the nurse manager subscales correlated with neonatal mortality rates, $r = 0.44$, $p = .025$. Thus, the hypothesis: a supportive nurse practice environments is associated with lower in-patient neonatal mortality was not supported by this study. As the nurse manager scale increased neonatal mortality increased in this sample. See Figure 9.

Figure 9 Scatterplot of Nurse Manager Subscale by Neonatal Mortality in Hospitals

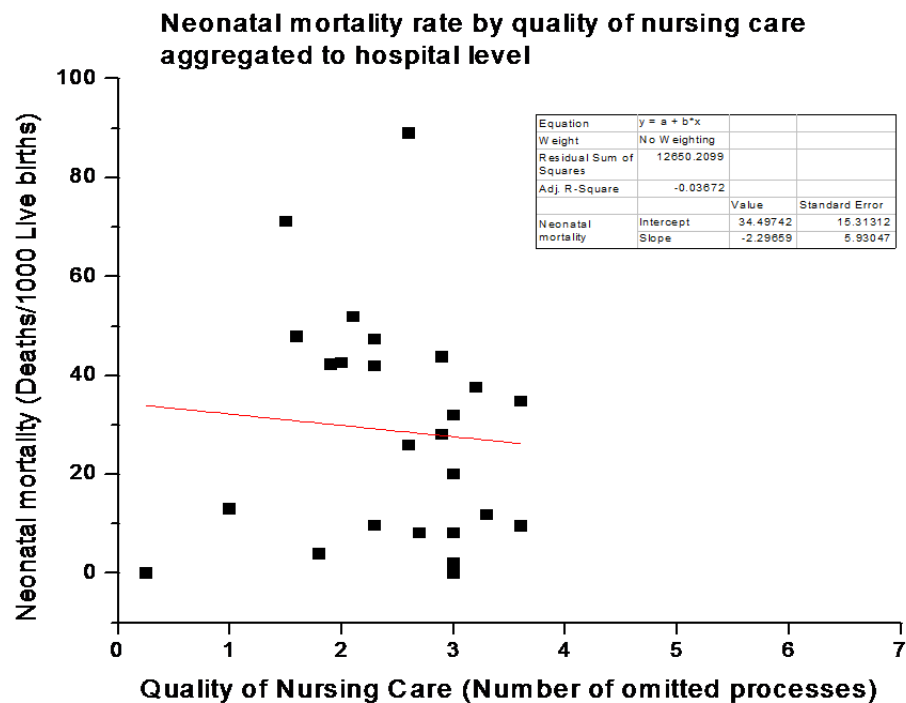


Nursing Care Processes and Neonatal Mortality

Hypothesis 5: Higher quality nursing care processes, less omitted nursing care, will be associated with lower neonatal mortality.

There was no significant relationship between the nursing care processes scale and neonatal mortality, $r = -.08$, $p = .7$. Thus, the hypothesis, which predicted a relationship between nursing care processes and neonatal mortality, was not supported. See Figure 10.

Figure 10 Scatterplot of Neonatal Mortality by Aggregated Nursing Care Processes



The Impact of Material Resources on Neonatal Mortality

Hypothesis 6. There is a relationship between availability of material resources and neonatal mortality.

There was no significant relationship between the material resource scale and neonatal mortality, $r = .303$, $p = .141$ and the hypothesis was not supported. However, there was a strong significant relationship between material resources and facility level (tertiary vs. non-tertiary) ($r = 0.467$, $p = .019$). There was a significant, positive relationship with tertiary facilities having a significantly higher level of material resources than non-tertiary facilities. When facility level was regressed on material resources, the model was significant ($F = 6.4$, $p = 0.19$). Facility level explained 21.8% of the variance in material

resources ($R^2 = 21.8$), with tertiary centers ($\beta = 0.47$, $p = 0.19$) having significantly more resources than non-tertiary (primary and secondary settings). See Table 16

Table 16 Regression Model of Facility Level on Material Resources for Newborns

Model	B	SE B	β	p
Constant	2.6	0.4		
Tertiary vs. non-tertiary	1.6	0.6	0.47	.019*

Note. $R^2 = .218$; * p-values: $< .05$; Dependent variable: Material Resource Scale, $N=26$

Additional Findings

The impact of facility type on neonatal mortality

The strongest predictor of neonatal mortality was facility type in this study of Nigerian healthcare facilities ($r = .56$, $p = .001$). A regression analysis was done to further understand the relationship between facility type and neonatal mortality. The variable, facility type was categorical and to be appropriate for the regression analysis the variable was dichotomized into tertiary vs. non-tertiary. Facility type was then regressed on neonatal mortality. The regression model was significant, and accounted for 28.7% of the variance in neonatal mortality ($F = 11.1$, $p = .003$). A subsequent model was done to examine staffing and facility type, the two strongest predictors into the model together. Since facility type was the strongest predictor, it was entered in to the model first, followed by staffing. The model was significant ($F = 8.7$, $p = .002$) and accounted for 38.2% of the variance in neonatal mortality rates. As depicted in Table 17, both staffing ($\beta = -.383$, $p = .04$) and facility type ($\beta = -.385$, $p = .04$) were equally strong predictors of neonatal mortality. As the number of patients per nurse increased, worse staffing, neonatal mortality decreased. This inverse relationship was not expected and the hypothesis that better staffing predicted better patient outcomes was not supported.

However, as expected, non-tertiary centers had lower neonatal mortality than tertiary centers. The neonatal mortality rate for non-tertiary centers was lower by 18 neonatal deaths per 1000 live births. Importantly, the relationship between staffing and mortality was diminished when facility type was controlled, $\beta = -.385$, compared to -0.56 prior to the addition of facility type. See Table 17

Table 17 Linear Regression models of facility level on NMR per 1000 live births, controlling for staffing

	B	SE B	B	p
Model 1				
Constant	17.7	4.9		.001
Tertiary vs. non-tertiary (1 vs. 0)	26.3	7.9	.56	.003
Model 2				
Constant	36.9	9.9		.000
Patient to RN ratio	-0.56	0.26	-.383	.041*
Tertiary vs. non-tertiary (0 vs. 1)	18.0	8.3	.385	.040*

Note: Model 1 $R^2 = 0.29$; Note: Model 2 $R^2 = 0.38$ * p-values < .05; Dependent variable: Neonatal mortality rate per 1000 live births, N=26

Final Regression Analysis Model on Neonatal Mortality

It was suspected that facility type was either a mediator or moderator of the relationship between staffing and neonatal mortality. A mediator or moderator is a third variable that changes the association between the independent variable (in this case staffing) and the outcome variable (neonatal mortality) (Baron & Kenny, 1986).

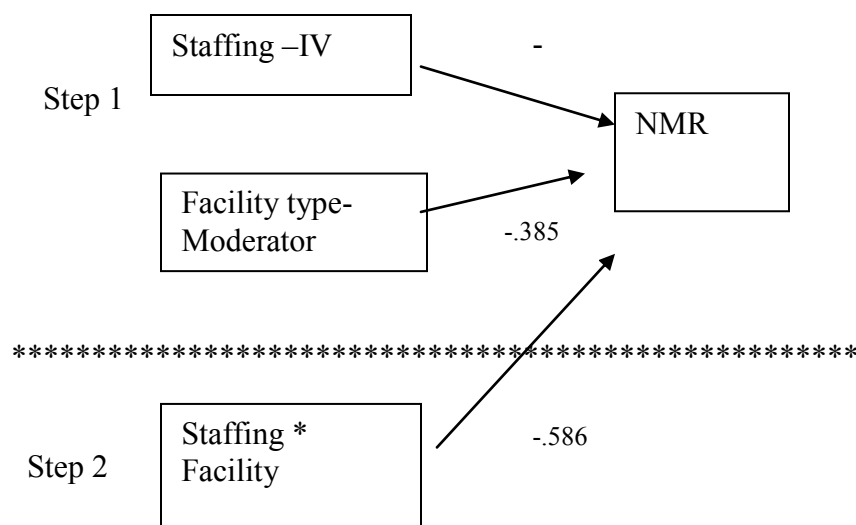
Consideration of mediators or moderators allow for more precise description of the relationships. A mediator is predicted by the independent variable and in the final regression models, there was no relationship between staffing and facility type. Thus, facility type was not a mediator of staffing. A moderator is a separate independent

variable that may or may not have an independent relationship with the outcome variable. Moderators may affect both the strength of the association and the direction of the association with the independent variable (Bennett, 2000). In this study, both, the independent variable- staffing and the moderator- facility level had independent relationships with the outcome variable, neonatal mortality. Thus, statistical analysis was done to examine moderator effects were examined using the approach defined by Bennett.

1. Staffing and facility type were entered in the regression model simultaneously in the first step
2. An interaction term (staffing * facility type) were entered in the regression model alone in the second step.
3. The dependent variable was neonatal mortality
4. In the final model, the predictors were entered in a separate block before the interaction term, following the correct procedures for testing moderator effects.

See Figure 11

Figure 11 Statistical Test for Moderator Effect



The interaction term in step 2, revealed that the joint relationship between staffing and facility type accounted for additional variance in neonatal mortality ($\beta = -.586$) beyond that explained by either staffing ($\beta = -.383$), $p = .04$ or facility type ($\beta = -.385$, $p = .04$), alone. Thus, facility type does moderate the relationship between staffing and neonatal mortality, and may be having an impact on the strength of the association between staffing and neonatal mortality. In this study, the moderation effects were noted, as neonatal mortality rates were higher in tertiary centers with more favorable staffing levels.

Summary of Results

In closing, this study of 26 Nigerian hospitals with 223 nurse participants, revealed extremely high patient to nurse ratios, a severe lack of neonatal material resources, and high neonatal mortality rates across the various levels of care. However, most of the theoretical and empirical relationships that have been consistently demonstrated in other nurse work organization studies using Aiken's model were either not significant or in a directionality not predicted by the Aiken model. Staffing, which was conceptualized as a number of patients per nurse did not predict lower neonatal mortality. In fact, the relationship was reversed. The Nurse Practice Environment and the Nursing Care Processes scales both lacked variability in this sample and no significant relationships were noted between the scales and neonatal mortality.

CHAPTER V: THE DISCUSSION

Overview

The current study contributes to science in several ways. First, this is the first study, to the researcher's knowledge, to utilize Aiken's Nurse Work Organization Model to address a critical global health issue in sub-Saharan Africa. This study helps to identify several modifiable nurse work organizational factors that may improve neonatal mortality in the participating healthcare facilities in Nigeria. Finally, this study focuses on the often neglected and overlooked, healthcare worker, the African nurse, and articulates the importance of elevating the capacity of nurses in sub-Saharan Africa in order to improve health care systems and address a critical global health issue, neonatal mortality.

According to the Lancet Neonatal Survival Steering Team (2005), if only community and outreach interventions for neonatal care are scaled up, without attention to clinical, in-hospital care, the final effect on reductions in neonatal mortality is predicted to be much lower (20–35% vs. 50%). Hence, it was recommended that the long-term focus should move towards improving quality and equity of skilled care within a stronger health system, including emergency obstetric and neonatal care. For this reason, this study focused on the most available healthcare worker in the sub-Saharan

African healthcare system, the African nurse. The overall aim was to identify the specific nursing related characteristics that could be modified to help to reduce neonatal mortality. Nurses in the hospital are key informants for healthcare organizations and are in an ideal position to lead the way towards improving newborn survival. In many settings in developing countries, like Nigeria, due to the severe shortage of physicians, nurses are already taking this leadership role.

