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Assessment of the Infection Control System in Neonatal Intensive Care Units in the West Bank and East Jerusalem Hospitals

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Assessment of the Infection Control System in Neonatal Intensive Care Units in the West Bank and East Jerusalem Hospitals

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Palestine, 2013

Declaration

I certify that this thesis is the result of my own work research, except where otherwise indicated. It has been submitted for the degree of Masters and not for a higher degree to any other university or institution.

.....

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Abstract

Background: Newborns are susceptible to catch infections inside Neonatal Intensive Care Units (NICUs) due to several reasons. Many studies showed that most deaths occur due to infection at the late neonatal period (between the 8^{th} and the 28^{th} days of infant life). There is a national protocol for the control of hospital infections in Palestine. However, there is a lack of assessment of the compliance with the protocol in NICU setting.

Aim: To assess the infection control system at NICUs in West Bank and East Jerusalem hospitals, this included assessment of the compliance to the national infection control guidelines and the barriers for implementing the infection control system from respondents perspectives.

Method: A descriptive cross sectional design conducted at 16 NICUs. All nurses and physicians working at NICUs were targeted. Data was collected using a self administered questionnaire and a facility checklist.

Findings: 209 nurses/physician participated in the study, response rate was (68.5%). Alia Hospital in Hebron and Holy Family Hospital in Bethlehem have the largest number of participants (11% each). Whereas Medical complex hospital has the highest responses among its participants. Most participants (55%) came from NGO hospitals, (40%) were from large hospitals (>150 bed) and 54.5% work at unit capacities greater than 10 patients. Most respondents (60.8%) were females, respondents ages less than 30 years (62.2%), 80.3% were nurses of which (36.4%) were staff nurses, more than half of respondents hold bachelor degree, and (60%) had experience of 5 or less years. Only (18.2%) had training in neonatology, (34.4%) in resuscitation, and (9.6%) received both trainings. Half of the respondents (51.2%) said they didn't receive any infection control training courses in the last two years, (87.1%) felt a need to gain more training about infection control protocol, (78%) had access to infection protocols when needed and (74.6%) believed that hospital systems enforce the implementation of infection control protocols.

The respondent's positive response to the compliance level for hand washing protocol was (84.3%), for hand gloving protocol (81.2%), (82.05%) for antiseptics use protocol, (79.28%) for decontamination and cleaning protocol, and (80.03%) for waste disposal protocol.

The overall compliance score to recommend infection control practices/guidelines (ICP) was (81.37%). Among main barriers for adherence to infection protocol guidelines were: lack of training on the infection control protocols (57.5%), lack of supplies and materials (56%), the type of antiseptic used that irritates skin (54.6%), lack of staff and high workloads (54.5%), lack of knowledge and skills (54.1%), lack of necessary equipments and lack of motivation (52.6%), lack of job satisfaction and lack of surveillance and performance measures systems (49.8%).
The main barrier for compliance was lack of training on the ICP (57.5%).

The results showed those aged $\geq$30 years and those had training in neonatology and resuscitation were significantly more compliant to the infection control practices than their counterparts ($P<0.05$). The other independent factors for hospital and respondent's characteristics were not significantly associated with the compliance to infection control practices.

Conclusion: The assessment revealed weaknesses in the infection control practices in the Palestinian NICUs. Infection control improvement measures are needed. The required measures need to be customized to each of the NICUs.

تقييم نظام مكافحة العدوى في أقسام حديثي الولادة في مستشفيات الضفة الغربية و شرقي القدس

اسم الباحث: تريز نصري خير

اسم المشرف: د. معتصم حمدان

ملخص الدراسة

الخلفية: الأطفال حديثي الولادة في وحدات العناية المركزة عرضة لالتقاط العدوى لأسباب عديدة. حيت أظهرت العديد من الدراسات بان معظم الوفيات الناجمة من العدوى تكون في الفترة ما بين اليوم الثامن إلى اليوم الثامن والعشرون ما بعد الولادة. هناك نظام وطني لمكافحة العدوى التي تحدت داخل المستشفيات في فلسطين غير انه لا توجد دراسات في تقييم مدى الالتزام بهذا النظام داخل اقسام حديثي الولادة.

الهدف: تقييم نظام مكافحة العدوى في أقسام حديثي الولادة في مستشفيات الضفة الغربية ومستشفيات القدس الشرقية ؛ وهذا التقييم يشمل مدى الالتزام بالنظام الوطني لمكافحة العدوى و العوائق لتنفيذ هذا النظام من وجهة نظر المشاركين.

الطريقة: تم استخدام تصميم وصفي مقطعي في 16 قسم للخدج, استهدف جميع الممرضين و المرضات و الاطباء العاملين في أقسام العناية المركزة لحديثي الولادة. تم جمع البيانات باستخدام استبيان.

النتائج: شارك في الدراسة 209 ممرضين و أطباء , وكان معدل الاستجابة (68,5%), مستشفى عالية بالخليل و مستشفى العائلة المقدسة في بيت لحم لديهم اكبر عدد من المشاركين (11% لكل منهما) و مستشفى الحكومي برام الله كانت له أعلى استجابات من بين المشاركين. معظم المشاركين (55%) من مستشفيات المنظمات غير الحكومية؛ (40%) من مستشفيات كبيرة (> 150 سرير)؛ و54,5% يعملون في اقسام خدج تتسع لاكثر من 10 اطفال.
معظم المشاركون (60,8%) إناث. والتي أعمارهم اقل من 30 عام (62,2%). (80,3%) ممرضات منهم 36.4% ممرضات/ ممرضين قانونيين, و أكثر من نصف المشاركين يحملون درجة البكاليوريوس و 60% لديهم خبرة 5 سنوات أو اقل. 18,2% لديهم التدريب في حديثي الولادة ,34.4% لديهم التدريب في الإنعاش. أشار نصف المشاركين (51.2 ٪) أنهم لم يتلقوا أي دورات تدريبية لمكافحة العدوى في العامين الماضيين.

ردود الفعل الإيجابية إلى مستوى الامتثال لبروتوكول غسل الأيدي كانت (84.3 ٪) ، لبروتوكول تغطية القفاز (81.2 ٪), (82.05 ٪) لبروتوكول استخدام المطهرات ، (79.28 ٪) لبروتوكول إزالة التلوث و التنظيف، و (80.03 ٪) لبروتوكول التخلص من النفايات .

النتيجة الإجمالية للامتثال بممارسات مكافحة العدوى / المبادئ التوجيهية 81.37% . ومن بين الحواجز الرئيسية إلى التقيد بالمبادئ التوجيهية لبروتوكول العدوى هي: نقص التدريب على بروتوكولات التحكم في العدوى ونقص الإمدادات والمواد.

الخلاصة: أظهرت نقاط الضعف من جراء تقييم ممارسات نظام مكافحة العدوى في أقسام الخدج الفلسطينية . وهناك حاجة إلى تدابير تحسين في ممارسات مكافحة العدوى التي تحتاج إلى أن تكون مخصصة لكل من هده الاقسام.

Table of Contents

List of Tables

List of Figures

List of Annexes

Abbreviations

AAOP	American academy of paediatrics
ACOG	American college of obstetricians and gynaecologists
AICA	Australian infection control association
APIC	Association for Professionals in Infection Control and Epidemiology
CDC	Centers for Disease Control and Prevention
eICAT	Electronic infection control assessment tool
ESBL	Extended spectrum beta lactamases
HBV	Hepatitis B virus
HCAIs	health care-associated infections
HCV	Hepatitis C virus
HIV	Human immunodeficiency virus
ICP	Infection Control Protocol
JCAHO	The Joint Commission on Accreditation of Healthcare Organizations
JCI	Joint Commission International
MoH	Ministry of Health
NGO	Non Governmental Organisation
NHSN	National Health Safety Network
NICUs	Neonatal intensive care units
NNIS	National Nosocomial Infection Surveillance system
OSHA	The Occupational Safety and Health Administration
SENIC	The Study on the Efficacy of Nosocomial Infection Control
SHEA	Society for Healthcare Epidemiology of America
UNRWA	United Nations Relief and Works Agency
USAID	United States Agency for International Development
VLBW	Very low birth weight
VRE	Vancomycin resistant enterococcus
WHO	World Health Organization

Chapter One
Introduction

1.1 Introduction

Although advances in medical technology in the field of treating neonates over the last decades have improved the survival and quality of life, particularly for those infants born with extreme prematurity and congenital defects. Neonates represent a highly vulnerable patient population in Palestine.

Immunity immaturities and altered cutaneous barriers play a role in the susceptibility of neonates to hospital acquired infections. Clear therapeutic interventions that have proven to be lifesaving for those fragile infants appear to be associated with the majority of infectious complications resulting in neonatal morbidity and mortality.

Infection control is defined by the Royal Marsden manual as the clinical application of microbiology in practice, and it is a collective term for the activities intended to protect people from infections (Dougherty et al., 2011). Whereas, nosocomial infection refers only to infections acquired in hospitals, and the term healthcare-associated infection (HAI) refers to infections associated with health care delivery in any setting (Siegel et al., 2007).

Rates of infections in neonatal intensive care units (NICUs) in Palestine varies from one unit to another where it depends on the compliance to the infection prevention and control protocol.

Despite advances in supportive care and use of antibiotics, sepsis preserves its importance due to its high mortality and morbidity for neonates. Identifying the causative agents and antibiotic resistance yearly in the NICUs helps the physicians to choose the most appropriate empirical therapy (Yalaz et al., 2006).

Wherever patient care is provided, adherence to infection prevention guidelines is needed to ensure that all care is safe care (CDC, 2013).

1.2 Background

The rate at which NICUs are exposed to infection outbreaks depends on the maturation of neonatal immune systems, the type and number of invasive procedures utilized, the etiological agent and its antimicrobial sensitivity pattern, and above all the infection control policies and guidelines being practiced within the NICUs. All of these factors help determine the incidence and prevalence of these infections.

The mortality rate for very low birth weight (VLBW) infants who develop sepsis is threefold higher than those who do not develop sepsis during their hospitalisation period. In fact, sepsis accounts for approximately half of all deaths beyond the second week of life in VLBW infants (Adolf et al., 2012).

In Palestine, rates of infections in neonatal intensive care units (NICUs) varies from unit to another where it depends on the compliance level to the infection prevention and control protocol. The infants account for 13.7 % of West Bank population including Jerusalem (MoH Report, 2010).

The infant's death counts for 11.8 % of the total population deaths in the West Bank. The infant mortality rate in 2009 was 12.6 %, in 2010 was 12.1% and in 2012 was 12.8 %. This can show that the infant mortality is much higher when compared to the United states of America and United kingdom infant mortality rates.

The leading causes of deaths among infants from infectious diseases; were 12.2 %, and from prematurity and low birth weights; 11.3 % of the total deaths (Moh, 2010).

Newborns are most vulnerable during the neonatal period, the first twenty-eight days of their lives. Globally, An estimated four million deaths occur every year during this critical time period, accounting for 37% of all deaths of children fewer than 5 years. Of these deaths, 2.8 million (70%) take place during the first week of life (the early neonatal period), and 1.2 million (30%) occur between the 8th and 28th days of life (the late neonatal period). More than 40% of neonatal deaths take place within 24 hours after delivery (Healthy newborn network, 2006).