This chapter summarizes the findings presented in the previous chapter using Aiken's theoretical model. Secondly, staffing and neonatal mortality are discussed in relation to the current state of the science in nursing work organization and neonatal mortality literature. Finally, the implications for theory development, nursing practice, policy, and future studies are also suggested while acknowledging the limitations of the study and its study methods.

Summary of Findings

This study of 26 Nigerian hospitals with 223 nurse participants, found dramatic extremes in patient to nurse ratios, a severe lack of neonatal material resources, and high neonatal mortality rates across all levels of neonatal care. However, most of the theoretical and empirical relationships that have been consistently demonstrated to be significant in other nurse work organization studies using Aiken's model were not found to be statistically significant in the present study. Staffing, which was conceptualized as a lower number of patients per nurse, did not predict lower neonatal mortality. The Nurse Practice Environment and the Nursing Care Processes scales both lacked variability in this sample and no significant relationships were noted between the scales and neonatal mortality.

Summary of Hypothesis Testing

Research Question 1

1. Hypothesis 1. Higher levels of nurse staffing are associated with better quality nursing care practices, specifically less omitted nursing care processes.
 1. *There was no significant relationship between staffing and nursing care processes and hypothesis was not supported.*
2. Hypothesis 2. Supportive nurse practice environments are associated with better quality nursing care processes. Specifically, higher nurse practice environment scores are associated with less omitted nursing care processes
 2. *No significant relationships were noted between the nurse practice environment and nursing care process scale. The hypothesis was not supported.*

Research Question 2

3. Hypothesis 3. Higher levels of nurse staffing are associated with better patient outcomes, specifically lower in-patient neonatal mortality.
 3. *Nurse staffing was a significant predictor of neonatal mortality. As the number of patients per nurse decreased, neonatal mortality rates increased and the hypothesis was not supported. Decreasing the number of patients per nurse was not associated with lower in-patient mortality. Thus, the hypothesis was not supported.*
4. Hypothesis 4: A supportive nursing practice environment is associated with better patient outcomes, specifically lower in-patient neonatal mortality.

4. *The hypothesized relationship between the total nurse practice environment scale and neonatal mortality was not supported.*
5. Hypothesis 5: Higher quality nursing care processes, less omitted nursing care, will be associated with lower neonatal mortality.
5. *There were no significant relationships between the nursing care processes scale and neonatal mortality and the hypothesis was not supported.*

Other Significant Findings:

5. Hypothesis 6. There is a relationship between availability of material resources and neonatal mortality.
 - *There was no significant relationship between material resources and neonatal mortality and the hypothesis was not supported.*
 - *There was a significant relationship between essential newborn material resources and facility type.*
6. Although the potential effect of variations in the health care center type was discussed a priori as a potential factor, no a priori hypothesis was established. Facility type is thought to be a moderator of staffing in this study. There were significant findings based on facility type in multiple sections of the analysis. The findings were as follows:
 - *On average, the availability of human resources, specifically the number of nurses, varied significantly by facility type (tertiary vs. non-tertiary) in this study.*
 - *There were significant relationships between the availability of essential material resources to care for newborns and facility type. The*

availability of key material resources varied significantly between tertiary and non-tertiary centers in this study.

- *There were significant differences in nurse staffing by facility with tertiary centers having less patients per nurse (better staffing) than non-tertiary facilities.*
- *In closing, facility type was the strongest predictor of neonatal mortality in this study and was a moderator in the relationship between staffing and neonatal mortality. Tertiary centers had higher mortality compared to all other facility types.*

Theoretical Implications of the Current Study

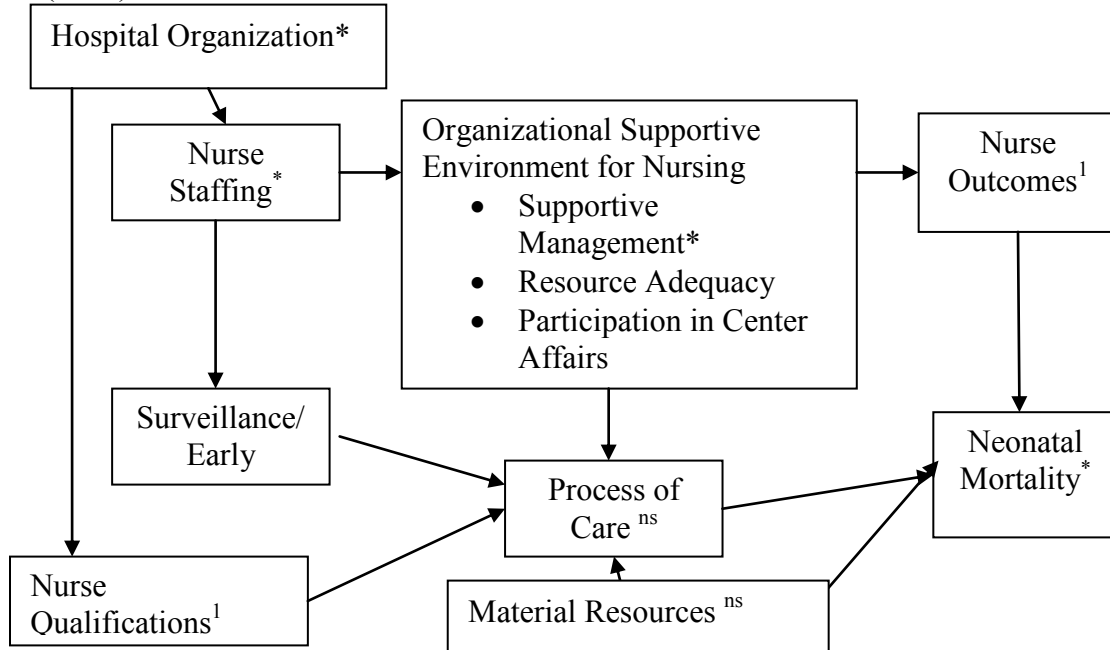
The Nurse Work Organization and Outcomes Model

Aiken's Nurse Organizational and Outcomes Model has been extensively studied in nursing research and both national and international studies support the use of this model for developing an understanding of the linkages between nursing and neonatal mortality this study. As depicted in the model below, some of the theoretical relationships were present in this study, while others were either not significant or could not be empirically examined. See Figure 12.

1. Hospital organization type is noted to be an important concept in the model and was the strongest significant predictor of neonatal mortality.
2. Nurse staffing as depicted in the model has been shown to be a significant predictor of adverse patient outcomes, such as neonatal mortality. While grossly elevated patient to nurse ratios were noted in this study, the hypothesis was not supported

3. The impact of nurse education on nursing care processes and patient outcomes as depicted in the model was not examined due to lack of variation in education in the sample. Most were diploma prepared nurses, 96%. Nurses were noted to have limited education in neonatal resuscitation (only 22% trained) and care of the premature infant (only 12% trained).
4. The Nurse Practice Environment was not a significant predictor of neonatal mortality, and limited variations in the measure were noted.
5. Nurse outcomes, were collected, but are not yet examined, as they were not the specific aim of this study.
6. Nursing Care processes, as conceptualized for this study was not found to be empirically related to neonatal mortality in this study.
7. Material resources was argued to be important when applying Aiken's model in developing countries, however it was not a significant predictor of neonatal mortality in this sample.

Figure 12 The Nursing Organization and Outcomes Model (Aiken, Clarke & Sloane, (2002)



Note: ¹ Relationships not examined; * significant findings noted; ns- findings not significant

Within this study, most of the proposed theoretical and empirical linkages between concepts in Aiken’s model of nurse work organization were not supported. The nurse practice environment scale, specifically as a total scale score, did not have a relationship with neonatal mortality. It is possible that most nurse practice environments were equally favorable or unfavorable, leading to limited variation in the scores among this group of hospitals. Secondly, the nursing care processes scale as conceptualized for this study was not found to be associated with the nurse work organizational factors. The research on nursing care processes is still relatively underdeveloped with very few studies to which to compare. The nature of the nursing care processes scale also requires that it be modified in order to be applicable in the specific population of patients. Prior to this study, the nursing care processes scale had not been studied in the context of neonatal care. It is

also possible that the study was threatened by construct validity. It is feasible that the nurses participating in this study either did not understand the questions or were reluctant to report missed care, and overall they reported missing very little care. Finally, there were no linkages between material resources and nursing care processes as was hypothesized. Again, this may be related to the conceptualization and measurement of the scale. Many of the essential tasks included in the scale, specifically documentation and supervision and coordination of nursing care, did not rely on specific material resources, thus associations between the two variables was limited. Additional qualitative investigations to investigate the meaning of this concept in a resource poor setting would be an important focus for future studies.

In closing, while the potential that the Aiken model would not be congruent with this sample of nurses was considered at the onset of this study, it was still surprising that many of the theoretical and empirically supported propositions of the model were not supported in this study. While Aiken's model has generally worked well in resource rich settings, it is possible that the model simply did not capture the nature of nursing in Nigeria. Another alternative explanation is that since the instruments used to operationalize the Aiken model have been largely standardized in developed countries they may not be valid measures of the conceptual elements of the model in lower income countries. Therefore, new instruments may need to be developed or the current ones refined in future research. Thus, this study neither repudiates nor validates the Aiken model in the Nigerian healthcare setting.

Alternatively, other theoretical models could be used to explain the unique work environment of these nurses. Other inter-disciplinary conceptual models, such as the

demand control model (Karesek et. al, 1981), have identified other work organizational variables such as job strain, produced by high demands and low control, and workplace social support and have been examined for relationships with patient and nurse outcomes, as noted in the empirical literatures (Orth-Gomer & Johnson, J.V, 1987, Johnson, .J.V & Hall, 1988, among others). In addition, there is a growing body of research that suggest these adverse events and poor patient outcomes may be related to other factors such as nurses working extensively long hours or being emotionally and physically exhausted, regardless of staffing (Rogers, et. al, 2004, Johnson, J.V. & Lipscomb, 2006, Geiger-Brown et al, 2007). These conceptual models could also be considered in future research in this population of Nigerian nurses.

In closing, several other important findings, not specific to the model, were noted in this study, and will be discussed in the subsequent sections including a detailed discussion of nursing staffing in Nigeria ; the important impact of facility type on nurse staffing, the lack of availability material resources, and the impact of all of these factors on neonatal mortality

Staffing and Neonatal Mortality in Nigeria

This study was performed in the Nigerian healthcare setting where very poor staffing levels are typical features of nursing work. The situation faced by most Nigerian and Sub-Saharan African nurses is not comparable to any of the previous studies that have utilized the Aiken model. Even in Aiken's international study, which included nurse participants from Canada, England, Scotland, and the United States, the number of patients to nurse by country, ranged from 6.3 – 11.9 patients per nurse (Aiken et al, 2002). Staffing in the current study was quite different with nurses caring for as many

200 patients per nurse and with thirty-one patients being the average number. The resulting wide variations in staffing and the very high number of patients per nurse, makes this sample markedly different from those studied previously. According to the regression, model in this study, for every one less patient, the neonatal mortality rate increased by 0.8 deaths per 1000 live births. Interpreting the meaning of this inverse relationship between staffing and neonatal mortality in this study is challenging and is not completely understood thus the results should be interpreted with extreme caution. The Aiken model has never been used in the presence of such poor staffing levels. Even without using the Aiken model, one would expect that in the presence of better staffing, patient outcomes would improve. In the presence of extremely poor staffing, accompanied by extremely high in-patient neonatal mortality rates, it seems reasonable that a reduction in the patient load by one (for example from 200 to 199 patients), would be insufficient to make any significant difference in the neonatal mortality rate. However, in this study mortality increased and this is simply difficult to understand. Most would agree that the very high patient to nurse ratios noted in this study are inadequate in order to provide quality care and require urgent attention.