Diagnosis of infections, especially in neonates is very difficult in comparison to older infants because symptoms of infection are often non-specific (Van der Zwet et al., 2005). Nowadays, nosocomial infections are still a major cause of morbidity and mortality among neonates admitted to NICUs (Auriti et al., 2010).

1.3 Infection control protocol

Worldwide, several organizations have produced protocols for infection control; The Centers for Disease Control and Prevention (CDC) in the United States is one of the main contributors.

The Palestinian infection prevention and control training protocol (MoH, 2010) and the East Jerusalem Hospitals infection control manual in 2005 were derived mainly from the CDC guidelines.

The principles of infection control include Standard Precautions and Transmission Based Precautions. The standard precautions are the minimum infection prevention measures that apply to all patient care, regardless of suspected or confirmed infection status of the patient in any setting where health care is delivered. These precautions are considered to protect the healthcare personnel and prevent the spread of infections among patients by including protocols for: 1) Hand hygiene 2) Use of personal protective equipment 3) Respiratory hygiene and cough etiquette 4) Safe injection practices 5) Safe handling of potentially contaminated equipment. The Transmission Based Precautions are intended to support standard precautions in patients with known or suspected colonization. These additional precautions are used when the route of transmission is not completely interrupted using standard precautions, and it includes: 1) Contact precautions 2) Droplet precautions and 3) Airborne precautions (CDC, 2011).

Only 14 hospitals that participated in this study are adhering to either the Palestinian infection prevention and control training protocol (MoH, 2010) or the East Jerusalem Hospitals infection control manual in 2005 (EJH, 2005). Moreover, few hospitals were accredited by the Joint Commission International (JCI) standards.

1.4 Palestinian infection prevention and control training protocol

The production of the Palestinian infection prevention and control training protocol in November 2004 and its subsequent update in July 2010 was intended to protect the health of the workers, the clients, the community, and the environment and strengthen the health care system in

Palestine by providing the best appropriate infection prevention and control practices based on the international standards of CDC, World Health Organization, and the Association for Professionals in Infection Control and Epidemiology.

Developed with technical and financial support from MARAM where it receives funding from the United States Agency for International Development (USAID), this protocol draft was approved by the Palestinian Ministry of Health and disseminated to other partners as United Nations Relief and Works Agency (UNRWA).

The key components for this manual are: proper hand hygiene, wearing gloves, physical barrier usages, using antiseptic agents, using safe work practice, safe disposal of waste materials, process instruments and protection of workers' health.

1.5 Problem statement

Infection in NICUs is a major public health problem worldwide. NICUs infections are one of the most important causes of mortality and morbidity in hospitals. Patients admitted to hospitals are at risk of acquiring infection from hospitals. In general, NICU patients are at higher risk for catching infections due to immature immune systems and due to high exposure to invasive procedures as well as connected to devices.

Neonatal infections are a key challenge in Palestinian hospitals. Controlling this issue requires accurate assessment of the current infection control activities being carried out in several NICUs hospital settings.

1.6 Justifications

Despite the importance of the issue, there is a lack of information and proper assessment of the infection control activities in Palestinian hospitals. In addition, the lack of information makes it very difficult to monitor and evaluate practices in order to improve infection control system in Palestinian hospitals.

The results of this study can be used to bridge the gap in the knowledge, illuminate current practices, and contribute to developing the infection control system of NICUs in Palestinian hospitals.

Furthermore, the country lacks such a study to provide a comprehensive approach for assessment and evaluation of the applied infection control system in NICUs.

Healthcare-associated infections are a major setback to any organization. The prevalence of HCAI varies widely across the globe. Worldwide it is estimated that almost 10% of the hospitalized patients acquire at least one HCAI. The prevalence of HCAI in developing countries can become as high as 30-50%. Many of the pathogens implicated in HCAI are often multi-drug resistant and are able to survive in the environment for a long period of time. The most important mechanism of spread of these HCAI is via the contaminated hands of the healthcare givers such as doctors, nurses, other staff or relatives/friends of the patients. Contaminated environmental surfaces are another important reservoir for spread of these infections. However, they are often under-recognized. Infection can also spread to patients by drugs, intravenous solutions or by foodstuffs. These HCAI are associated with increased morbidity, mortality and healthcare expenditures. Due to these clinical, ethical, and financial factors, healthcare providers are increasingly paying more attention to surveillance and prevention of HCAI (Jain et al., 2012).

1.7 Aim of the study

To assess the infection control system in neonatal intensive care units in the West Bank and East Jerusalem hospitals.

1.8 Study objectives

1. To assess the infection control structure of NICUs in the West Bank and East Jerusalem hospitals (settings, environment, safety measures...).
2. To assess the infection control practices, procedures in NICUs in relation to the Palestinian infection prevention and control protocol.

3. To identify the challenges/barriers for implementing infection control practices in Palestinian NICUs.
4. To assess differences in compliance to infection control practice/ guidelines between hospitals and professional groups.

1.9 Limitations of the study

1. The study depended on respondent perceptions than on observational practices.
2. The nursing and physician students were excluded from this study.

1.10 Summary

This introductory chapter provides an overview about the importance of infection control practices that have a direct link to infant mortality and morbidity in NICUs; it includes the aim, the assessment of the infection control system in Neonatal intensive care units in West Bank and East Jerusalem hospitals, that will be achieved through a set of objectives.

Chapter Two
Literature Review

2.1 Introduction

Infection Control is one of the prime areas of quality assurance in a Neonatal intensive care unit, and shall be strongly emphasized in the Quality Assurance Program.

Before presenting the relevant literature, it is important to know about the definitions of neonatal care:

1. Normal neonatal care (level 1), is care given, usually by the mother, in a postnatal ward supervised by the nurse and doctor but requiring minimal medical or nursing advice.
2. Special care nursery (level 2) is care given in a special care nursery which provides observation, treatment, and monitoring that exceeds normal routine care, but falls short of intensive care.
3. Intensive neonatal care unit (level 3) is care given in an intensive care nursery for seriously ill neonates who require intensive skilled management by nursing and medical staff (Chuan et al., 2001).

Because of the higher risk of spreading infectious disease in a hospital setting, higher levels of precautions are taken there. Typically, health care workers wear gloves with all patients since it is difficult to know whether a transmittable disease is present or not. Patients who have a known infectious disease are isolated to decrease the risk of transmitting the infectious agent to another person. Hospital workers who come in contact with infected patients must wear gloves and gowns to decrease the risk of carrying the infectious agent to other patients. All equipment used in an isolation room are sterilized before reuse. Immune compromised patients maybe be put in protective isolation to decrease the risk of exposure to infectious agents. Any hospital worker with infections, including colds, are restricted from that room.

Airborne infections; infections that can be transmitted through the air. Thus, care must be taken when handling infected materials so as to decrease the numbers of infectious agents that become

airborne. Special care should also be taken with hospital ventilation systems to prevent recirculation of contaminated air (Jones, 2002).

Health care-associated infections (HAIs) are considered the most frequent adverse events that threaten patient safety around the world. Around 5% to 15% of patients admitted to acute care hospitals in developed countries acquire HAIs at any given time. The risk of acquiring infection is 2 to 20 times higher in developing countries (EMRO, 2013).

Newborn infants are uniquely susceptible to infectious diseases, especially bacterial infections (BI). Serious BI in newborns is the main cause of mortality and morbidity, including sepsis, bacteremia, bacterial meningitis, urinary tract infections, pneumonia, and bacterial gastroenteritis. In developing countries, the incidence of neonatal sepsis is about 3.5- 4.3 cases per 1,000 live births (Fahmey, 2013).

Organisms that cause nosocomial infection in NICUs are most commonly transmitted by the hands of physicians, nurses, physiotherapists, and other hospital personnel. Hand hygiene has often been singled out as the most important procedure in preventing nosocomial infection (Lam et al., 2004).

Healthcare workers hands are the most common vehicle for the transmission of healthcare-associated pathogens from patient to patient and within the healthcare environment. Hand hygiene is the leading measure for preventing the spread of antimicrobial resistance and reducing healthcare-associated infections (HCAIs), but healthcare worker compliance with optimal practices remains low in most settings (Allegranzi & Pittet, 2009).

Health care-associated infection remains a major issue of patient safety. It complicates a significant proportion of patient care deliveries, adds to the burden of resource use, and contributes to unexpected deaths. Early infection control pioneers showed that surveillance and prevention programs can be successful and have set the scene for today's infection control activities. Parameters for success include those to recognize and explain health care-associated infections and implement interventions to decrease infection rates and limit antimicrobial resistance spread (Pittet, 2005).

The importance of good hand hygiene practices in NICUs cannot be overemphasized, yet many published studies conducted in intensive care units have reported that health care workers (HCWs) failed to wash their hands more than half of the recommended times. Furthermore, in many cases, the hand-washing procedure was inadequate, physicians in particular wash their hands significantly less frequently than nurses (Lam et al., 2004).

2.2 Infection transmission cycle

The chain of infection is a conceptual frame used to understand the infection process. The chain is a circle of elements, each representing a component in the cycle. Each link must be present and in sequential order for an infection to occur. The elements are: infectious agent, reservoir, portal of exit from the reservoir, mode of transmission, and portal of entry into a susceptible host. Understanding the characteristics of each element prevents the spread of infection. Awareness of this cycle provides a knowledge of methods for self-protection.

The infectious agent is a microbial organism with the ability to cause disease. These organisms include bacteria, virus, fungi and parasites. The reservoir is the place where the microorganisms can thrive and reproduce (an example is water). The portal of exit refers to the way the microorganism leaves the reservoir. The mode of transmission is the method of transfer by which the organism moves from one place to another while the portal of entry refers to an opening that allows the microorganism to enter the host. Finally, the host refers to a person who cannot resist a microorganism invading the body resulting in an infection (Lux, 2001).

2.3 Infection control and prevention

Standard Precautions are the minimum infection prevention practices that apply to all patient care, regardless of suspected or confirmed infection status of the patient, in any setting where healthcare is delivered. These practices are designed to both protect HCP and prevent HCP from spreading infections to patients. Standard Precautions include: 1) hand hygiene, 2) use of personal protective equipment (e.g., gloves, gowns, masks), 3) safe injection practices, 4) safe handling of potentially contaminated equipment or surfaces in the patient environment, and 5) respiratory hygiene/cough etiquette. Education and training on the principles and rationale for recommended practices are critical elements of Standard Precautions because they facilitate appropriate decision-making and promote adherence (CDC, 2011).

2.4 Literature review

2.4.1 Globally

Annually, approximately two million patients suffer with healthcare-associated infections (HAIs) in the USA, and nearly 90,000 are estimated to die. The overall direct cost of HAIs to hospitals ranges from US$28 billion to 45 billion. While the range is wide, HAIs are clearly expensive.
In addition, most HAIs are thought to be preventable; however, published guidelines are not congruent (Stone, 2009).

Studies in clinical areas such as adult intensive care units, where patient contact is high, showed that strict compliance with hand hygiene occupies at least one quarter of nursing time, and implementing strict practices may affect the quality of patient care, a formidable drawback. However, in NICUs, modern neonatal nursing emphasizes the concepts of minimal handling; this coupled with clustering of nursing care may make the situation become more optimistic (Lam et al., 2004).

Several unanswered questions remain and require additional studies to help understand and improve infection-control programs in developing countries. Because these interventions do not require expensive technology, developing countries should not delay the implementation of basic infection-control interventions while awaiting additional data. Resource-limited countries should develop national infection-control guidelines to reduce the rate of nosocomial infections and drug-resistant microorganisms **(**Apisarnthanarak & Fraser, 2009).

Numerous strategies to increase the frequency and effectiveness of hand hygiene indicate that education in combination with performance feedback is the most successful approach. A study by Conly et al showed that hand washing compliance rose from 28% to 81% after the introduction of an education program. This was associated with a significant drop in the nosocomial infection rate. However, after 3 years, the nosocomial infection rates rose again, and a repeated survey showed deterioration in hand-washing compliance (Conly et al., 1989).

Another controlled study by Mayer et al in an intensive care unit showed improved compliance by providing performance feedback in the form of a daily memo to staff on hand-washing frequency (Lam et al., 2004).

There is a growing demand for systems to assess the quality of care practices and services relating to hospital infection control. Such assessments can be made by means of indicators that are defined as quantitative measurements of variables, characteristics or attributes relating to a given process or system that make it possible to recognize its results, whether desirable or undesirable (Silva & Lacerda, 2011).

The knowledge of standard precautions was uniformly poor being only 55.3% amongst both the doctors and nurses. The doctors (71.3%) had significantly more knowledge of the standard precautions than the nurses (52%) (Jain et al., 2012).

2.4.2 Regionally

A similar study at Embaba general hospital in Egypt, Assessment of Infection Control Practices in a Neonatal Intensive Care Unit. It resulted with a well organized institutional system for infection control from organizational point of view in which the NICU setting has satisfactory resources (Ibrahim et al., 2011).

Another study at 16 Turkish NICUs, which measured the nosocomial sepsis rates and identified several factors that affect hand washing (such as overcrowding and understaffing in six centers, lack of time in two centers and the nurse-to-patient ratio was quite inadequate especially during night shifts) that are known to be important for infection control (Kültürsay, 2010).

2.4.3 Nationally

This study is considered the first work made at the neonatal intensive care units in the West Bank and East Jerusalem hospitals by considering all sectors providing health services, and no other study was made with similar objectives in the West Bank.

A study in Gaza strip was similar to this study which measured the adherence to infection prevention and control protocols in the neonatal intensive care units in the governmental

hospitals in Gaza governorates (Awad, 2009). The study results showed low understanding of universal precautions among health care workers; that may be related to the lack of post-employment education training (on job) about universal precautions; so a need to update the HCW's knowledge about standard precautions and on job training. And that HCWs and the neonates in their hospitals are at risk to acquire nosocomial infections because of non-adherence of HCWs to infection prevention and control due to several reasons which are: lack of training, lack of knowledge about IPC protocols and lack of some supply and equipments.

A study by (Togan & Imam, 2011) who assessed the standards of quality care and nurses performances in neonatal units at governmental hospitals in the West Bank; resulted in a positive relationship between the absence of procedure guideline and the lack of quality application. And the neonatal nurses who are older, had more years of experience and more educational degrees applied higher standards of quality care than their younger, less experienced and less educated nurses.

2.5 Summary

This chapter provides a theoretical background and evidences of the literature review. Many researches were done regarding the infection control precautions, the results of the studies were displayed.

Chapter Three

Conceptual Framework

3.1 Introduction

Infection control practice serves as a cornerstone of modern health care. However, there is minimal research on health professionals' perception of infection control practices and how those perceptions influence staff compliance with recommended protocols.

The research framework was used to explore health care professionals' attitudes and perceptions of infection control practices. Five main domains from the Palestinian infection control protocol were adopted and investigated: Hand washing, hand gloving, antiseptic usage, decontamination/cleaning and waste disposals. The thesis results indicated the importance of both respondents and hospital characteristics in determining levels of compliance with the infection control practices in hospitals. Identification of the factors that influence health workers level of compliance will be used to develop strategies to support long-term compliance with infection control practices.

3.2 Dependent variables

3.2.1. Overall compliance to infection control protocol

The compliance represents the final output from the use of infection control measures/ protocol that can be affected by the hospital or respondents (nurses and physicians) characteristics. Its measurements provide correct and realistic indications that reflect the importance of increasing infection control compliance to maintain the safety of infants' health. Meanwhile, the compliance to infection control differed from one unit to another and appeared differently depending on many factors such as lack of supplies and materials at public hospitals and lack of necessary equipment at private hospitals. In an observational study at a teaching hospital in Geneva, Switzerland, (Pittet et al., 1999) the hand washing compliance was 48%, where the non

compliance was higher among physicians (odds ratio (OR) = 2.8) than among nurses and the lowest compliance was observed on the weekends (OR = 0.6). Also, non compliance was higher in intensive care units than in internal medicine units (OR = 2.0).

The overall compliance level was calculated through the measurement of the five infection control domains that form the basis of this conceptual framework, in relation to the compliance to infection control protocol. Each domain consists of a number of constructs/ items.

3.2.2. Hand washing compliance

This study domain measures whether hand washing is a major routine procedure followed on a daily basis at the NICU level.

Some studies indicate that hand washing is suboptimal in the NICUs (Cohen et al., 2003, Thibeau et al., 2005), and that hands become progressively contaminated with commensal flora and potential pathogens during routine neonatal care (Pessoa-Silva et al., 2004). Horton and Parker (2002) state that hand washing is universally considered to be the most basic but vital infection control measure, but it is also one of the most neglected of practices. Despite all the information in studies and educational demonstrations on the importance of hand washing in infection control, healthcare workers frequently do not wash their hands adequately (Callaghan, 2007).

The CDC estimated that one third of all hospital acquired infections are caused by lack of adherence to established infection control practices such as hand hygiene (Braimoh & Udeabor, 2013).

Alcohol hand rubs are not as effective as cleaning agents, and hands that are visibly soiled or that have been contaminated by body fluids need to be washed with soap and water (Horton & Parker, 2002; Pratt et al., 2007).

The introduction of alcohol-based hand rubs may have had a positive effect on reducing colonization and HCAI rates, and their use is highly recommended (Teare et al., 2001; Fendler et al., 2002).

The hand washing statement lists the hand washing standards that should be practiced regularly by all the health workers pre and post arrival to the unit. Items were adopted from the Palestinian infection and training protocol to measure the hand washing compliance among study participants. All statement items were positively worded and measured on a 5 point Likert scale (table 3.1).

Table 3.1: Hand washing domain statements

Hand washing statements (5 point Likert scale: Strongly disagree, Disagree, Neutral, Agree, Strongly agree)
❖ Routinely wash hands with plain soap and running water ❖ Wash hands immediately when arriving at work/unit ❖ Wash hands before and after touching the newborns ❖ Wash hands before performing invasive procedures ❖ Wash hands when visibly soiled, or after touching mucus membranes, blood and body fluid ❖ Replace hand wash with alcohol hand rub when hands are visibly clean (manugel)

3.2.3. Hand gloving compliance

The use of gloves does not replace hand washing as gloves become easily contaminated, and hands are then contaminated during the removal of gloves (Pratt et al., 2007). Boyce et al (1997) and Bhalla et al (2004) found that the gloves of healthcare workers can easily be contaminated without direct contact with a colonized patient; they only require contact with the patients' bedrails and tables. Hence, in the NICU, there is the risk of contamination from a colonized patient's incubator. Horton and Parker (2002) stated that washing gloves rather than changing them is not safe. Pratt et al (2007) also cautioned that gloves may leak while appearing undamaged.

To measure the hand gloving compliance among study participants, constructs/statement items from the hand gloving domain were adopted from the Palestinian infection and training protocol. All statement items were positively worded and measured on a 5 point Likert scale (table 3.2).

Table 3.2: Hand gloving domain statements

Hand gloving statements (5-point Likert scale: Strongly disagree, Disagree, Neutral, Agree, Strongly Agree)
❖ Wear gloves prior to contact with blood and body fluids from any infant. ❖ Wear sterile gloves for invasive procedures only ❖ Gloves always used when working with isolated or immune suppressed infants ❖ Gloves are discarded (thrown) after each task and between infants.

3.2.4. Antiseptic usage compliance

The antiseptic usage construct/ statement examined the different procedures requiring the use of antiseptics. Item statements were adopted from the Palestinian infection and training protocol to measure the extent use of antiseptic among study participants. All statement items were positively worded and measured on a 5 point Likert scale (table 3.3).

Table 3.3: Antiseptic usage domain statement

Antiseptic usage statements (5-point Likert scale: Strongly disagree, Disagree, Neutral, Agree, Strongly Agree)
❖ Wash hands with antiseptics prior to starting invasive procedure (surgical hand scrub) ❖ Wash hands with antiseptics prior to touching neonates susceptible to infection. ❖ Use antiseptic solution for preparing the infant skin prior to invasive procedures ❖ Use the hospital approved antiseptic solution effective against the microorganisms.

3.2.5. Decontamination and cleaning compliance

This domain measures to what extent the cleaning and disinfecting of equipments and surfaces are used to effectively decrease and/or eliminate the number of microorganisms that are present at patient surroundings. The sources of these statements were from the Palestinian infection and training protocol. All the items/ statements were positively worded and measured on a 5-point Likert scale (table 3.4).

Table 3.4: Decontamination and cleaning domain statement

Decontamination and cleaning statements (5-point Likert scale: Strongly disagree, Disagree, Neutral, Agree, Strongly Agree)
❖ Surfaces that come with direct contact to body fluids as counters, beds etc, are cleaned using a hospital approved disinfectants ❖ Sinks and toilets are cleaned daily or more often as needed ❖ Instruments are cleaned with soap and water prior to sterilization ❖ Infants who stay long in NICU should be transferred to a clean incubator once a week.

3.2.6. Waste disposal compliance

In this study, collection of information regarding the treatment of the wastes produced by the units were requested. The following statements were taken from the Palestinian infection and training protocol. All the items/ statements were positively worded and measured on a 5-point Likert scale (table 3.5).

Table 3.5: Waste disposal domain statement

Waste disposal statements (5-point Likert scale: Strongly disagree, Disagree, Neutral, Agree, Strongly agree)
❖ Infectious waste is separated from household waste ❖ Infectious wastes are discarded in special containers as sharp boxes, heavy plastic bottle. ❖ Liquid wastes are poured down in a utility sink drain or through a flushable toilet ❖ Waste containers are kept away from sterile instruments and equipments

3.3 Study independent variables

Many studies displayed the effects of independent variables (participant/ hospital characteristics) such as sex, educational level, years of experience, profession, and trainings received on the compliance to infection precautions. In this study, many important independent variables were included in the questionnaire that might have a direct effect on the compliance level.

In this study the following independent variables were used and therefore considered important:

- **Gender:** This refers to male and female respondents,
- **Age:** This refers to the age of the respondent. Data was collected and then grouped into two groups (<30 years, ≥30 years). For instance, a study by Kirkland (2011) indicated that higher scores for workplace safety, climate, increased age, and longer nursing work experience were positively associated with compliance.
- **Job:** This refers to the profession of the respondent. It was categorized into six groups:

Neonatal nurse, Staff nurse, Aid nurse, Neonatologist, Specialist physician, Resident physician. A study for Inter-professional differences in compliance with standard precautions in operating theatres resulted with nurses being more willing to follow protocols (Cutter & Jordan, 2012).