The staffing measure was not adjusted for the impact of nursing unit variations and that affected the results. According to Aiken, staffing is systematically different by unit, therefore some measures should be taken to control for unit type. In this study, the inclusion criteria for nurse participants allowed for all maternal child health nurses working at the facility to participate, which resulted in 223 nurses mostly from labor and delivery, postpartum care, antenatal care, pediatrics and neonatal intensive care units. This resulted in a wide variety of nursing unit types and thus great variations in nurse

staffing levels. Nurses working in labor and delivery, pediatrics and special care baby units were those that were perceived to be more likely to have a direct impact on neonatal mortality. Nurses working in outpatient settings, the antenatal care setting and primary health care settings had higher staffing levels. It is important to note that while unit level staffing data was available in this study the neonatal mortality data was only available at the facility level. To control for the impact of unit level, a method described by Aiken et al (2002) was used to control for unit type. Using this method, the staffing variable was calculated after aggregating it to the unit level and no relationships were noted between staffing and neonatal mortality, suggesting that the earlier finding of increased mortality with increased staffing may be spurious. In this analysis, controlling for staffing by unit limited the relationship between staffing and neonatal mortality. This was also interpreted with caution because; the result was inconsistent with the individual level data. As noted in the earlier section, the unit based staffing variable loss a significant amount of variation with the aggregation process and was thought to be unreliable. Importantly, in this study, mortality data was not available at the unit level. It is still possible that unit level staffing confounded these results and future examinations of staffing, controlling for unit type, utilizing more advanced statistical procedures such as GEE and multilevel analysis, merits further attention, specifically for nurses working in Labor and Delivery, Pediatrics, and Special Baby Care Units, who may have the most impact on neonatal mortality rates.

In addition, acuity and intensity of patient care, which was not captured in this study, should be examined. It should be noted that the objective nature of the staffing measure used for this study, did not capture how busy nurses were in the unit. For

example, three stable patients in the antenatal clinic are clearly not equivalent to three acutely ill newborns in the special baby care unit or three women delivering simultaneously in the labor and delivery room. Thus, only measuring the number of patients per nurse does not capture these specific details and further investigation is needed.

The Impact of Healthcare System Variations

International studies have concluded that relationships between nurse staffing and the nurse practice environment and poor patient outcomes were congruent across countries (Aiken, et al, 2008), however these studies primarily focused on developed countries, including United States, Canada, England, Scotland, and Germany, with resource rich health care system and did not include any African healthcare systems. As noted in the introduction, nursing work organization, as conceptualized for this study, had the potential to be distorted by other special factors within sub-Saharan Africa, such as availability of equipment and other important resources, the variations in the healthcare system, and nurse education. Although the potential impact of the healthcare system and variations in the healthcare facility type was discussed in the introduction of this dissertation as a potential factor, no a priori hypothesis was established. However, based on the statistical findings in this study, facility type was found to moderate the relationship between staffing and neonatal mortality. The healthcare system in Nigeria is not homogenous or resource rich and has significant variations by facility type. The three tiers of the health care system operate through a network of primary, secondary, and tertiary level facilities. In the primary care settings, newborns are delivered, seek emergency interventions, and receive early routine follow-up care. However, once these

newborns become ill, they are referred to secondary or tertiary care. Thus, in this study it is important to note that newborns are born and die in all levels of care. Significant findings related to nurse staffing, material resources, and neonatal mortality were noted in multiple sections of the statistical analysis. On average, the availability of human resources, specifically the number of nurses, varied significantly by facility type (tertiary vs. non-tertiary) in this study. There were also significant differences in nurse staffing by facility type with tertiary centers having less patients per nurse (better staffing) than non-tertiary facilities

There were significant relationships between the availability of essential material resources to care for newborns and facility type. The availability of key material resources varied significantly between tertiary and non-tertiary centers in this study.

Facility Type and Neonatal Mortality

Importantly, facility type was the strongest predictor of neonatal mortality in the study and accounted for nearly 60% of the variance in neonatal mortality in this sample. Facility type was a moderator for staffing, which was evident from the descriptive and bivariate analysis. On average neonatal mortality was highest in tertiary centers and the differences between tertiary and other facility types was significant. In addition to having the highest mortality rates, tertiary centers also had better staffing. Thus, the facilities with the better staffing also had the highest mortality rates. Globally, tertiary centers are well known to traditionally have the most severely ill neonates and the highest neonatal mortality rates, especially in a hierarchical healthcare system. Within the Nigerian healthcare system, this issue was exaggerated because the hierarchy of referral for severely ill infants does not seem to have adequate material and human resources needed

for a smooth transition from lower levels of care (PHC) to higher level of care (tertiary centers). Furthermore, many neonates that were born at primary and secondary facilities may have been transferred to the participating tertiary centers where they later died. The outcome variable for this study, in-patient neonatal mortality was collected as a facility level variable. Although, a question in the hospital administrator survey, requested data on outborn vs. inborn for infants that died; 25 of the 27 participating hospitals reported not collecting that data. Due to the lack of data availability denoting the place of birth for newborns, those that died may have received treatments and care either inside or outside of the hospital. The differences between infants that died due to care at the tertiary center versus the death due to care received at other levels of care could not be fully distinguished. It is well documented that in-patient neonatal mortality rates are higher in tertiary centers, thus utilizing risk adjustment procedures to eliminate other factors that contribute to mortality, such as facility of birth. However, due to limited data availability, it was impossible to risk adjust mortality rates for this sample of healthcare institutions. Future prospective studies on neonatal mortality need to consider concurrent collection of data on other neonatal factors that may contribute to mortality, as the collection of this data was not standard in the participating healthcare facilities. In closing, many of the findings discussed above have implications for nursing practice, policy, and future research, which will be discussed in detail in the final section of the dissertation.

Nursing Implications

While nursing work organizational factors have been studied in many resource rich, countries all over the world, very little attention has been given to the specific

contributions of Sub-Saharan African nurses/midwives to improving maternal child health outcomes. The roles of nurses in this Nigeria and the contexts under which they work are different, and research findings from earlier studies of nursing work organizational factors done in other countries are not completely generalizable to this region. This study provides specific details related to the impact of nursing on neonatal mortality within the participating facilities in Nigeria. From this study, suggestions for improvement of the modifiable organization factors will be developed for each hospital. While staffing did not predict neonatal mortality in this study, many would concur that the poor staffing levels need to be improved. In addition, nurses self-reported very low opportunities to participate in continuing education programs that could improve the lives of newborns. If staffing and education of nurses can be modified, these interventions may have the ability to improve neonatal outcomes in the participating facilities.

In addition, nurses in the field were physically observed performing a wide variety of roles, including non-nursing and physician roles. This issue of task shifting, nurses taking on the responsibility of physicians, is a well-known phenomenon in nursing in developing countries. Nurses in developing countries are increasingly expected and sometimes forced to perform duties not initially designed for nurses, since they may be the only professional healthcare provider present in the facility due to severe physician shortages. Due to the abundance of tasks and responsibilities for the nursing staff, creative and immediate interventions are needed to assist nurses by freeing their time to provide quality care to their patients. Certain non-nursing tasks, such as answering the phone and cleaning patient rooms and equipment could be handed down to nursing support staff, so that nurses can focus their attention on the immediate needs of their

patients. The use of nursing support staff, such as nursing assistants and health extension workers was noted to be sparse in this sample, especially in tertiary and secondary settings, within the maternal child health units in these government owned facilities. Other ways to assist in allowing nurses to focus on nursing care is to improve the number of healthcare workers to provide essential newborn care including the utilization of multi-disciplinary teams involving other skilled professionals. Social workers, respiratory therapists, nutritionists, and others certainly can take on some of the duties currently ascribed to nursing. The use of a multi-disciplinary team may not only increase the quality of care received by newborns, but will also alleviate the burden of responsibility from the nurse and allow her to focus more directly on providing quality care to newborns and their families. Allowing nurses to have adequate time to care for neonates is important because unlike adults, these sick babies are completely vulnerable and totally dependent on the nurse for their care. Therefore, when nurses are pulled away from caring for these babies it has serious consequences for other neonatal outcomes, such as mortality. In order to improve neonatal survival, babies, especially the tiny premature newborns in the special baby care nursery need nurses to provide constant surveillance and monitoring for early signs of adverse events (Lake & Patrick, 2008).

Nurse education and training in neonatal care is another important nursing implication in this study. While premature birth and birth complications have been noted to be leading causes of neonatal mortality, most nurses in this study had not received sufficient training in these methods. Only 22% of nurses in the study had received training in neonatal resuscitation (emergency CPR for infants) and only 12% had received training in care of the premature infant during the last 2 years. The lack of

adequate education in procedures that are known to decrease neonatal deaths is concerning. This confirms the findings of Ogunlesi et al, (2008), who noted that on 14% of nurses working secondary hospitals in Nigeria, had received training in neonatal resuscitation. He argued that in order to improve neonatal outcomes in Nigeria the lack of nurse education and training in basic neonatal care needed to be addressed. In closing, maternal child health, nurse educational trainings are urgently needed to help prepare them for both emergency resuscitation and care for the premature infant.

Policy Implications

The most important policy change to be taken from this study is the need to develop an integrated referral system for newborns within the Nigerian healthcare system. In this study, facility type was the most important predictor of neonatal deaths, which suggests that links from primary to secondary to tertiary centers need to be better understood in order to improve newborn outcomes. According to the Nigerian Health Data System, geographical location is a major factor in newborn survival. Newborns all over Nigeria are born without equal chances of survival with infants in rural and the Northern part of the country at the most risk for death. There was a scarcity of resources noted in primary and secondary care setting to provide care to newborns. Most of these facilities did not have functioning isolettes, emergency resuscitation bags, and functioning ambulances. Based on the results of this study, there is evidence that newborns that become ill in primary and secondary settings may be born in environments that do not have the adequate human or material resources they need to survive. In addition, they may not have the ability to be transferred to a center that could provide those services. Repeatedly, primary health centers and secondary hospitals in this study

reported not having a functioning ambulance to transport infants to tertiary centers who did have adequate resources. In addition, tertiary centers did not have a system of travelling to the primary and secondary centers to retrieve the ill infants who had the misfortune of being born in a center without adequate resources. According to Tlebere, et al. (2007), in order for developing countries to meet the Millennium Developmental Goals for reducing infant and neonatal mortality, free, 24 hour emergency transport of both mothers and newborns must be available that would link patients to facilities with adequate material and human resources. It is possible that newborns are unable to survive as they transition through the gaps between the primary, secondary, and tertiary facilities in this sample of Nigerian healthcare facilities. Institution of a referral transport system for newborns has been documented to be the single most effective measure in reducing neonatal mortality in developed countries.