- **Educational level:** This refers to the level of education obtained by respondents. It was categorized into three groups: 2 year Diploma, Bachelor Degree, Graduate studies.
- **Years of experience:** This refers to the years of work spent in the NICUs. It was categorized into the following: ≤ 5 years, > 5 years.
- **Trainings received:** This refers to the trainings received by the respondents that were relevant to infant care. It was categorized into five groups: training in neonatology, training in resuscitation, training in neonatology and resuscitation, other specialty training, and did not receive any specialty training.
- **Ownership:** This refers to the ownerships of the NICUs participating in this study. It was listed in three groups: Public, Private, NGOs.
- **Hospital size:** This refers to the actual sizes of the hospitals participating in this study. It was categorized into three groups: Small (<60 bed), Medium (60-150 bed), and Large (>150 bed).
- **NICU beds:** This refers to the actual infant beds at the studied NICUs. It was categorized into two groups (≤10 beds, >10 beds).

3.4 Operational definitions

This section provides the main concepts that were used in the study and their operational definitions**.**

Infection control: the discipline concerned with preventing nosocomial or healthcare-associated infection (http://en.wikipedia.org/wiki/Infection_control).

Standard precautions: guidelines recommended by the Centers for Disease Control and Prevention for reducing the risk of transmission of blood-borne and other pathogens in hospitals (medical dictionary).

Universal precautions: precautions that are taken with all blood and 'high-risk' body fluids, correctly called universal blood and body fluid precautions (Dougherty & Lister, 2011).

Infectious agent: anything that may be transmitted from one person to another or from the environment to a person and subsequently cause an infection or parasitic infestation. Infectious agents are most often micro-organisms such as bacteria or viruses (Dougherty & Lister, 2011).

Pathogen: a micro-organism that is capable of causing infection. Many micro-organisms are opportunistic pathogens; that is, they will cause infection in vulnerable individuals but not, normally, in healthy adults (Dougherty & Lister, 2011).

Infection prevention and control (IPC):
Infection: the transmission of microorganisms into a host after evading defence mechanisms, resulting in the organism's proliferation and invasion within host tissue (CDC, 2007).

Prevention: The intention to stop something before it happens (Cambridge Advanced Learner's Dictionary).

Control: to order, limit, instruct or rule something, or someone's actions or behaviour (Cambridge Advanced Learner's Dictionary).

Colonization: when micro-organisms are present on or in a person but not currently causing any harm, that person is said to be colonized with those organisms. For example, human beings are normally colonized with huge numbers of several different species of bacteria (Dougherty & Lister, 2011).

Healthcare-associated infection (HAI): a localized or systemic condition resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s) that was not present on admission to the acute care facility (CDC, 2013).

Cross-infection: the transmission of infectious agents between patients within the healthcare setting. It may be direct transmission from one person to another, or indirect. For example via an incorrectly cleaned piece of equipment (Dougherty & Lister, 2011).

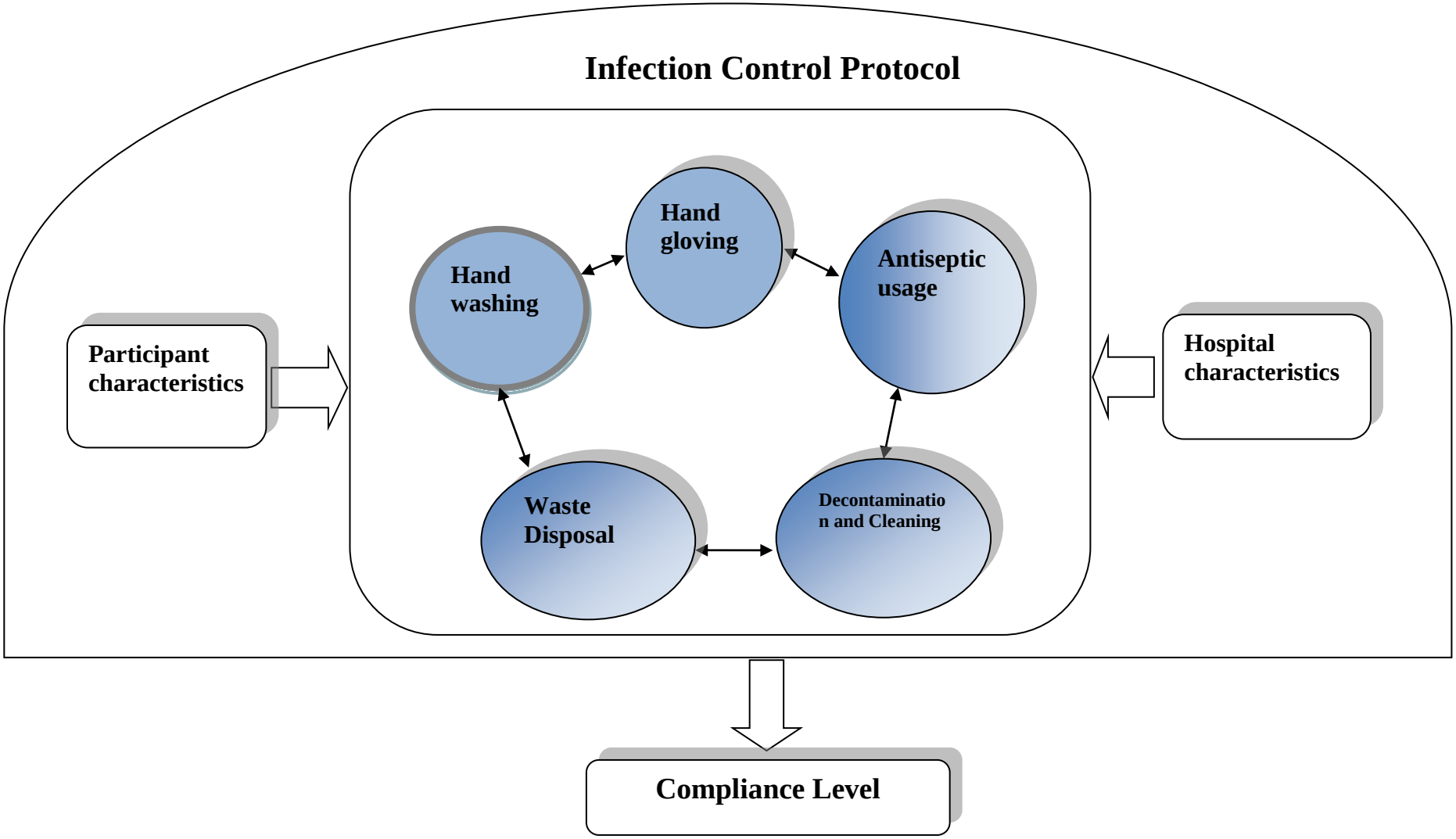
Decontamination: the process of removing foreign material such as blood, body fluids, or radioactivity. It does not eliminate microorganisms but is a necessary step preceding disinfection or sterilization (Medical dictionary).

Cleaning: The principal aim of cleaning is to remove visible dirt. It is essentially a mechanical process: the dirt is dissolved by water, diluted until it is no longer visible, and rinsed off (WHO, 2004).

Sepsis: Systemic illness caused by microbial invasion of normally sterile parts of the body (Lever & Mackenzie, 2007).

Nosocomial infection: An infection acquired in hospital by a patient who was admitted for a reason other than that infection, or an infection occurring in a patient in a hospital or other health care facility in whom the infection was not present or incubating at the time of admission, also called hospital acquired infection (WHO, 2002).

Figure 3.1: Conceptual framework model of the study



Chapter Four
Methodology

4.1 Introduction

This chapter describes the several methodologies used to assess the infection control system at the NICUs. It displays the study settings, study population, study design, instrument, data collection and data analysis.

4.2 Study setting

Neonatal intensive care services in Palestine are provided through a mix of sectors including the public (MoH), private and non-governmental organizations (NGOs), and all were covered by this study. One private hospital did not participate, bringing the targeted NICUs total to 16 hospitals. The participating hospitals with NICUs were: nine NGOs, five public and two private hospitals as listed in table (4.1).

The study covered the West Bank including East Jerusalem hospitals. Seven districts joined and hospital names were listed in each district as below.

- Hebron: 4 units were included and are named: Al Mizan hospital, Al Ahli hospital, Red Crescent Hebron and Alia hospital.
- Bethlehem: Holy Family Hospital.
- Ramallah: The Medical Complex and Red Crescent Ramallah.
- Nablus: Rafidia Hospital, Nablus Specialized Hospital, St Lukes Hospital and Al Itihad Hospital.
- Tulkarem: Thabet Thabet Hospital and Al Zakkat Hospital.
- Jenin: Jenin Governmental Hospital.
- East Jerusalem: Al Makkassed Hospital and Red Crescent Maternity Hospital Jerusalem.

Table 4.1: Distributions of Palestinian NICUs in relation to hospital ownership in the West Bank and East Jerusalem Hospitals

Governorate	Ownership			Total
	MoH	NGO	Private	
Hebron	1	2	1	4
Bethlehem	-	1	-	1
Ramallah	1	1	-	2
Nablus	1	2	1	4
Tulkarem	1	1	-	2
Jenin	1	-	-	1
East Jerusalem	-	2	-	2
Overall total	5	9	2	16
Percentages	31.25%	56.25%	12.50%	100%

4.3 Study population

The study population are all health care providers, the nurses and physicians who have direct contact with the patients in the 16 Palestinian NICUs. The inclusion criteria were those who worked in the studied NICUs not less than 3 months before the administration of questionnaires and have direct contact with the patients.

The total sample included 305 individuals (79 physician and 226 nurses) who represented the whole population. However, after the researcher filtered the questionnaires for answers completion, only 209 questionnaires were accepted and taken into consideration for this study of which 41 physicians (neonatologists, paediatricians and resident doctors) and 168 nurses (neonatal nurses, staff nurses and practical nurses), making a response rate of 68.5% (table 4.2).

Table 4.2: Total distributed and collected questionnaires among nurses and physicians

Hospital name	No Distributed nurses	No. distributed doctors	Collected nurses	Collected doctors	Total distributed	Total collected	Response rate %
Tulkarem	13	6	10	4	19	14	**73.7**
Al Zakkat	9	5	9	3	14	12	**85.7**
Nablus specialized	11	1	6	0	12	6	**50.0**
Alia government	17	8	17	6	25	23	**92.0**
Medical Complex	12	4	12	3	16	15	**93.8**
Al Mizan	13	5	13	3	18	16	**88.9**
Holy Family Hospital	19	7	17	6	26	23	**88.5**
Red Crescent Hebron	17	6	17	3	23	20	**87.0**
Rafidia government	21	8	11	3	29	14	**48.3**
Red Crescent Jerusalem	12	5	10	0	17	10	**58.8**
Al-Ahli	10	6	10	1	16	11	**68.8**
Al-Itihad	13	4	10	3	17	13	**76.5**
Red Crescent Ramallah	9	3	5	0	12	5	**41.7**
Al Makassed	34	7	13	3	41	16	**39.0**
Jenin governmental	11	3	4	2	14	6	**42.9**
St.Lukes	5	1	4	1	6	5	**83.3**
Total	226	79	168	41	305	209	**68.5**

Differences in response rates were clearly seen between the participating NICUs. The highest response rate (93.8%) came from the Medical Complex hospital in Ramallah, and the lowest response rate (39%) came from Al Makassed hospital.

The returned questionnaires were mostly from staff nurses, and the neonatologists were the least represented group. The distributions of the filled questionnaires in regards to the job of respondents are listed in table (4.3).

Table 4.3: Distribution of accepted questionnaire among job of respondents

Respondents	Numbers	Percentages
Nurses	168	55.0 %
1. Neonatal nurse	28	
2. Staff nurse	76	
3. Aid nurse	64	
Physicians	41	13.45%
1. Neonatologists	5	
2. Specialist	11	
3. Resident	25	
Total		68.5%

4.4 Study design

A quantitative, descriptive, cross sectional design was used to assess the infection control system at Neonatal units. Data was collected between March and August 2012. A 305 questionnaire was administered to all the nurses and physicians working in the 16 NICUs.

4.5 Instruments

Two instruments, a questionnaire and a check list (annex1, annex2), were used to collect the data. A self administered questionnaire developed from the Palestinian infection prevention and control training protocols that was updated in 2010 by the Palestinian Ministry of Health and the infection control guidelines for East Jerusalem hospitals (2005) were used to assess the physicians and nurses knowledge, attitudes, and perceptions.

The questionnaire was prepared in the English language because it is related and extracted from the Palestinian infection prevention and control training protocols which is written in English.

The second tool is a hospital infection control structure assessment checklist. This was prepared by taking into consideration the system requirement, the recommended guidelines for the NICU design (White, 2006), and recommended standards for infection control in NICU (Lam et al., 2001).

This tool collects general hospital information, applied infection control practices, structure of the neonatal unit, parental nutrition and medication preparation, infection surveillance system, and availability of equipment and material.

The participant survey (annex1) takes approximately 10-15 minutes to complete. The questionnaire consists of three parts; the first part collects personal and professional information such as job position, qualifications, years of experience, and special trainings in neonatology. The second part consists of five infection control domains and 22 questions scored on a five point Likert-type response scale indicating the level of agreement ranging from '1' strongly disagree to '5' strongly agree (strongly disagree, disagree, neutral, agree, strongly agree). Part three is related to the barriers for implementation/ adherence to the infection control practices, and included 16 questions also scored on a five point Likert scale.

Both tools were validated by six qualified personnel who are experts and specialists in infection control. The internal consistency was assessed by means of Cronbach's α. This could range from 0.00 to 1.00 and the higher the coefficient was, the more exact (internally consistent) the measurement would be. The results showed an acceptable level of internal reliability. Reliability levels were ranged from 0.70 for Hand Gloving to 0.85 for Antiseptic usage.

4.6 Data collection

A formal letter was sent to the targeted hospitals asking for permission to conduct this study. Al-Quds University review board approved the study. Approvals were received from MoH, Private and NGO hospitals; some were written and the others were verbally notified.

The first questionnaire (annex 1) was distributed directly to the nurses and physicians by hand or was kept with head of NICUs to be distributed to all the staff, and by giving a period of two weeks in order to reach all staff at each unit, they were collected from the nursing head manager upon completion. The participation was voluntary and participants were provided with information about the aim of the study and that the data will be treated with confidentiality.

The second questionnaire (annex 2) is a hospital checklist that was completed with the NICUs head nurse, physician, or the nursing director. A tour to observe each unit was also conducted.

4.7 Data analysis

After completing data collection, entering of data started by using the Statistical Package for Social Sciences version 19. Response scores were converted from 5-likert scale to a 100-point scale using a SAQ (Safety Attitudes Questionnaires) computation formula.

Descriptive statistics including frequencies and percentages were produced for all domains. Some items were grouped together to measure the infection control compliance. The percentages of positive responses (agree and strongly agree) were calculated in order to identify areas of strength or areas for potential improvement.

A Bivariate analysis test for the purpose of determining the relationship between variables were used to test the association between composite infection control compliance score and different respondent and hospital characteristics. A p value <0.05 was considered statistically significant in the analysis of the data.

A scale was used to describe the findings of data regarding the strength of the issue as high was considered $\geq$80%, moderate was between 60-79% and low was <60%.

The second tool which is the hospital performance checklist (annex 2) was analyzed manually.

4.8 Ethical considerations

Approvals were obtained from all intended hospitals. The participation in the study was voluntary and confidential; the participants were informed about the study purpose and were given explanation about the importance of their participation to reflect the actual situation.

4.9 Summary

This chapter provides an overview of the methodology that was used in this study. It describes the study setting, study population, study design, instrument, data collection and data analysis.

Chapter Five

Results

This chapter presents the findings and results of the study "assessment of the infection control system in neonatal intensive care units in West Bank and East Jerusalem hospitals".

The first section includes three parts. Part one presents the participants and hospitals characteristics. Part two presents the compliance to infection control domains which are hand washing, hand gloving, antiseptic usage, decontamination/cleaning and waste disposals domains extracted from the Palestinian infection prevention and control training protocols (MoH, 2010). Part three presents the barriers to adherence and implementation of the infection control protocol. The data presented in section one is based on respondent's answers to the survey questions. Whereas, section two in this chapter displays the NICUs structural setting concerning requirements of infection control, surveillance and reporting system, structure requirement, feed and medication management, equipment use, disposable supplies use, waste management, and human resources. Section three shows the compliance level by participants and hospitals characteristics. Section four gives feedback for barriers to adhere to or implement the infection control protocol by hospital ownership and respondent's job.

5.1 Section One: Respondent's answers to the survey questions

5.1.1 Participants and hospitals characteristics

Table 5.1 shows the distribution of participants by the hospital characteristics. Out of the distributed questionnaires to the 305 nurses and doctors who come into direct contact with the infant in the 16 NICUs, 209 questionnaires were returned. The response rate was 68.5%.

Alia hospital in Hebron and Holy family hospital in Bethlehem had the largest number of participants (11% each), and the least participants were from two hospitals, Red Crescent Ramallah and St. Lukes hospital in Nablus with 2.4 % each. But Medical complex hospital has the highest response rate among its participants.

Three sectors provide neonatal services within the studied hospitals, the distribution of participants according to hospital ownerships were mostly from NGO hospitals (55.0%), 34.4% were from public hospitals, 10.5% from private hospitals. With regard to hospital size: most of the participants (40.7%) were from large in sized hospitals (>150 beds), 38.8% from small sized (<60 beds) hospitals, and 20.6% from medium sized (60-150 bed) hospitals. As for the size of NICUs, the results show that 54.5% of the participants work in NICUs that can accommodate more than 10 patients (table 5.1).

Table 5.1: Distribution of participants by hospital characteristics

Hospital	N	%
Tulkarem-Government	14	6.7
Zakat-Tulkarem	12	5.7
Nablus specialized	6	2.9
Alia-Government	23	11.0
Med. Complex- Government	15	7.2
Al Mizan	16	7.7
Holy Family	23	11.0
Red Crescent Hebron	20	9.6
Rafidia-Government	14	6.7
Red Crescent Jerusalem	10	4.8
Al Ahli Hebron	11	5.3
Al Itihad-Nablus	13	6.2
Red Crescent- Ramallah	5	2.4
Al Makassed	16	7.7
Jenin-Government	6	2.9
St.Luke's Nablus	5	2.4
Total	209	100%
Ownerships		
Public	72	34.4
Private	22	10.5
NGO	115	55.0
Total	209	100%
Hospital size		
Small (<60 bed)	81	38.8
Medium (60-150 bed)	43	20.6
Large (>150 bed)	85	40.7
Total	209	100%

NICU beds		
≤10	95	45.5
>10	114	54.5
Total	209	100%

N=frequency, %=percentages

Table 5.2: Characteristics of the participants/respondent

Gender	N	%
Male	82	39.2
Female	127	60.8
Total	209	100%
Age	N	%
<30	130	62.2
≥30	79	37.8
Total	209	100%
Job	N	%
Neonatal nurse	28	13.4
Staff nurse	76	36.4
Aid nurse	64	30.6
Neonatologist	5	2.4
Specialist Physician	11	5.3
Resident physician	25	12.0
Total	209	100%
Education level	N	%
Diploma (2Yrs)	64	30.6
Bachelor	105	50.2
Graduate studies	40	19.1
Total	209	100%
Years of Experience	N	%
≤5 years	126	60.3
>5 years	83	39.7
Total	209	100%
Trainings Received	N	%
Training in Neonatology	38	18.2
Training in resuscitation	72	34.4
Training in Neonatology and Resuscitation	20	9.6
Other specialty training	18	8.6
Did not receive any specialty training	61	29.2
Total	209	100%

Table (5.2) presents the characteristics of the respondents. The majority of respondents were females (60.8%), and mostly less than 30 year of age (62.2%). The respondents' job positions were (36.4%) staff nurses, (30.6%) aid nurses, 13.4% neonatal nurses, 12.0% resident doctors, 5.3% specialist physician and 2.45% neonatologists.

About half of the respondents (50.2 %) had a bachelor degree, 30.6% had a diploma degree, and 19.1% had graduate studies qualifications. The respondents' years of experience in NICUs were mostly less than or equal to 5 years (60.3%). The respondents' training courses received relevant to neonatology were higher in resuscitation trainings (34.4%), followed by training in neonatology (18.2%), neonatology and resuscitation (9.6%), and 8.6% received other specialty trainings. However, 29.2% indicated that no specialized training courses received were relevant to neonatology.

The table (5.3) below presents the data regarding the applied infection control program from the respondents' view; whereas 51.2% of respondents indicated that they did not receive any infection control training courses in the last 2 years and 87.1% feel that they need more training on infection control protocol. Meanwhile, 78.0% of respondents indicated that they have access to infection control protocol when needed. And 74.6% believe that system enforce implementation of infection control protocol at their hospital.

Table 5.3: Infection control program

Received any infection control training courses in the last two years	N	%
Yes	102	48.8
No	107	51.2
Total	209	100%
Feel a need to training more about infection control protocol	N	%
Yes	182	87.1
No	27	12.9
Total	209	100%
Access to infection protocol when needed	N	%
Yes	163	78.0
No	46	22.0
Total	209	100%

Believe that system enforce implementation of infection control protocol at the hospital	N	%
Yes	156	74.6
No	53	25.4
Total	209	100%

5.1.2. Compliance to infection control protocol

This part shows the responses of the participants on the level of compliance to the different domains extracted from the Palestinian infection control protocol.

5.1.2.1 Hand washing domain

Hand washing domain received a relatively high percentage of positive responses as 84.3% responded agree and strongly agree (table 5.4). This domain included six items, and all of them got positive responses except for one item "to replace hand wash with alcohol hand rub when hands are visibly clean (manugel)", which received moderate positive responses (65.6%). All of the other items received high positive responses as listed in table 5.4.

This reveals a high compliance rate of the participants to the protocol with regard to hand washing practices.