The second policy concern from this study is related to nurse migration and the overall decreased number of professional health care workers in Nigeria. While this issue has been addressed by policy makers in Nigeria, nurse capacity clearly needs to be improved and policy shifts can certainly play an important role. To address sub-optimal nurse staffing, nursing organizations including the Nursing and Midwifery Council and other Nurse Advocacy groups can use this data to support the need to increase hiring of nurses within Nigeria. While, not as immediate as the recommendations noted above, other countries, such as the UK, have instituted policy changes which have resulted in optimal nurse staffing ratios being implemented in neonatal intensive care units in an effort to improve neonatal mortality (British Association of Perinatal Medicine, 2009).

Limitations

Overview

This is a cross-sectional, global health study that was limited to government owned hospitals. Cross-sectional studies represent only one point in time and cannot be used to establish cause and effect relationships. The study was limited to maternal child health nurses in Nigeria. The work environment of nurses that has been described in this study is distinctly different from that studied in previous research within higher resource countries. The results are likely to be only generalizable to other regions of the world with similar shortages in material and human resources. While cross-sectional studies are useful in global health studies when the disease process is often occurring over short periods, they nevertheless have some limitations. However, the descriptive and correlation data may help to describe the nature of nursing work organization, nursing care processes, and neonatal mortality in the participating facilities. This study also only focused on one patient outcome, in-patient neonatal mortality, which may have proven to be too simple a measure to examine the quality of nursing. As noted earlier, the causes of neonatal mortality are multi-factorial. The addition of other neonatal outcome variables should be considered for future research studies in this setting. In addition, it cannot be assumed that patient outcomes are a direct result of nursing care provided. While within the Nigerian healthcare system, nurses are key informants, other team members-physicians, auxiliary support and administrative staff, contribute significantly to the patients care. Isolating the independent contribution of nursing care to patient outcomes, from other members of the health care team, is a difficult task. In this study, the staffing

and mortality measures offered some challenges, which will be discussed in the following sections.

Staffing Measure

Methodological challenges were noted with the nurse staffing measures. The measure used in this study was taken from the nurse survey and asked nurses how many patients did they manage on their last day of work? This measure has been used in multiple research studies using the Aiken model. Similar to most nurse work organization studies, the nurse patient ratio (NPR) was aggregated for each participating facility and used as a continuous variable. The NPRs in Nigeria were quite different with nurses caring for as many as 200 patients per nurse and although the variable has been very sensitive with a lower number of patients, it seems to have lost sensitivity in this sample of nurses. While other studies have used cutoff points of high vs. low staffing in the past, there were no clear criteria, which would allow one to conclude and decide on an appropriate cutoff point for this population; thus, this cutoff method was not used. Finally, the nurse patient ratio measure in this study only represented day shift nurses and fluctuations in staffing and the tradition of decreased staffing on nights and evening is not reflected in this study and may help to account for the fact that the NPR was not correlated with nursing care processes.

Mortality Measure

Facility level in-hospital mortality measures were initially the principal units through which patient outcomes were viewed in nurse work organization studies. For many purposes, cross sectional designs have been used for the initial description of nurse work organization. This is also true for this first study of nurse work organization using

the Aiken model in Nigeria. For these initial descriptive purposes, facility level mortality data does have utility. However, it is possible that in this study that facility level data overlooks the diversity of conditions facing primary and tertiary centers, labor and delivery nurses and antenatal care nurses, and urban and rural settings. Ideally, facility level neonatal mortality data should be supplemented by indicators that control for the variations across and within health care systems and should be addressed in future prospective research studies.

Although, newborn indicators such as Apgar score, gestational age, birth weight and whether an infant was born in or outside of the hospital, are important variables to be included in a risk adjustment of neonatal mortality, the data was not normally collected by the participating facilities and was unavailable. Healthcare facilities in Nigeria should be encouraged to enlarge their current data collection procedures to increase the quality of data retrieved. Improvements in data collection could lead to a better understanding of the factors that contribute to in-hospital neonatal mortality. Healthcare facilities in Nigeria should be encouraged to enlarge their data collection on neonatal deaths to include measures that would allow one to risk adjust mortality rates retrieved from their facilities. Despite the disadvantages of using in-hospital neonatal mortality rates, it is important to consider the advantages. The data was readily available and documented in a running logbook prior to data collection and the in-hospital data was also a better indicator of the nurse's work in the hospital than the general population NMR which also takes into account community births.

Limitations

The major limitation of this study relates to the multi-factorial nature of the outcome variable, neonatal mortality. There are many socially determined and systemic health system factors that likely made a contribution to the outcome variable and while many of them were considered a priori not all could be controlled for in this study.

According to WHO (2010), neonatal deaths and stillbirths stem from multiple factors including poor maternal health, inadequate care during pregnancy, inappropriate management of complications during pregnancy and delivery, poor hygiene during delivery and the first critical hours after birth, and lack of newborn care. In addition, several other socially determined factors such as women's education and status in society, their nutritional status at the time of conception, as well as, harmful practices, such as inadequate cord care, letting the baby stay wet and cold, discarding colostrum and feeding other food, are deeply rooted in the cultural fabric of societies and interact in ways that are not always clearly understood. These socially determined factors are external factors that serve as unexamined and that may have modified the relationships observed in this study.

In addition to these socially determined factors that may have affected neonatal mortality, several important healthcare system related factors affected the results of this study. In 2002, The World Health Organization (WHO) ranked the performance of health systems, taking into account both health status indicators and specific systems indicators such as financing and responsiveness. Of 191 countries in the WHO World survey, most countries in Sub-Saharan Africa ranked in the bottom 50%, with Nigeria ranking 187/191. The low ranking of most Sub-Saharan countries is due in part to the

significant differences between resource rich and resource-limited countries. Countries with limited financial resources generally allocate less of their finances to healthcare, resulting in fewer funds to pay healthcare workers, improve infrastructure, and purchase supplies. Consideration of the health system factors is important in this study of public hospitals that are known to rely heavily on the government for financing. The challenges facing health systems in Sub-Saharan Africa are well documented and are not limited to financial issues, which result in debilitated healthcare facilities and lack of drugs and supplies. Additional factors such as poor regulations and quality standards, doctor and nurse migration, invisible workers, the brain drain, poor public accountability, and corruption all play a significant role (Buchan & Sochalski, 2004; Chen et al, 2004; Cohen, 2006, Ogbolu, 2007). Poor regulation and quality standards, significant losses of health care workforce to migration, and lack of material resources all contribute to unhealthy healthcare systems and negatively impact the work of nurses and patient outcomes, especially vulnerable newborns.

In addition, trends in healthcare facility ownership, which has been rapidly changing over the last decade and is important in this study. Ownership of hospitals is decentralized in Nigeria with each tier of government owning and operating hospitals within its area of jurisdiction. Within the sample, there was participation from all three tiers of the healthcare system. Local governments own and are primarily responsible for the administration of primary health care facilities; while state governments are accountable for secondary facilities; and the federal government supervises tertiary centers. In this study, variations in material and human resources were noted and tertiary centers were shown to have better resources. Tertiary centers, which are federally

owned, had nearly three times the number of nursing staff compared to all other facilities, although some secondary facilities had the same number of beds. In addition, all tertiary sites were well prepared with all of the essential material resources needed for emergency newborn care, while many primary and secondary centers lacked the basic equipment needed to give emergency care. This is important because due to a renewed emphasis on primary health care (PHC), local government ownership of healthcare facilities has increased dramatically and state and federal government ownership has sharply declined over the last decade. In 2000, there were 10,149 primary health care institutions, 937 state owned institutions and only 51 federal government owned health institutions (Amaghionyeodiwe, 2008). From the evidence presented in this study, these trends, and shifts in ownership may be key factors in the variations noted in infrastructure, drug availability, and the availability of healthcare providers and services, which has been noted within the current healthcare system. The low quality and inadequacy of health services provided in Nigerian public facilities been noted in other studies as the cause of increased use of the sector for consumers of health care in Nigeria (Ogunbekun, Ogunbekun & Orobato 1999). In 1999, it was noted that the use of private health care facilities have increased tremendously over the last decade with over >11, 000 private institutions present at that time (Ogunbekun, Ogunbekun & Orobato 1999)

Quality assurance for these healthcare facilities is done by the Federal Ministry of Health Nigeria (MOH) in each tier of the government. According to the MOH, it is responsible for supervising the associated facilities including processing appointments of Chief Medical Directors and Medical Directors, supervising oral health research, developing policies on nursing, coordinating training programs for nurses and monitoring

the midwifery service scheme in collaboration with National Primary Health Care Development Agency (NPHCDA) (National Population Commission Federal Republic of Nigeria, 2008). There was no specific information available concerning how or whether the number of patients per nurse and the assurance of adequate material resources in facilities were controlled.

This lack of human and material resources within the facilities ultimately affected the associations between nurse work organization and neonatal mortality in the current study. These socially determined and health system factors were so powerful that they were likely to have interfered with the ability to detect any meaningful associations between nurse work organization factors and neonatal mortality. The theoretical propositions in Aiken Nurse Work Organization and Outcomes model were not significant in this study of Nigerian healthcare facilities. This is likely because it has traditionally been used in resource rich healthcare systems, which is quite different from the limited resources in Nigeria. This model primarily used in the US healthcare system cannot be fairly compared to using the model in public hospitals within the Nigerian healthcare system. Therefore, this study neither repudiates nor validates the use of the Aiken model in developing countries.

Key differences in health system factors related to nursing and quality assurance mechanisms may add additional insight in the understanding of the study outcomes. First, the total number of nurses in the United States is 2.6 million. This is nearly ten times the amount of nurses in Nigeria (Human Resources for Health, 2008). The quality assurance (QA) which is obtained through agencies such as the Joint Commission on the Accreditation of Hospitals and the American Hospital Association- which surveys and

ranks hospitals annually; have no counterparts providing the same QA for Nigerian hospitals. For neonatal care, specifically, in the US, agencies such as American Academy of Pediatrics (AAP) (1997) and the National Association of Neonatal Nurses (NANN), (2008) have developed position statements, which place limitations on the number of patients per nurse. Both the AAP and NANN organizations have recommend patient to nurse ratios of 2-3 neonates per nurse in US hospitals. These position statements are grounded in a concern for patient safety and are generally enforced by most American hospitals. According to NANN, during periods of decreased patient census or reduced patient acuity (4-6 patients total), an absolute minimum of two registered nurses are required to respond adequately to resuscitative emergencies; to assess emergent metabolic states such as hypoglycemia; and to manage cardiorespiratory emergencies such as mechanical ventilation or the decompression of a pneumothorax. NANN further states, "No age group is more susceptible to asphyxia or is as frequently in need of resuscitation than the neonate". Resuscitation occurrences are not confined to the delivery process. They can and do occur at any time during hospitalization. These events mandate the immediate availability of qualified personnel and equipment. These quality assurance methods that ensure both appropriate material and human resources be available to help nurses provide a high quality of care is simply not present in these Nigerian hospitals. Thus in the presence of a resource limited healthcare system, better nurse staffing study did not predict lower mortality. Thus, this study confirms that improving nurse staffing without consideration of the contextual, systemic factors, is not enough to decrease neonatal mortality in these sample of hospitals.

In closing, the following three cases further illustrate the negative impact of the health system related contextual variables on neonatal mortality in the participating public healthcare facilities. A detailed description will be provided of three of the facilities that participated in this study; including one of each primary, secondary, and tertiary health facilities.

Case 1- Hospital A: Primary Health Setting

- Rural, Small, Primary Health Center, Managed by a Community Health Officer who manages the facility and also prescribes medications to patients
- Community primarily comprised of Hausa population and most deliveries occur at home
- Severe lack of human resources! *“Nurses do not come to work regularly and patients feel discouraged and do not come to the center to deliver. All of the nurses live very far away”* per Community Health Extension Worker (CHEW) who was the only person available at the center with patients on my arrival.
- 3 nurses were scheduled to come to work on the day of my visit, I waited for 2 hours for them, however only one nurse came in....and was the only one to complete the survey for this site. The CHEW reports that the nursing staff regularly does no report for duty as assigned.
- There was a severe lack of necessary material resources. There was no newborn resuscitation/ ambu bag in the facility to help with acute emergencies in newborns. Facility had no telephone or intercom system and health care providers use personal cell phones to communicate with patients and each other.

- Many other resources were available and the center was clean and physically well organized. Many medications were available including antiretrovirals for mothers and infants; a Solar powered refrigerator was used to store medications, specifically immunizations, and an impressive parent educational resource from USAID “Guide to making life better in our community” was available for all parents to have a personal copy. This was the only facility in the study with written educational guides that were given to parents on the care of newborns!
- The organizational structure, in terms of leadership, seemed to affect the function of the center. The CHO had the authority to manage the center, but not to supervise the nursing staff.

Case 2- Hospital B: Secondary Care Setting

- Rural, small secondary facility
- nurses present/ 6 nurses participated; 1 CMD- (quotes below from CMD)
- The nurse that did not participate was very busy with baby with a seizure. She was providing medical care beyond normal nursing duties and was unable to complete the survey
- This hospital was located in a state that supplied free healthcare for pregnant women, including up to 6 months postpartum and all children less than 5 years old
- Very poor material resources- No drugs available on site- parents have to go and purchase them from “town”
- CMD seemed very discouraged and was laughing sarcastically, as I asked him about the supplies and equipment. The ambulance >20 years old with no devices- and is “an old empty pickup car” per CMD; no ambu bag- “If a baby is asphyxiated, little or

nothing to do, no ambu bag....nothing to help.” “All transport done by the family, the hospital does not arrange and poverty and distance has a major impact on how long it takes a baby to arrive at a referral facility for care.”

- No blood available, *“if mother is hemorrhaging- she has to wait for family to donate blood and then have blood tested in the lab, before it is given in an emergent situation”*

Case 3- Hospital C: Tertiary Care Setting

- Large, urban, tertiary center, which is the only referral center for newborns in the state, caring for ~ 8 million people.
- Many specialty services available including: Neurosurgery, trauma, cardiac thoracic unit, SCBU, Special Care Baby Unit do not generally transfer patients, unless to another country with rare disorder
- Community very commercialized with many motor bikes (Okadas)- and many vehicle related trauma/accidents
- Due to size of facility, there were many MCH nurses and a nurse matron (manager) for each unit. There were 16 nurses present and all participated. Important to note that due to the size of the facility and the high number of patients, all nurse matrons also provided direct care.
- An abundance of material resources was present with > 5 ambu bags, isolettes, and ambulances for emergency transport. Except for the lack of ventilators for newborns, the NICU was comparable to American settings.
- Patients pay fee for services at this facility, but hospital accepts the National Health Insurance Service which is available only to civil servants

- CMAC- Chairman Medical Advisory Committee- research oriented, very helpful and interested in the study. He reviewed the current stats from the National Population Commission Federal Republic of Nigeria, 2008, and made significant recommendations for this research and urged me to ground the data in the Nigerian Demographic Health Survey

In closing, the study's empirical evidence that nurse staffing and the nurse practice environment are not associated with neonatal mortality; does not match the visual reality on the ground and should be further evaluated using qualitative approaches to identify common themes across this set of hospitals. It is therefore concluded that in the midst of a resource limited healthcare system, that increases in nurse staffing and improvement of the nurse practice environment without concurrent improvements in the systemic factors that affect the healthcare system may not result in improvement of neonatal mortality.

Future Research Implications and Significance

The current study contributes to science in several ways. First, this is the first study, to the researcher's knowledge, to utilize Aiken's Nurse Work Organization Model to address a critical global health issue in sub-Saharan Africa. This study focuses on the often neglected and overlooked, healthcare worker, the African nurse, and articulates the importance of elevating the capacity of nurses in sub-Saharan Africa in order to improve health care systems and address a critical global health issue, neonatal mortality. This study does serve as a foundation for understanding the work factors that affect neonatal mortality in Nigeria.

The theoretical and empirical linkages in the Aiken model were not significant in this study and the instruments and measure used deserve a qualitative examination as the next step. During the data collection phase, field notes and observations were recorded. In addition, the nurses and hospital administrators provided qualitative data via open-ended questions in the survey. This qualitative approach may result in the complete unveiling of the study data and help to clarify findings. It will also provide a detailed and concise description of the facilities that will enhance understanding of the quality of the working conditions of nurses and other healthcare professionals in Nigeria. While nurses in Nigeria do speak English, the language and meaning may have been different. Some of the nurse survey questions, specifically those related to the nurse practice environment and nursing care processes, merit additional qualitative and quantitative investigation in order to better understand why these measures as defined in this study were ineffective.

Secondly, Nurse outcomes such as job satisfaction, intent to migrate, were collected during the data collection phase of this study and will be examined in future research. In addition, data was collected on specific neonatal nursing care practices related to infection, care of the premature infant, and care of the HIV exposed infant. These results while not the focus of the aims of this study will be addressed in future research.

Future researchers may also want to investigate whether in-hospital neonatal mortality rates would be impacted if nurses were trained in neonatal resuscitation and care of the premature infant. Since birth, asphyxia and premature births are two of the leading causes of neonatal mortality in Nigeria; these educational trainings have the potential to have an impressive impact on improving neonatal survival. Finally, researchers could implement a referral system in a small group of hospitals. This approach has been proven

to lead to decreased in-patient neonatal mortality in participating facilities in developed countries and has the potential to have the most impact on improving survival in this setting. These are all important research questions that could be addressed in future studies. This study with a baseline examination of nurse staffing, the nurse practice environment, and nursing care processes may allow future researchers to develop and implement nursing specific strategies, such as advanced training in emergency resuscitative procedures and measures to assist with monitoring and intervening to prevent adverse complications due to premature birth and infection. These strategies may ultimately decrease neonatal mortality in developing countries, enhance the country's ability to reach the fourth Millennium Developmental Goal, and ultimately help reduce child mortality.

APPENDIX A



INSTITUTE OF HUMAN VIROLOGY, NIGERIA

Pent House, Maina Court, Plot 252, Herbert Macaulay Way,
Central Business District, P. O. Box 9396, Garki, Abuja.
Tel: +234 (0) 803 304 7250, 09-234 0472, 234 0474, 234 6780 Fax: 09-234 0554, 2340552.

19th February, 2010

IHVN HREC Protocol number: NHREC/05/01/2010a-0001

Re: The Impact of Nursing Work Organizational Factors on Neonatal Mortality in Nigeria.

Name of Principal Investigator: Emilia Ngozi Iwu

Address of Principal Investigator: Institute of Human Virology, Abuja, Nigeria; Institute of Human Virology, University of Maryland & School of Nursing, University of Maryland, Baltimore, U.S.A.

Date of receipt of valid application: 10th November, 2010

Date of meeting when final determination of research was made: 18th February 2010

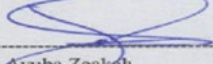
Notice of Full Approval

This is to inform you that the research described in the submitted protocol, the consent forms, advertisements and other participant information materials have been reviewed and *given full approval by the Health Research Ethics Committee.*

This approval dates from **18th /02/2010 to 17th /02/2011**. If there is delay in starting the research, please inform the IHVN HREC so that the dates of approval can be adjusted accordingly. Note that no participant accrual or activity related to this research may be conducted outside of these dates. *All informed consent forms used in this study must carry the IHVN HREC assigned number and duration of approval of the study.*

In line with the National Code for Health Research Ethics you are required to comply with all institutional guidelines, rules and regulations and with the tenets of the Code.

Institutional guidelines, rules and regulations and with the tenets of the Code including ensuring that all adverse events are reported promptly. No changes are permitted in the research without prior approval by the IHVN HREC except in circumstances outlined in the Code. The IHVN HREC reserves the right to conduct compliance visit your research site without previous notification.



Prof. Ayuba Zoakah
Chairman, IHVN HREC

APPENDIX B



University of Maryland, Baltimore
Institutional Review Board (IRB)
Phone: (410) 706-5037
Fax: (410) 706-4189
Email: hppo@som.umaryland.edu

New Study Approval Notification

Date: January 14, 2010

To: Jeffrey Johnson
From: IRB Chair/Vice Chair: Robert Edelman
RE: HP-00041341
Risk designation: Minimal Risk
Submission Date: 11/6/2009
Original Version #: N/A

Approval for this project is valid from 1/14/2010 to 1/13/2011

This is to certify that the University of Maryland, Baltimore (UMB) Institutional Review Board (IRB) has fully approved the above referenced protocol entitled, "*The Relationship Between Nursing Work Organization and Neonatal Mortality in Nigeria*".

The IRB has determined that this protocol qualifies for expedited review pursuant to Federal regulations 45 CFR 46.110, 21 CFR 56.110, & 38 CFR 16.110 category(ies).

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies. (NOTE: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR 46.101(b)(2) and (b)(3). This listing refers only to research that is not exempt.)

Please be aware that only valid IRB-approved informed consent forms may be used when written informed consent is required.

Investigators are reminded that the IRB must be notified of any changes in the study. In addition, the PI is responsible for ensuring prompt reporting to the IRB of proposed changes in a research activity, and for ensuring that such changes in approved research, during the period for which IRB approval has already been given, may not be initiated without IRB review and approval except when necessary to eliminate apparent immediate hazards to the subject (45 CFR 46.103(4)(iii)).

DHHS regulations at 45 CFR 46.109 (e) require that continuing review of research be conducted by the IRB at intervals appropriate to the degree of risk and not less than once per year. The regulations make no provision for any grace period extending the conduct of the research beyond the expiration date of IRB approval. You will receive continuing review email reminder notices prior to study expiration; however, it is your responsibility to submit your continuing review report in a timely manner to allow adequate time for substantive and meaningful IRB review and assure that this study is not conducted beyond the expiration date. Investigators should submit continuing review reports in the electronic system at least six weeks prior to the IRB expiration date.

In addition, you must inform the IRB of any new and significant information that may impact a research participants' safety or willingness to continue in your study and any unanticipated problems involving risks to participants or others.

Research activity involving veterans or the Baltimore VA Maryland Healthcare System (BVAMHCS) as a site, must also be approved by the BVAMHCS Research and Development Committee prior to initiation. Contact the VA Research Office at 410-605-7131 for assistance.

The UMB IRB is organized and operated according to guidelines of the International Council on Harmonization, the United States Office for Human Research Protections and the United States Code of Federal Regulations and operates under Federal Wide Assurance No. FWA00007145.