Table 5.4: Hand washing domain

Hand washing				
Item	Mean 5- points	Mean 100- points	SD	% Positive responses
Routinely wash hands with plain soap and running water	4.38	84.56	1.04	88.0
Wash hands immediately when arriving at work/unit	4.38	84.56	0.84	86.6
Wash hands before and after touching the newborns	4.48	87.08	0.77	92.3
Wash hands before performing invasive procedures	4.44	86.12	0.83	88.5
Wash hands when visibly soiled, or after touching mucus membranes, blood and body fluids	4.37	84.44	0.91	84.7
Replace hand wash with alcohol hand rub when hands are visibly clean (manugel).	3.71	67.82	1.08	65.6
Total hand washing domain	4.29	82.83	15.51	84.3
Cronbach's Alpha				0.809

5.1.2.2 Hand gloving domain

The results show high compliance with the protocol hand gloving practices which received 81.2% of positive responses (table 5.5). High compliance (86.1% positive responses) was indicated with wearing gloves prior to contact with blood / body fluids from any infant or with discarding gloves (thrown) after each task and between contacts with different infants. However, lower compliance with wearing sterile gloves for invasive procedures only was indicated as it received only 73.7% positive responses.

Table 5.5: Hand gloving domain

Hand gloving				
Item	Mean 5-points	Mean 100-points	SD	% Positive responses
Wear gloves prior to contact with blood and body fluids from any infant	4.28	82.05	0.91	86.1
Wear sterile gloves for invasive procedures only	3.97	74.28	0.98	73.7
Gloves always used when working with isolated or immune suppressed infants	4.08	77.03	1.06	78.9
Gloves are discarded (thrown) after each task and between infants	4.32	83.01	0.90	86.1
Total hand gloving domain	4.16	79.86	15.83	81.2
Cronbach's Alpha				0.70

5.1.2.3 Antiseptic usage domain

The level of compliance to using antiseptic solutions provided at each hospital setting was relatively high, and received 82.05% positive responses (table 5.6). The lowest score was for "Use antiseptic solution for preparing the infant skin prior to invasive procedures" (78.5%), and the highest scores were for "Wash hands with antiseptics prior to starting invasive procedure (surgical hand scrub)" with 85.6% positive response, then "Use the hospital approved antiseptic solution effective against the microorganisms" with 82.3% positive response, and finally, "Wash hands with antiseptics prior to touching neonates susceptible to infection" with a score of 81.8%.

Table 5.6: Antiseptic usage domain

Antiseptic				
Item	Mean 5-points	Mean 100-points	SD	% Positive responses
Wash hands with antiseptics prior to starting invasive procedure(surgical hand scrub)	4.18	79.66	0.93	85.6
Wash hands with antiseptics prior to touching neonates susceptible to infection	4.10	77.51	0.94	81.8
Use antiseptic solution for preparing the infant skin prior to invasive procedures	4.04	76.07	0.99	78.5
Use the hospital approved antiseptic solution effective against the microorganisms	4.07	76.91	0.85	82.3
Total antiseptic use domain	4.10	78.29	17.88	82.05
Cronbach's Alpha				0.850

5.1.2.4 Decontamination and cleaning domain

The compliance score to the cleaning and decontamination domain was also relatively high with a percentage of 79.28% (table 5.7). Two items received high scores, 'Sinks and toilets are cleaned daily or more often as needed' and 'Instruments are cleaned with soap and water prior to sterilization', with 80.80% and 83.70% respectively, but lower compliance was observed in the items "Infants who stay long in NICUs should be transferred to a clean incubator once a week" received only 74.6% and "Surfaces that come with direct contact to body fluids as counters, beds etc, are cleaned using a hospital approved disinfectants" received 79.28% of positive responses.

Table 5.7: Decontamination and cleaning domain

Decontamination and cleaning				
Item	Mean 5-points	Mean 100-points	SD	% Positive responses
Surfaces that come with direct contact to body fluids as counters, beds etc, are cleaned using a hospital approved disinfectants	3.9	74.04	0.90	78.0

Sinks and toilets are cleaned daily or more often as needed	3.9	74.88	0.90	80.8
Instruments are cleaned with soap and water prior to sterilization	4.04	76.19	0.79	83.7
Infants who stay long in NICUs should be transferred to a clean incubator once a week	3.97	74.40	0.91	74.6
Total decontamination and cleaning domain	3.99	75.24	16.41	79.28
Cronbach's Alpha				0.784

5.1.2.5 Waste disposals domain

Waste disposals are a major issue in the infection control system within hospitals. The results showed high compliance percentage to waste disposal measures with 80.03% (table 5.8), 86.6% of the respondents indicated that "Infectious wastes are discarded in special containers as sharp boxes, heavy plastic bottle "and 84.7% indicated that "Waste containers are kept away from sterile instruments and equipments." There was moderate agreement ,72.3%, with the item ''Infectious waste is separated from household waste,'' and 76.5% agreed that "Liquid wastes are poured down in a utility sink drain or through a flushable toilet".

Table 5.8: Waste disposals domain

Waste disposal				
Item	Mean 5-points	Mean 100-points	SD	% Positive responses
Infectious waste is separated from household waste	3.95	73.80	0.88	72.3
Infectious wastes are discarded in special containers as sharp boxes, heavy plastic bottle	4.19	79.90	0.82	86.6
Liquid wastes are poured down in a utility sink drain or through a flushable toilet	3.92	73.20	0.80	76.5
Waste containers are kept away from sterile instruments and equipments	4.18	79.54	0.81	84.7
Total waste disposals domain	4.06	76.98	16.37	80.03
Cronbach's Alpha				0.845

5.1.3. Barriers to adherence and implementation of the infection control protocol

Table 5.9 shows the ratings of the participants on the barriers for adherence to or implementation of the infection control protocol or practices in the studied NICUs. The barriers were listed according to the percentages of positive responses received by the participants.

Table 5.9: The Barriers for infection control protocol implementation

Barriers				
Item	Mean 5-points	Mean 100-points	SD	% Positive responses
Lack of training on the infection control protocol	3.38	59.44	1.10	57.5
Lack of supplies and materials	3.36	58.97	1.17	56.0
The hospital recommended antiseptic that irritates my skin	3.46	61.60	1.15	54.6
Lack of staff and high workloads	3.40	58.97	1.10	54.5
Lack of knowledge and skills of the infection control practices	3.31	57.65	1.21	54.1
Lack of necessary equipments	3.30	58.37	1.17	52.6
Lack of motivation	3.45	61.24	1.15	52.6
Lack of job satisfaction	3.20	54.78	1.19	49.8
Lack of surveillance and performance measures system	3.30	57.77	1.15	49.8
Insufficient time required for each task	3.30	56.57	1.10	47.8
Lack of quality improvement and patient safety program	3.23	55.74	1.15	46.0
Lack of follow up and supervision	3.10	53.58	1.20	45.5
Lack of hand rub dispensers per patient beds (manugel)	3.12	52.99	1.18	43.5
lack of recognition of hand hygiene opportunities during patient care	3.15	53.70	1.20	43.0
Lack of teamwork environment in the NICUs	3.02	50.47	1.20	39.3
Poor culture towards patient safety	3.10	52.15	1.17	39.2

Generally, the ratings on the barriers for the implementation of the infection control system were relatively close in range between 57.5% “lack of training on the infection control protocols” to about 39.3% for the “lack of teamwork environment in the NICUs”, or to the

"poor culture towards patient safety" (39.2%). The lack of supplies and materials was among main factors (56%), hospital recommended antiseptic that irritates my skin (54.6%), lack of staff and high workloads (54.5%), lack of knowledge and skills of the infection control practices (54.1%), lack of necessary equipments and lack of motivation (52.6%), lack of job satisfaction and lack of surveillance and performance measures systems (49.8%), insufficient time required for each task (47.8%), lack of quality improvement and patient safety program (46%), lack of follow up and supervision (45.5%), lack of hand rub dispensers per patient beds "manugel" (43.5%) and lack of recognition of hand hygiene opportunities during patient care (43%).

5.2 Section Two: NICUs structural setting

This section provides the data collected on the setting, structure and conditions of the studied NICUs in addition to the infection control prevention practices and policies. The data was collected through the study checklist (annex 2) in the interview conducted with the 16 NICUs responsible nurses in the studied hospitals and by observation. Descriptive analysis of the results was done to produce numbers and percentages of the hospitals applying or having these elements. The detailed results of this section are provided in (annex 3).

5.2.1 Requirement of infection control

Table 5.10 lists the important elements required for infection control according to the recommendation from the Palestinian infection control and training protocol. All hospitals (100%) have microbiological laboratory, water at unit and antiseptic soap available. An infection control committee was found in most of the units (87.5%). The infection control guidelines and manugel (hand rub solution) were available in 81.25%. In addition, 62.50% of the studied NICUs had one sink for every five or more beds.

Table 5.10: Requirement of infection control

Item	Infection control committee	Infection control guideline available	Microbio-logical laboraty	Water availability	Sink to bed ratio	Antiseptic soap availability	Manugel availability
F	14	13	16	16	10	16	13
%	87.5	81.25	100.0	100.0	62.5	100.0	81.25

F: frequency, the number of hospitals that have the item; %: percentage.

5.2.2 Surveillance and reporting system

Availability of infection surveillance towards hospital acquired infection for both staff and patient including analysis of the data and preparation of report for either to unit manager, unit supervisor, chief medical officer, hospital manager or ministry of health is an important element of infection control system at hospitals. While only half of the studied NICUs/ hospitals have staff surveillance infection systems, only 7 (43.75%) of the hospitals have infant surveillance systems. Meanwhile, except for one hospital, all the studied NICUs have or prepare infection surveillance reports (table 5.11).

Table 5.11: Surveillance and reporting system

Items	Staff surveillance	Infant surveillance	Infection surveillance report	Reporting system
F	8	7	15	15
%	50.0	43.75	93.75	93.75

F: frequency, the number of hospitals that have the item; %: percentage.

5.2.3 Structure requirement

The building structure of the studied NICUs was surveyed according to the ventilation structure requirement of the unit and the build in resources. Mechanical, electrical, and gas supply for each bed were available in most of the units (87.5%), and 14 units that had isolation rooms within the NICUs. ‘Isolation door(s) able to be closed’ were seen in 12 units only

(75%), whereas ‘isolation window(s) opens to public area’ were seen in 7 units. Neither unit was supported with a negative pressure filtration system for the isolation room, and only 7 units (43.75%) had a separated ventilation system for an isolation room as listed in (table 5.12).

Table 5.12: Structure requirement

Items	Mechanical, Electrical and gas supply at each bed	Isolation room within NICU	Isolation window opens to public area	Isolation door able to be closed	Ventilation system for isolation is separate from the unit	Isolation room supported with negative pressure
F	14	14	7	12	7	0
%	87.5	87.5	43.75	75.0	43.75	0.0

F: frequency, the number of hospitals that have the item; %: percentage.

5.2.4 Feeding and medications management

Feeding and medication administration are vital components to the infants treatment process; preterm infants rely on parental nutrition for long periods.

Out of the studied NICUs, only 13 units has similarities in ‘medications that are prepared beside patient’ (81.25%). The rest of units prepared their medications in a special room, and more than half of the units prepared the feeding in a special room (62.5%). Nine units prepares their intravenous solution beside the patient (56.25%), few units prepared it on the nurses' counter (18.75%) and two units prepared it in a special room and under sterile conditions (12.5%), as shown in (table 5.13).

Table 5.13: Feeding and medications management

Medications are prepared in	F	%	Feeding is prepared in	F	%	Intravenous solution is prepared in	F	%
Beside patient	13	81.25	Beside patient	6	37.5	Beside patient	9	56.25
Special room	3	18.75	Special room	10	62.5	On the nurses counter	3	18.75
						Special room	2	12.5
						Under sterile field	1	6.25
						Under laminal flow	1	6.25

F: frequency, the number of hospitals that have the item; %: percentage.