APPENDIX C



RESEARCH CONSENT FORM

Protocol Title: Nursing and Neonatal Care in Developing Countries

Study No.: HP-00041341

Principal Investigator: Jeffrey V. Johnson, PhD (1-410-706-0799)

Sub-Investigator: Emilia Ngozi Iwu, RN, MSN, FNP, CRNP, APN-C (011 234 806- 539946)

Sub-Investigator: Yolanda Ogbolu, RN, MSN, CRNP, NNP (1- 410 706-3685)

You have been asked to participate in a research study under the direction of Jeffrey Johnson, Emilia Iwu, and Yolanda Ogbolu. Dr. Johnson is Professor and Director of the Office of Global Health and the WHO Collaborating Center for Mental Health, University of Maryland School of Nursing in Baltimore, Maryland, USA. Yolanda Ogbolu is a PhD Student and Global Health Fellow at the University of Maryland, School of Nursing in Baltimore, MD, USA. Ms. Emilia Iwu is the Senior Technical Advisor at the Institute for Human Virology Nigeria (IHVN). The address for the Institute for Human Virology Nigeria is: Pent House, Maina Court, Plot 252, Herbert Macaulay Way, Central Business District, Garki, Abuja, Nigeria.

Your participation in this study is voluntary. Please read this form carefully, and do not hesitate to ask any questions at any time that may occur to you, relating to participation in this study before signing this consent.

PURPOSE OF STUDY

To learn about nursing work environments and nursing care practices related to newborns in clinical settings. Your responses will allow us to identify specifically how nurses work environments affect the care provided to newborns and help newborns survive in Nigeria. We are interested in the general care practices, material resources, and nursing work characteristics of hospitals and not specific characteristics of individuals. Thirty clinical sites in Nigeria have been selected to participate in this study. As someone who is involved either directly with newborn health care provision or hospital administration of care for newborns you qualify to participate in this project. You will be one of approximately 30 hospital leaders to be asked to participate in this study.

PROCEDURES

As a part of this study, in-person surveys will be conducted to assess organizational factors, including the demographics of nursing staff, material resources available to provide care to newborns and the number of newborn births and deaths in clinical settings. If you decide to participate, upon your arrival at the interview location, you will be asked to read and sign this

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HP-00041341

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consent form. You will be provided the opportunity to meet with the investigator or research staff to ask questions privately. You will not be identified for any purpose, even if you choose not to participate.

If you decide to participate in this study, you will be interviewed individually. A member of the study team will provide an individual consent form. Completion of the in-person survey will take approximately 1 hour. There will be no identification of individual participants in notes and surveys. Surveys will be kept separately from consent forms in a locked file and accessible only to research staff. The principal investigator will destroy the interview scheduling list. You are expected to keep all information discussed confidential. You should not communicate any information discussed with anyone.

During the in-person survey completion, a member of the research team will visually check for availability of material resources. No individual behavior will be recorded during in-person survey. A copy of this consent form will be provided to you.

POTENTIAL RISKS/DISCOMFORTS:

We will ask you to share your honest views. Your name will not be on interview notes, so the information cannot be directly linked to you. Breach of confidentiality is a potential risk of this study, since the survey will be done in-person. Loss of confidentiality will be minimized by storing data in a secure location (locked office and locked cabinet); electronic data will be password protected.

POTENTIAL BENEFITS

The goal of the study is to help improve neonatal survival. The input from participants may lead to interventions that could result in improved outcomes for their patients. The results of this study may help participants to direct their practical efforts to reducing neonatal mortality in the involved institutions and in other units of the target hospitals and other hospitals in Nigeria. Long-term benefits are that results may lead to interventions to improve neonatal care scale up and improved working conditions in the health care sector.

ALTERNATIVES TO PARTICIPATION

You may choose to not participate in this study.

COSTS TO PARTICIPANTS

There are no costs to you as a consequence of your participation in this research study.

PAYMENT TO PARTICIPANTS

All participants will receive a one time, small in-kind token of appreciation. A phone card valued at 500 Naira (~\$3 USD) will be given to all participants.

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CONFIDENTIALITY

All interview materials will be kept in a secure environment at the Institute for Human Virology Nigeria or the University of Maryland Baltimore, School of Nursing and will not be made available to your employers or to fellow employees. The results will be reported in the form of group patterns, hospital type, number of beds, etc. so as to protect the confidentiality of individuals. No advantages or disadvantages either financially or professionally will occur as the result of participation or non-participation in this study. The employer will not be informed as to who has or who has not participated in interviews.

You are expected to keep all information discussed confidential.

The data from this study may be published. However, neither you, nor your institution, will be identified by name. People designated from the institutions where the study is being conducted and people from the sponsor will be allowed to inspect sections of your research records related to this study. Everyone using study information will work to keep your personal information confidential. Your personal information will not be given out unless required by law.

RIGHT TO WITHDRAW

Your participation in this study is voluntary. You do not have to take part in this research. You are free to withdraw your consent at anytime. Refusal to take part or to stop taking part in the study will involve no penalty or loss of benefits to which you are otherwise entitled. If you decide to stop taking part, if you have questions, concerns, or complaints, or if you need to report a medical injury related to the research, please contact the investigator EMILIA IWU at 234 – 806 – 539946.

In addition to the risks described in this form, there may be unknown risks/discomforts involved in participating in the study. Study staff will update you in a timely way on any new information that may affect your health, welfare, or decision to stay in this study. The investigator EMILIA IWU can decide to withdraw you from the study at any time. You could be removed from the study for reasons related solely to you (for example, not following study-related directions from the Investigator or research team). Also, the entire study may be stopped by the sponsor, Investigator, the Institutional Review Board, the facility where the study is being carried out, or the University of Maryland.

UNIVERSITY STATEMENT CONCERNING RESEARCH RISKS

The University is committed to providing participants in its research all rights due them under State and federal law. You give up none of your legal rights by signing this consent form or by participating in the research project. Please call the Institutional Review Board (IRB) if you have questions about your rights as a research participant.

The research described in this consent form has been classified as minimal risk by the IRB of the University of Maryland, Baltimore (UMB). The IRB is a group of scientists, physicians, experts, and other persons. The IRB's membership includes persons who are not affiliated with UMB and

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persons who do not conduct research projects. The IRB's decision that the research is minimal risk does not mean that the research is risk-free. You are assuming risks of injury as a result of research participation, as discussed in the consent form.

If you are harmed as a result of the negligence of a researcher, you can make a claim for compensation. If you have questions, concerns, complaints, or believe you have been harmed through participation in this research study as a result of researcher negligence, you can contact members of the NHREC to ask questions, discuss problems or concerns, obtain information, or offer input about your rights as a research participant. The contact information for NHREC is:

National Health Research Ethics Committee
Federal Ministry of Health
Federal Secretariat Complex
Shehu Shagari Way
P.M.B. 083, Garki – Abuja,
Abuja, Nigeria
E-mail: secretary@nhrec.net, deskofficer@nhrec.net

Or, contact the staff of the Human Research Protections Office (HRPO) at University of Maryland in Baltimore, Maryland, USA, to ask questions, discuss problems or concerns, obtain information, or offer input about your rights as a research participant. The contact information for the IRB and the HRPO is:

University of Maryland School of Medicine
Human Research Protections Office
BioPark I
800 W. Baltimore Street, Suite 100
Baltimore, MD 21201
1-410-706-5037

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Signing this consent form indicates that you have read this consent form (or have had it read to you), that your questions have been answered to your satisfaction, and that you voluntarily agree to participate in this research study. You will receive a copy of this signed consent form.

If you agree to participate in this study, please sign your name below.

Participant's Signature

Date: _____

Investigator or Designee Obtaining
Consent Signature

Date: _____

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APPENDIX D

Nursing and Neonatal Mortality in Nigeria

2009-2010

This questionnaire asks you about your nursing practice and patient care.

This questionnaire is anonymous. Completing this survey means you agree to participate in this research study. We will not be able to identify you from the responses from this survey.

Please do not write any personal identifying information on the questionnaire

Yolanda Ogbolu, MSN, Neonatal NP, PhD candidate

Section I. This section asks general questions about you and your primary job. Your primary job is the job where you spend most of your time. Please place an X next to the appropriate response, or fill in the blank as indicated.

1. How long have you been working:
 - 5 in your current position? _____ years
 - 6 for your current employer? _____ years

- 7 in maternal child health nursing? _____ years
2. Do you plan to be with your current employer one year from now?
 Yes No
3. Do you plan to work as a nurse in another country in the next year?
 Yes No
4. Which of the following best describes your current, primary position?
 Staff nurse/midwife, direct patient care
 Staff nurse/midwife, indirect patient care
 Staff nurse, direct care and indirect care
 Nurse Matron
 Other (specify) _____
5. Which of the following best describes your plans for the type of work you will do for the next year? Check all that apply
 Stay in my current position
 Leave direct patient care and work as administrator
 Remain in nursing but in a different country
 Leave nursing for another career

6. How satisfied are you with the following aspects of your job?

	Very Satisfied	Moderately Satisfied	A Little Satisfied	Very Dissatisfied
Work schedule	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Career Opportunities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Independence at work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Professional status	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Salary/wages	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Very Satisfied	Moderately Satisfied	A Little Satisfied	Very Dissatisfied
Work schedule	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Career Opportunities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Independence at work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Professional status	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Salary/wages	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. Overall, how satisfied are you with your current, primary job?

- Very satisfied
 Moderately satisfied
 A little dissatisfied
 Very dissatisfied

Section II. Please indicate the extent to which you agree that each of the following is present in your current, primary job. Please circle one number on each row.

	Strongly Agree	Somewhat Agree	Somewhat Disagree	Strongly Disagree
1. Adequate support services allow me to spend time with my patients.	1	2	3	4
2. Doctors and nurses have good working relationships.	1	2	3	4
3. A head nurse that is supportive of nurses.	1	2	3	4
4. Active staff development or continuing education programs for nurses, such as neonatal resuscitation.	1	2	3	4
5. Career development/ Clinical ladder.	1	2	3	4
6. Opportunity for staff nurses to participate in policy decisions	1	2	3	4
7. Head nurses use mistakes as learning opportunities, not criticism.	1	2	3	4
8. Enough time and opportunity to discuss patient care problems with other nurses.	1	2	3	4
9. Enough registered nurse to provide quality patient care the mothers and newborns	1	2	3	4
10. A head nurse who is a good manager and leader.	1	2	3	4
11. A Chief Nursing Officer (Matron) who is highly visible and accessible to staff.	1	2	3	4
12. Enough staff to get the work done.	1	2	3	4
13. Praise and recognition for a job well done.	1	2	3	4
14. High standards of nursing	1	2	3	4

care are expected by the administration.				
15. A Chief Nursing Office (Matron) equal in power and authority to other top level hospital executives/administrators.	1	2	3	4
16. A lot of team work between nurses and doctors.	1	2	3	4
17. Opportunities for advancement.	1	2	3	4
18. A clear philosophy of nursing that is wide spread in the patient care environment.	1	2	3	4
19. Working with nurses are clinically competent.	1	2	3	4
20. A head nurse/ charge nurse that backs up the nursing staff in decision making, even if the conflict is with the doctor.	1	2	3	4
21. Administration that listens and responds to employee concerns.	1	2	3	4
Please indicate the extent to which you agree that each of the following are present in your current, primary job. Please circle one number on each row.	Strongly Agree	Somewhat Agree	Somewhat Disagree	Strongly Disagree
22. An active Quality Assurance Program.	1	2	3	4
23. Staff nurses are involved in the internal governance of the hospital, such as committees on practice and policy.	1	2	3	4