5.2.5 Equipment use

The single use equipment is preferred to be specific to each baby in these units allocated to use as recommended by the CDC. Most units provided a tourniquet to each infant (n=15; 93.75%), 14 NICUs provided a thermometer to each infant (87.50%), 11 NICU provided a stethoscope to each infant (68.75%), and ten units provided masks and Ambu bagging to the infants (62.50%). The blood pressure cuff was the equipment found in the least amount of units that provided equipment for each individual infant (56.25%), as presented in (table 5.14).

Table 5.14: Equipment use

Items	Thermometer	Stethoscope	Tourniquet	Mask and Ambu bagging	Blood pressure cuff
N	14	11	15	10	9
%	87.5	68.75	93.75	62.50	56.25

N: the number of hospitals that have the item; %: percentage.

5.2.6 Disposables supply use

Disposable supplies were used once for single procedures at the unit. Disposables included sterile gloves, disposable gloves, head masks, overshoes and disposable gowns that were always available in all the studied NICUs (100%). The head covers were present in all hospitals except one unit (93.75%), as in (table 5.15).

Table 5.15: Disposables supply use

Items	Sterile gloves	Gloves	Head masks	Overshoes	Gown	Head covers
N	16	16	16	16	16	15
%	100.0	100.0	100.0	100.0	100.0	93.75

N: the number of hospitals that have the item; %: percentage.

5.2.7 Waste management

The waste clearance system is a complementary issue to infection control. Table 5.16 provides information about the waste clearance system in response to the availability of sharp dispensers and proper treatment of wastes in the studied units. All NICUs have sharp dispensers (100%), and all hospital sharps and medical wastes are treated properly according to Palestinian protocol (100%).

Table 5.16: Waste management

Items	Sharp dispensers available	Sharps and medical wastes are treated properly according to Palestinian protocol
N	16	16
%	100.0	100.0

N: the number of hospitals that have the item; %: percentage.

5.2.8 Human resources

The human resources are the cornerstone for running NICUs. In this survey, the doctors and nurses are the center of the vision. However, the number of nurses was the main focus. Ten units had a nursing number ranging between 11-20 (62.50%). Meanwhile, two units had the highest number of nurses between 21-34 (12.5%), and only 4 units had a nurses' number ranging between 5-10 (25%). The patient to nurse ratio percentages in the studied units were close to each other with a little rise in one nurse to 3 or more patients (56.25%).

Table 5.17: Human resources

Number of nurses	N	%
5-10	4	25.0
11-20	10	62.5
21-34	2	12.5
Patient to nurse ratio		
1:<3	7	43.75
1:≥3	9	56.25

N: the number of hospitals that have the item; %: percentage.

5.3. Section Three: Compliance level by participant and hospital characteristics

Table 5.18 shows the unadjusted bivariate analysis between the overall infection control compliance score (the total score of the protocol domains) and the participants' characteristics. The results show that only the age of participants (nurses/ physicians) and the type of training/education received in neonatology were significantly associated with the overall score. Participants aged ≥30 years assigned higher score than younger participants (p=0.045), and those received training in neonatology and resuscitation had significantly higher score than their counterparts (p=0.026).

Table 5.18: Compliance with infection control domains by respondent's characteristics

	Respondent characteristic	Mean	SE	F	P value
1.	Age			4.052	0.045
	<30	76.91	1.35		
	≥30	80.93	1.27		
2	Gender			0.321	0.571
	Male	77.74	1.56		
	Female	78.87	1.24		
3.	Job of respondent			0.646	0.665
	Neonatal nurse	78.12	4.14		
	Staff nurse	79.16	1.54		
	Aid nurse	76.59	1.51		
	Neonatologist	85.66	4.91		
	Specialist physician	81.81	3.30		
	Resident doctor	78.31	2.29		
4.	Education level			1.014	0.365
	Diploma (2Yrs)	76.59	1.51		
	Bachelor	78.75	1.24		
	Graduates studies	80.53	3.06		
5.	Experience			0.705	0.402
	≤5	77.76	1.28		
	>5	79.44	1.48		
6.	Training/education in neonatology			2.835	0.026
	Training in neonatology	74.97	2.78		
	Training in resuscitation	78.28	1.79		
	Training in neonatology and resuscitation	87.60	2.77		
	Other specialty training	78.81	2.59		
	Did not receive any specialty training	77.64	1.37		

In addition, we compared overall compliance score with the hospital characteristics, namely ownership, bed size, occupancy rate, the average number of monthly admitted patients to the NICUs, and patient to nurse ratio in the NICUs. The results in Table 5.19 show that no significant difference was observed in the overall score in relation to any of the hospital characteristics ($p>0.05$).

Table 5.19: Compliance with infection control domains by hospital' characteristics

	Hospital characteristic	Mean	SE	F	P value
1.	Ownership			2.534	0.082
	Public	78.21	1.59		
	Private	75.92	1.86		
	NGO	81.29	1.54		
2.	Unit size			2.083	0.150
	≤10 beds	76.89	1.21		
	>10 beds	79.71	1.46		
3.	Occupancy rate			1.742	0.188
	≤75	75.79	2.17		
	>75	79.05	1.08		
4.	Patient admissions/month			2.275	0.105
	<30	75.32	2.09		
	30-60	80.36	1.36		
	>60	77.62	1.80		
5.	Patient/nurse ratio			0.078	0.780
	1 to <3	78.73	1.24		
	1 to ≥3	78.18	1.45		

We also compared the overall compliance score with the availability of different infection control system elements including availability of infection control committee, guidelines, availability of staff and infant surveillance system, and regular infection reporting system. The results in Table 5.20 show that except for the availability of infant and staff surveillance systems the other factors were not significantly associated with the overall compliance scores. While NICUs with infants surveillance system significantly had higher score ($p<0.001$), hospitals with staff surveillance system had significantly lower overall compliance score ($p<0.031$). This can be analyzed that NICUs with infant surveillance system were more compliant to infection control protocol than from NICUs which have a staff surveillance system.

Table 5.20: Compliance with infection control domains by different infection control system elements

	Infection control system	Mean	SE	F	P value
1.	I.C. Committee			1.625	0.204
	Yes	77.80	1.08		
	No	80.87	2.20		
2.	I. C. Guidelines			0.252	0.616
	Yes	78.16	1.04		
	No	79.31	2.41		
3.	Staff surveillance system			4.716	0.031
	Yes	76.17	1.68		
	No	80.38	1.06		
4.	Infant surveillance system			12.459	0.001
	Yes	81.70	1.27		
	No	75.00	1.41		
5.	Regular Infection reporting system			0.044	0.833
	Yes	78.40	0.99		
	No	79.75	2.01		

We also examined the variability of the dimension of infection control mean scores by participating NICUs using ANOVA. A two-tailed P value <0.05 was considered statistically significant as shown in Figure 5.1.

The results in Figure 5.1, describes the variations in compliance to infection control protocol domains between participating NICUs. Infection control domains score significantly varied between the NICUs ($p<0.05$). Alphabetical coding was given for the participating NICUs for confidentiality reasons. NICU 'A' had the highest compliance score among other NICUs in Hand washing, Antiseptic usage and Decontamination/cleaning domains. While, NICU 'N' received the highest compliance mean score in Hand gloving and Waste disposals domains, but NICU 'H' received the lowest compliance mean scores for infection control domains among its counterparts.

Figure 5.1: Mean score of compliance to infection control protocol domains by NICU

Dimension	F	P value
Hand washing	1.72	0.049
Hand gloving	2. 93	0.00
Antiseptic usage	4.30	0.00
Decontamination and cleaning	3.16	0.00
Waste disposals	3.67	0.00

5.4. Section Four: Barriers to adherence/ implementation to the infection control protocol

Table 5.21 displays the ANOVA analysis between implementation barriers, the infection control protocol, and the hospital ownership. The results show that three barriers were significantly associated with the hospital ownership, which are: Insufficient time required for each task (p=0.001), Lack of supplies and materials (p<0.001) which were higher in public hospitals, and lack of necessary equipments (p<0.001) which was a little bit higher in private hospitals.

Table 5.21: Barriers with implementation to the infection control protocol by hospital ownership

	Barriers	Mean	SE	F	P value
1.	Lack of knowledge and skills of the infection control practices			0.010	0.990
	Public	3.32	0.156		
	Private	3.32	0.250		
	NGO	3.30	0.108		
2.	Lack of training on the infection control protocol			0.342	0.711
	Public	3.44	0.123		
	Private	3.45	0.225		
	NGO	3.32	0.104		
3.	lack of recognition of hand hygiene opportunities during patient care			0.557	0.574
	Public	3.25	0.137		
	Private	3.23	0.254		
	NGO	3.07	0.114		
4.	Lack of teamwork environment in the NICUs			0.440	0.645
	Public	2.96	0.143		
	Private	2.86	0.274		
	NGO	3.09	0.114		
5.	Lack of follow up and supervision			1.422	0.244
	Public	3.04	0.139		
	Private	2.86	0.257		
	NGO	3.26	0.112		
6.	Lack of staff and high workloads			2.118	0.123
	Public	3.57	0.123		
	Private	3.14	0.240		
	NGO	3.27	0.106		
7.	Insufficient time required for each task			7.751	0.001
	Public	3.67	0.119		
	Private	3.00	0.237		

	NGO	3.06	0.104		
8.	Lack of supplies and materials			11.332	p<0.001
	Public	3.78	0.124		
	Private	3.73	0.230		
	NGO	3.03	0.109		
9.	Lack of necessary equipments			16.028	p<0.001
	Public	3.81	0.111		
	Private	3.82	0.193		
	NGO	2.95	0.112		
10.	The hospital recommended antiseptic that irritates my skin			1.380	0.254
	Public	3.58	0.141		
	Private	3.68	0.241		
	NGO	3.35	0.104		
11.	Lack of job satisfaction			0.858	0.426
	Public	3.29	0.132		
	Private	3.36	0.233		
	NGO	3.10	0.117		
12.	Lack of motivation			1.064	0.347
	Public	3.46	0.125		
	Private	3.77	0.207		
	NGO	3.38	0.115		
13.	Lack of quality improvement and patient safety program			1.836	0.162
	Public	3.31	0.129		
	Private	3.59	0.260		
	NGO	3.11	0.109		
14.	Poor culture towards patient safety			2.804	0.063
	Public	2.99	0.130		
	Private	3.64	0.224		
	NGO	3.04	0.113		
15.	Lack of surveillance and performance measures system			0.476	0.622
	Public	3.38	0.127		
	Private	3.45	0.215		
	NGO	3.24	0.114		
16.	Lack of hand rub dispensers per patient beds (manugel)			2.029	0.134
	Public	3.24	0.126		
	Private	3.45	0.215		
	NGO	2.98	0.118		

Moreover, we analyzed associations between barriers to adhere to the infection control protocol and job of respondents. Table (5.22) shows that there were no significant differences between any of the barriers with the job of respondents (P>0.05).