24. Collaboration/Cooperation between nurses and doctors.	1	2	3	4
25. A preceptor program for newly hired registered nurses.	1	2	3	4
26. Nursing care is based on nursing rather than a medical model.	1	2	3	4
27. Staff nurses have the opportunity to serve on hospital and nursing committees.	1	2	3	4
28. Nursing administrators consult with nursing staff on daily problems and procedures.	1	2	3	4
29. Written, up to date nursing care plans for all patients.	1	2	3	4
30. Patient care assignments that foster continuity of care. The same nurse cares for the patient from one day to the next.	1	2	3	4
31. Use of nursing diagnosis.	1	2	3	4
32. Adequate patient care supplies allow me to provide care for my patients.	1	2	3	4
33. My job requires working very fast.	1	2	3	4
34. My job requires working very hard.	1	2	3	4
35. I am not asked to do an excessive amount of work.	1	2	3	4
36. I have enough time to get the job done.	1	2	3	4
37. I am free from conflicting demands others make.	1	2	3	4
38. My job requires that I learn new things.	1	2	3	4
39. My job involves a lot of repetitive work.	1	2	3	4
40. My job requires me to be	1	2	3	4

creative.				
41. My job requires a high level of skill.	1	2	3	4
42. I get to do a variety of things on my job.	1	2	3	4
43. I have an opportunity to develop my own special abilities.	1	2	3	4
44. My job allows me to make a lot of decisions on my own.	1	2	3	4
45. On my job, I am given a lot of freedom to decide how I do my work.	1	2	3	4
46. I have a lot to say about what happens on my job.	1	2	3	4
47. My supervisor is concerned about the welfare of those under him/her	1	2	3	4
48. My supervisor pays attention to what I am saying.	1	2	3	4
49. My supervisor is helpful in getting the job done.	1	2	3	4
50. My supervisor is successful in getting people to work together.	1	2	3	4
51. People I work with are competent in doing their jobs.	1	2	3	4
52. People I work with take a personal interest in me.	1	2	3	4
53. People I work with are friendly.	1	2	3	4
54. People I work with are helpful in getting the job done.	1	2	3	4

Section III. The next set of questions asks you about your nursing activities during your MOST RECENT WORKDAY at your current, primary job. Please fill in the blank as appropriate.

What time of day did you actually start work? _____

2. What time of day did you actually finish work? _____
3. On your most recent workday, what was the total number of patients that were managed by you?
total patients _____
4. On the last shift that you worked: What were the total number of admissions _____ and total discharges: _____
5. On your most recent workday, counting yourself, how many of each of the following provided direct patient care during the hours you worked?
RNs _____
Health Assistants _____
Others (specify role and number) _____

6. On your most recent workday, which of the following activities were necessary but omitted because you lacked the time to complete them?

(Please place an X next to ALL that apply):

- Adequate surveillance of newborns for complications
- Teach /council patients and family on newborn care practices
- Comfort/talk with parents
- Coordinate patient care for the health assistants
- Document nursing care in the medical record
 - Feed a newborn or supervise a mother during feedings
- Adequate supervision of auxiliary staff and parents

Section IV. This section asks general questions about newborn care practices in your facility.

- How do you identify newborns that are born to HIV positive mothers?

(Please place an X next to ALL that apply):

- The mother reports her own HIV status
- The lab results are in the mother's chart
- There is no way for me to know
- Report from the antenatal clinic
- Mother is tested on admission

- If you are aware of the mother's HIV positive status, what procedures are generally done to prevent maternal to child transmission of HIV?

(Please place an X next to ALL that apply):

- 4 Bathing the newborn prior to all injections
- 5 Early initiation of breast feeding
- 6 Administration of antiretrovirals to the mother during delivery

- 7 Providing antiretrovirals to newborn within the first 6 hours of life
 - I am not sure what procedures to do for mothers and newborns
- 8 The medicine is not available

- What procedures are used for infants with respiratory distress?

(Please place an X next to ALL that apply):

- 5 Use of a ventilator
- 6 Continuous positive pressure with CPAP
- 7 Bag/mask ventilation
- 8 Oxygen
- 9 Nasal Cannula
- 10 Surfactant medication to help lungs
- 11 Observation
- 12 Stimulation with methylated spirit
- 13 Other; Specify: _____
- 14 None of the above

- What procedures are done to help premature infants gain weight?

(Please place an X next to ALL that apply):

- Feeding maternal breastmilk
- Feeding donor breast milk
- Tube feeding breast milk or formula
- Cup/Spoon Feeding breastmilk or formula
- Total Parental Nutrition, fluids with vitamins and proteins
- IV fluids with vitamins, protein and fat
- Breastmilk with supplements with extra calories
- Other: Specify _____

- How do you monitor for serious complications, apnea, bradycardia, intraventricular hemorrhage?

(Please place an X next to ALL that apply):

- Continuous electronic monitoring
- Nurse Observation
- Maternal Report
- Changes in vital signs, Heart rate, respiratory rate
- Blood pressure changes
- Head ultrasounds

- What procedures are done to prevent infections in newborns in your facility?

(Please place an X next to ALL that apply):

- Handwashing with hot water
- Handwashing with cold water
 - Routine cord care: Gential violet (triple dye) and or methylated alcohol
 - Assessment of IV sites for redness and edema
 - Use of antimicrobial (alcohol, betadine) prior to IV placement

- Gloves and gown with every patient
- Minimize the use of co-bedding of infants
- Teach visitors/parents good handwashing skills
- Restrict visitors
- What is the most common reason newborns die in this facility?

Place only one X

- Premature birth
- Respiratory Distress
- Asphyxia
- Problems during delivery
- Jaundice
- Sepsis
- Surgical Complications
- Other; Specify _____

- Do the majority of the **mothers** that you care for at this facility have?

Please place an X by all that apply

1. Have running water in their home
2. Have some electricity at home
3. Have money to pay for their medications
4. Have at least secondary education
5. Unable to answer, I do not know

9. Please give the maternal child health program within this facility an overall grade on patient safety.

- A (Excellent) B (Good) C (Fair) D (Poor) F (Failing)

Section V. This final section asks general questions about you and your background and training.

1. What is your gender?

- Female Male

2. What is your age? _____

3. What was your age when you first became a RN? _____

4. From what type of program did you receive your first nursing education that lead to RN licensure?

- Diploma
 Hospital Based Training
 BS Degree in Nursing-University Training

5. What are the highest degrees that you hold?

	<u>In nursing</u>	<u>In a field other than nursing</u>
RN diploma	<input type="checkbox"/>	
Baccalaureate degree	<input type="checkbox"/>	<input type="checkbox"/>
Master's degree	<input type="checkbox"/>	<input type="checkbox"/>
Doctoral degree	<input type="checkbox"/>	<input type="checkbox"/>

6. Which best describes your current work status at this facility?

- Full time
- Part time
- Other (specify)_____

1. What additional special educational training in Newborn Care have you have received in the last 2 years:

Please place an X on all that apply:

6. Paediatrics

7. Immunization Training

- Care of newborn of the pregnant Woman with HIV
- Care of Premature Infants
 - Neonatal Resuscitation Training
 - Other (specify)_____

• What special training in Neonatal Care do you want in the future?

Please place an X next to all that apply:

- Care of newborn of the pregnant Woman with HIV
- Care of Premature Infants
 - Neonatal Resuscitation Training
- Pediatric Specialty Training
- Pediatric/ Neonatal Nurse Practitioner Training
- Other (please specify)_____

• Additional Comments: Please make any additional comments you may have here.

Thank you for completing this survey!

APPENDIX E

Safe Motherhood Needs Assessment - FAC - page 1

Data entry sequence number:	Data entry initials:
-----------------------------	----------------------

Hospital Administrator

Facility name:		Facility code:		District code:	
Type of facility (enter H=Hospital; C=Health Centre; P=Health Post):					
Facility administration (enter G=Government; M=Mission; P=Private):					
Date today:		Team code:		Surveyor code:	

After initially meeting with the officer in charge of the facility to ask questions on pages 1-3, explain that you would like to be shown the facilities to gather the remaining information. Complete one survey form for each facility.

(FAC1A)	WHAT IS THE ESTIMATED POPULATION SERVED BY THIS FACILITY? <i>Enter population; if not known enter 0</i>			
(FAC1B)	HOW MANY BEDS ARE THERE AT THIS FACILITY (INCLUDING MATERNITY) <i>Enter number</i>			
(FAC1C)	HOW MANY NEONATAL BEDS ARE THERE AT THIS FACILITY? <i>Enter number</i>			
(FAC1D)	WHAT IS THE ANTENATAL CARE COVERAGE RATE FOR THIS FACILITY? <i>Enter percentage; if not known do not calculate, enter 0</i>	%		
(FAC1E)	WHAT IS THE DELIVERY COVERAGE RATE FOR THIS FACILITY? <i>Enter percentage; if not known do not calculate, enter 0</i>	%		
AT THIS FACILITY HOW MANY FULL-TIME AND PART-TIME OCCUPIED POSTS ARE THERE FOR:		Enter number of posts occupied		
		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%;">Full-time</th> <th style="width: 50%;">Part-time</th> </tr> </table>	Full-time	Part-time
Full-time	Part-time			
(FAC2A)	REGISTERED MIDWIVES AND NURSE/MIDWIVES (FULLY QUALIFIED)			
(FAC2B)	ENROLLED MIDWIVES AND NURSE/MIDWIVES (LIMITED QUALIFICATIONS)			
(FAC2C)	PHYSICIANS (BOTH GENERALIST AND OBSTETRICIAN/GYNAECOLOGIST)			
	HEALTH ASSISTANTS			
(FAC2D)	ANAESTHETISTS AND NURSE-ANAESTHETISTS			
(FAC2E)	PHARMACISTS			

Safe Motherhood Needs Assessment - FAC - page 2

<p>WHICH OF THE FOLLOWING SERVICES HAVE BEEN PROVIDED WITHIN THE PAST SIX MONTHS AT THIS FACILITY? <i>Ask about each service separately</i></p>		<p><i>Tick one box for each item</i></p>	
{FAC3A}	ANTENATAL CARE	9 1 Yes	9 0 No
{FAC3B}	TETANUS TOXOID IMMUNIZATION	9 1 Yes	9 0 No
{FAC3C}	MANAGEMENT OF PRETERM INFANTS	9 1 Yes	9 0 No
{FAC3D}	NORMAL DELIVERY CARE	9 1 Yes	9 0 No
<p>WHICH OF THE FOLLOWING COMPLICATIONS HAVE OCCURRED AND HAVE BEEN MANAGED AT THIS FACILITY WITHIN THE PAST SIX MONTHS? <i>Ask about each service separately</i></p>		<p><i>Tick one box for each item</i></p>	
{FAC4A}	PRETERM BIRTH	9 1 Yes	9 0 No
{FAC4B}	EXCHANGE TRANSFUSIONS	9 1 Yes	9 0 No
{FAC4C}	SEVERE NEONATAL INFECTIONS	9 1 Yes	9 0 No
{FAC4D}	METHICILLIN RESISTANT STAPHYLOCOCCUS	9 1 Yes	9 0 No
{FAC4E}	RESPIRATORY DISTRESS IN NEWBORNS	9 1 Yes	9 0 No
{FAC4F}	PNEUMOTHORACIES IN NEWBORNS	9 1 Yes	9 0 No
{FAC4G}	GASTROINTESTINAL SURGERY IN NEWBORNS	9 1 Yes	9 0 No
<p>ARE THE FOLLOWING SERVICES PROVIDED EVERY DAY THAT THIS FACILITY IS OPEN? <i>Ask about each service separately</i></p>		<p><i>Tick one box for each item</i></p>	
{FAC5A}	ANTENATAL CARE	9 1 Yes	9 0 No
{FAC5C}	CHILD HEALTH SERVICES	9 1 Yes	9 0 No
	EMERGENCY PEDIATRIC/ NEONATAL CARE SERVICES	9 1 Yes	9 0 No
	INPATIENT NEONATAL CARE SERVICES	9 1 Yes	9 0 No
	OUTPATIENT NEWBORN SERVICES	9 1 Yes	9 0 No

WHICH OF THE FOLLOWING LABORATORY SERVICES HAVE BEEN PROVIDED AT THIS FACILITY WITHIN THE PAST WEEK?		<i>Tick one box for each item</i>	
<i>Ask about each service separately</i>			
{FAC6A}	HIV TESTING FOR MOTHERS AND NEWBORNS	9 1 Yes	9 0 No
{FAC6B}	HAEMOGLOBIN MEASUREMENT	9 1 Yes	9 0 No
{FAC6C}	BILIRUBIN MEASUREMENT	9 1 Yes	9 0 No
Emergency services and referral			
{FAC7A}	ARE NEWBORN SERVICES AVAILABLE AT NIGHT AND AT WEEKENDS?	9 1 Yes	9 0 No
{FAC7B}	ARE ON-CALL SERVICES FOR CARE OF COMPLICATED DELIVERIES AVAILABLE AT NIGHT AND AT WEEKENDS?	9 1 Yes	9 0 No
{FAC7C}	ARE ON-CALL SERVICES FOR PRETERM BIRTHS AVAILABLE AT NIGHT AND AT WEEKENDS?	9 1 Yes	9 0 No
{FAC7D}	ONCE YOU DECIDE TO REFER A NEONATAL EMERGENCY CASE, ABOUT HOW LONG DOES IT TAKE FOR HER TO ARRIVE AT THE REFERRAL FACILITY AND RECEIVE CARE? <i>Enter number of hours</i> <i>Enter 0 for referral centre/hospital</i>		
{FAC7E}	HOW FAR IS THE NEAREST REFERRAL FACILITY, IN KILOMETRES? <i>Enter number of kilometres, one way</i> <i>Enter 0 for referral centre/hospital</i>		
{FAC7F}	WHO, APART FROM THE DRIVER, USUALLY ACCOMPANIES AN EMERGENCY REFERRAL PATIENT TO THE HOSPITAL? <i>Tick one box</i>	9 0 Patient is not accompanied (driver only) 9 1 Nurse/Midwife 9 2 Other health personnel 9 3 Family member 9 4 Other - specify	
Infrastructure and equipment			
WHICH OF THE FOLLOWING ITEMS ARE AVAILABLE AND IN SATISFACTORY CONDITION? <i>Ask about each item separately. Code as unsatisfactory items which in your judgement are not functional, have missing parts, are unhygienic, or otherwise sub-standard. Be sure to look at each item.</i>		<i>Enter correct number below</i> 0 = Not available 1 = Available but not satisfactory 2 = Available and satisfactory 9 = Not applicable for this facility	
{FAC8A}	EXAMINATION ROOM OR AREA PROVIDING CLIENT PRIVACY (ROOM FOR SCREENING, COUNSELLING AND EXAMINATION)		
{FAC8C}	STORAGE AREA OR CUPBOARD FOR DRUGS AND OTHER SUPPLIES		
{FAC8D}	TOILET FACILITIES OR LATRINE		
{FAC8F}	REFRIGERATOR		
{FAC8G}	HOT WATER SUPPLY		
{FAC8H}	TELEPHONE OR RADIO TRANSMITTER		
{FAC8J}	AMBULANCE OR VEHICLE TO REFER AN NEONATAL EMERGENCY		

WHICH OF THE FOLLOWING ITEMS ARE AVAILABLE AND IN SATISFACTORY CONDITION?		Enter correct number below
<p><i>Ask about each item separately. Code as unsatisfactory items which in your judgement are not functional, have missing parts, are unhygienic, or otherwise sub-standard. Be sure to look at each item.</i></p>		0 = Not available 1 = Available but not satisfactory 2 = Available and satisfactory 9 = Not applicable for this facility
Registers		
{FAC9A}	CLINICAL MANAGEMENT GUIDELINES/FLOW CHARTS FOR NEONATAL HEALTH CARE	
{FAC9B}	REGISTER OR LOG BOOK FOR ADMISSIONS AND DISCHARGES FOR NEONATAL CATRE	
Basic equipment		
{FAC10A}	BLOOD PRESSURE APPARATUS (SPHYGMOMANOMETER)	
{FAC10B}	STETHOSCOPE	
{FAC10C}	INFANT WEIGHING SCALE	
{FAC10D}	FETAL STETHOSCOPE	
{FAC10E}	STERILIZER	
{FAC10F}	CLINICAL ORAL THERMOMETER	
{FAC10H}	PROTECTIVE CLOTHING (SHOES, APRONS)	
Absolute minimum for care of neonate		
{FAC12A}	CLOTH OR TOWEL TO DRY BABY	
{FAC12B}	BLANKET TO WRAP BABY	
{FAC12C}	BAG AND MASK FOR NEONATAL RESUSCITATION	
Educational materials...		
{FAC13A}	... ON WARNING SIGNS OF CLINICAL PROBLEMS IN NEWBORNS	
{FAC13B}	... ON NEWBORN CARE OR BREAST-FEEDING	
{FAC13D}	... ON SEXUALLY TRANSMITTED DISEASES / HIV/AIDS	
{FAC13E}	...ON NUTRITION FOR BREAST FEEDING MOTHERS	

Essential drugs and consumable supplies		
<i>For essential drugs and consumable supplies, it is sufficient to look for and see that a particular item is available, regardless of condition or expiration date.</i>		<i>Enter correct number below</i> 0 = Not seen at facility 1 = Seen at facility 9 = Not applicable for this facility
(FAC15A)	PROTECTIVE EQUIPMENT GOWN AND GLOVES	
	HAND SOAP	
	ANTI-BACTERIAL CLEANERS	
(FAC15B)	DISPOSABLE SYRINGES AND NEEDLES	
(FAC15C)	IV KIT	
(FAC15D)	DISPOSABLE FEEDING TUBES	
(FAC15E)	BLANK CLIENT CARDS OR NEONATAL RECORDS (AS APPROPRIATE)	
(FAC15F)	CORD TIES	
(FAC15G)	BLOOD GIVING SETS	
(FAC15H)	BLOOD DRAWING SUPPLIES	
	OXYGEN	
	DEVICES TO ASSIST WITH RESPIRATORY DISTRESS:VENTILATORS/ CPAP DEVICES	
	FUNCTIONING ISOLETTES	
	PHOTOTHERAPY LIGHTS	
	INFANT FORMULA	
(FAC15J)	URINE DIP STICK / PROTEINURIA TEST SUPPLIES	
Anaesthetics: general		
(FAC16A)	NITROUS OXIDE OR OTHER GENERAL ANAESTHETIC AGENT	
(FAC16B)	DIAZEPAM (INJECTION)	
(FAC16C)	KETAMINE (INJECTION)	
Anaesthetics: local		
(FAC17A)	LIDOCAINE 2% OR OTHER	
Analgesics		
(FAC18A)	NAME TYPE:	
Anti-infective drugs: antibacterial (NEONATAL)		
(FAC19A)	AMPICILLIN (INJECTION)	
(FAC19B)	BENZATHINE BENZYL PENICILLIN OR PROCAINE BENZYL PENICILLIN (INJECTIONS)	
(FAC19C)	CEFTRIAXONE (INJECTION) OR CIPROFLOXACIN (CAPSULE)	
(FAC19D)	GENTAMICIN (INJECTION)	
(FAC19E)	KANAMYCIN (INJECTION)	
(FAC19F)	ANTIRETROVIRALS FOR MOTHER	
	ANTIRETROVIRALS FOR NEWBORNS	
<i>For essential drugs and consumable supplies, it is sufficient to look for and see that a particular item is available, regardless of condition or expiration</i>		<i>Enter correct number below</i> 0 = Not seen at facility 1 = Seen at facility

	<i>date.</i>	9 = Not applicable for this facility
Anti-infective drugs: antibacterial (neonate)		
{FAC20A}	TETRACYCLINE (OINTMENT) OR SILVER NITRATE (EYE DROPS)	
Anti-infective drugs: antimalarials		
{FAC21A}	CHLOROQUINE (TABLETS)	
{FAC21B}	QUININE (INJECTION) OR CHLOROQUINE (INJECTION)	
Antianaemia drugs		
{FAC22A}	FERROUS SALT+FOLIC ACID (IN COMBINED FORM OR SEPARATELY)	
	BLOOD, PLATELETS, FRESH FROZEN PLASMA	
Anticonvulsive drugs		
{FAC24A}	PHENOBARBITAL	
	ATIVAN	
Immunologicals: Vaccines		
{FAC26A}	TETANUS TOXOID (INJECTION) STORED IN REFRIGERATOR	
{FAC26B}	BCG VACCINE (INJECTION)	
Disinfectants and antiseptics		
{FAC28A}	CHLORHEXIDINE OR SURGICAL SPIRIT OR ANY OTHER	
Intravenous solutions		
{FAC29A}	SALINE SOLUTION OR SODIUM LACTATE COMPOUND SOLUTION OR ANY OTHER	
	DEXTROSE SOLUTIONS	

Delivery registry and presentation of NEONATAL complications				
<p><i>Ask to see the delivery records or log book. Tally information on the number of cases of various conditions from the delivery registry or other relevant records for the past 12 months. Space is provided under each condition for tallying the number of cases. After completion, enter numerical totals in the right hand column. Exclude cases in which the baby was born before arrival at the facility.</i></p> <p><i>Use space below for tally</i> <i>Enter number below</i></p>				
(FAC30A)	TOTAL NUMBER OF BIRTHS (FOR PAST 12 MONTHS) (Count tally here e.g. IIII)			
(FAC30F)	STILLBIRTHS (FRESH AND MACERATED) (FOR PAST 12 MONTHS)			
	TOTAL NUMBER OF NEWBORN DEATHS IN THE FIRST 4 WKS OF LIFE (FOR THE LAST 12 MONTHS)	<2500 GMS	> 2500 GMS	
(FAC30G)	EARLY NEONATAL DEATHS < 1 WEEK OLD (FOR PAST 12 MONTHS)	TOTAL #	# INBORN	# OUTBORN
	LATE NEONATAL DEATHS < 4 WEEKS OLD (FOR PAST 12 MONTHS)	TOTAL #	# INBORN	# OUTBORN
	POST NEONATAL DEATHS > 4 WEEKS OLD (FOR PAST 12 MONTHS)	TOTAL #	# INBORN	# OUTBORN

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