Table 5.22: Barriers with implementation to the infection control protocol by job of respondent

	Barriers	Mean	SE	F	P value
1.	Lack of knowledge and skills of the infection control practices			1.162	0.329
	Neonatal nurse	3.21	0.259		
	Staff nurse	3.49	0.126		
	Aid nurse	3.08	0.160		
	Neonatologist	4.00	0.548		
	Specialist Physician	3.27	0.359		
	Resident physician	3.32	0.229		
2.	Lack of training on the infection control protocol			0.750	0.587
	Neonatal nurse	3.21	0.243		
	Staff nurse	3.51	0.118		
	Aid nurse	3.23	0.133		
	Neonatologist	3.80	0.490		
	Specialist Physician	3.36	0.364		
	Resident physician	3.44	0.209		
3.	lack of recognition of hand hygiene opportunities during patient care			0.585	0.712
	Neonatal nurse	3.25	0.275		
	Staff nurse	3.26	0.136		
	Aid nurse	2.97	0.137		
	Neonatologist	2.80	0.663		
	Specialist Physician	3.09	0.415		
	Resident physician	3.24	0.210		
4.	Lack of teamwork environment in the NICU			0.065	0.997
	Neonatal nurse	2.93	0.257		
	Staff nurse	3.01	0.136		
	Aid nurse	3.03	0.156		
	Neonatologist	3.20	0.735		
	Specialist Physician	3.00	0.405		
	Resident physician	3.08	0.223		
5.	Lack of follow up and supervision			1.532	0.181
	Neonatal nurse	3.43	0.221		
	Staff nurse	3.12	0.143		
	Aid nurse	2.88	0.145		
	Neonatologist	3.60	0.510		
	Specialist Physician	3.18	0.400		
	Resident physician	3.48	0.209		
6.	Lack of staff and high workloads			0.871	0.501
	Neonatal nurse	3.39	0.248		
	Staff nurse	3.34	0.125		
	Aid nurse	3.23	0.140		
	Neonatologist	4.00	0.548		
	Specialist Physician	3.82	0.263		
	Resident physician	3.36	0.199		

7.	Insufficient time required for each task			0.242	0.944
	Neonatal nurse	3.14	0.228		
	Staff nurse	3.26	0.123		
	Aid nurse	3.22	0.142		
	Neonatologist	3.40	0.600		
	Specialist Physician	3.36	0.310		
	Resident physician	3.44	0.224		
8.	Lack of supplies and materials			0.310	0.907
	Neonatal nurse	3.21	0.232		
	Staff nurse	3.32	0.129		
	Aid nurse	3.50	0.156		
	Neonatologist	3.40	0.600		
	Specialist Physician	3.36	0.411		
	Resident physician	3.28	0.204		
9.	Lack of necessary equipments			0.200	0.962
	Neonatal nurse	3.21	0.243		
	Staff nurse	3.32	0.139		
	Aid nurse	3.44	0.139		
	Neonatologist	3.40	0.600		
	Specialist Physician	3.18	0.325		
	Resident physician	3.32	0.229		
10.	The hospital recommended antiseptic that irritates my skin			2.035	0.075
	Neonatal nurse	3.21	0.232		
	Staff nurse	3.50	0.133		
	Aid nurse	3.69	0.137		
	Neonatologist	2.40	0.510		
	Specialist Physician	3.00	0.381		
	Resident physician	3.48	0.193		
11.	Lack of job satisfaction			1.281	0.273
	Neonatal nurse	3.25	0.270		
	Staff nurse	3.30	0.138		
	Aid nurse	3.23	0.139		
	Neonatologist	2.40	0.510		
	Specialist Physician	2.55	0.340		
	Resident physician	3.12	0.211		
12.	Lack of motivation			1.021	0.406
	Neonatal nurse	3.39	0.264		
	Staff nurse	3.55	0.137		
	Aid nurse	3.48	0.135		
	Neonatologist	2.40	0.400		
	Specialist Physician	3.36	0.364		
	Resident physician	3.36	0.172		
13.	Lack of quality improvement and patient safety program			0.692	0.630
	Neonatal nurse	3.18	0.252		
	Staff nurse	3.36	0.131		
	Aid nurse	3.25	0.139		
	Neonatologist	3.00	0.707		
	Specialist Physician	3.27	0.333		

	Resident physician	2.88	0.211		
14.	Poor culture towards patient safety			0.563	0.728
	Neonatal nurse	2.93	0.267		
	Staff nurse	3.13	0.139		
	Aid nurse	3.08	0.140		
	Neonatologist	2.40	0.510		
	Specialist Physician	3.27	0.384		
	Resident physician	3.20	0.173		
15.	Lack of surveillance and performance measures system			0.552	0.736
	Neonatal nurse	3.25	0.265		
	Staff nurse	3.36	0.122		
	Aid nurse	3.27	0.151		
	Neonatologist	2.60	0.600		
	Specialist Physician	3.55	0.312		
	Resident physician	3.40	0.200		
16.	Lack of hand rub dispensers per patient beds (manugel)			0.782	0.564
	Neonatal nurse	2.82	0.252		
	Staff nurse	3.16	0.141		
	Aid nurse	3.30	0.144		
	Neonatologist	3.00	0.707		
	Specialist Physician	3.00	0.270		
	Resident physician	2.96	0.187		

Chapter six

Discussion and Recommendation

6.1 Introduction

The purpose of this study was to assess the nurses and physicians perceptions and behavior towards the compliance with the Palestinian infection control protocol in hospitals NICUs.
The study assessed the whole infection control system at the participant NICUs including the hospital infection control settings (requirements for infection control including surveillance/reporting system, NICU infrastructure, feeding and medication management, equipment, disposables and supplies, waste management, human resource), infection control processes and practices (Hand washing, hand gloving, antiseptic usages, decontamination/cleaning and waste disposals domains), and the barriers that obstruct adherence to infection control protocol.

6.2 Implementation of infection control protocol in NICUs

A Palestinian infection control protocol by the MoH was available since 2004 (MoH, 2004) and the East Jerusalem Hospitals infection control manual since 2005 (EJH, 2005). The study showed only 13 hospitals out of 16 (81%) had written infection control guidelines. The infection control protocol seemed fairly accessible when needed as indicated by the study participants (78%). Infection control committees were found in fourteen of the studied hospitals (87.5%) while two NGO hospitals were running without an infection control committees that managed the infection control responsibilities among hospitals and were accountable for monitoring the infection control procedures.

The study results showed that almost half of the respondents did not receive any infection control training courses in the last two years. This reveals inactive and inadequate function of the infection control committees in some of the hospitals. This might be due to structural defects of the infection control committee, absence of authority delegated from the hospital administration, lack of leadership, lack of financial support (due to fixed hospital budget) and low motivation and cooperation of the health care professionals. If health care professionals don’t receive the

proper training on the infection control protocol, its implication will show differences in the quality of services provided at the NICUs.

Horton and Parker (2002) mentioned that the responsibility for implementing and monitoring infection control practices, infection rates, and the effectiveness of educational programs currently lies with the infection control team. The respondents in this study did emphasize the feeling that they need to receive more trainings about infection control protocols and more feedbacks of the infection surveillances and results. A study in a neonatal intensive care unit by Ibrahim et al. (2011) concluded the presence of a gap between the hospital infection control guidelines and its applications by the health care workers.

6.3 Compliance to infection control protocol

6.3.1 Hand washing

Hand washing procedures are considered as the most effective means of preventing the transfer of microorganisms from health workers to infants and vice versa. Micro-organisms that cause health care acquired infection (HCAI) are most likely to be transmitted from the hands of healthcare professionals (Lam et al., 2004). Pratt et al (2007) confirmed that the cross transmission of micro-organisms, either directly from hands or indirectly from environmental sources via hands, is a major contributing factor in the current infection threats to hospital inpatients.

In this study, the compliance to hand washing techniques in the studied NICUs was relatively high (84.3%) which could be due to the greater knowledge and awareness of hand washing among health care workers, the availability of soap and water, and the accessibility of resources compared to Ibrahim and colleagues study (2011) that showed a 67% pre contact and 84% post contact compliance. However, this shows the potential risk that health care workers can pose on vulnerable infants due to inadequate hand washing before and after contacts with the patients.

This study investigated the NICUs working environment in terms of the availability and staff accessibility to the resources considered important for hand hygiene procedures and assessed general indications for hand washing techniques that were high in response to infection control compliance. While adherence to the use of alcohol hand rub (manugel) as a substitute to hand

washing was not measured. The availability of alcohol hand rub solution was good among participating NICUs 81.25% (13 out of 16 NICUs), that makes it difficult to generalize the effects of manugel usages. These NICUs are named by sector; one public, one private and one NGO.

In the studied NICUs, 62.50% of the NICUs had one sink to five or more infant beds. That is considered fairly acceptable according to the Society of Pediatric from Sao Paulo which recommends having one sink to every five patients in medium and high risk nurseries (Mussi-Pinhata & Nascimento, 2001). However, Brady (2005) recommends that there should be at least one sink for every two patients. Furthermore, the standards released by the American Academy of Pediatrics (AAOP) and the American College of Obstetricians and Gynecologists (ACOG) recommend that there should be at least 1 hands free hand washing sink for 4 beds (Lam et al., 2001). The availability of acceptable sink ratios to infant beds facilitate the proper techniques for hand washing.

6.3.2 Hand gloving

The compliance to hand gloving was high (81.2%) which reflects good knowledge and perceptions regarding gloves usages and also the availability of materials at the NICUs. However, 'wear sterile gloves for invasive procedures only' received the lowest compliance score, but that might be due to the lack of knowledge about the indications for sterile gloves usage.

According to the CDC rules, gloving is necessary when being in contact with blood or other potentially infectious material (CDC, 2012). In this study, most respondents at different units wore gloves prior to contact with blood and body fluids from any infant while in others gloving was always used when working with isolated or immune suppressed infants. These results were higher than was reported by (Ibrahim et al.) (2011) where compliance to gloving was 70%. The use of gloves is recommended for the protection of the healthcare worker and to reduce the cross transfer of micro-organisms between patients. While gloves can protect staff from contamination, commensal and pathogenic bacteria can accumulate on gloves during care episodes, facilitating the transmission of pathogens (Pessoa-Silva et al., 2004).

6.3.3 Antiseptic usages

The compliance to antiseptic usage was 82%, reflecting a high adherence to antiseptic usages which shows a good awareness of workers leading to lower risk of infection during specific procedures. The lowest compliance was found in the 'Use of antiseptic solution for preparing the infant skin prior to invasive procedures' which might be due to a lack of staff knowledge about managing invasive procedures.

The study did not investigate the kinds of antiseptic used against specific microorganisms but rather was concerned with finding the level of using antiseptic solutions pre and post certain procedures. In comparison, a similar study carried out in Gaza by Awad (2009), showed a lower compliance to antiseptic usages of 23.9%.

6.3.4 Decontamination and cleaning

The compliance to decontamination and cleaning methods was good (79%). This could be attributed to the availability of materials necessary for cleaning and decontaminating of equipments. The item that received the lowest compliance rate was 'Infants who stay long in NICUs should be transferred to a clean incubator once a week' which could be related to the lack of staff assigned for each shift, work overload, and insufficient incubators for exchange process. Although, in some NICUs, it is customary that most patient equipment is cleaned by a member of the unit team. However, cleaning regimens should be designed to ensure that surfaces and equipment are cleaned adequately (Malik et al., 2003). Some studies highlighted that the cleaning of patient equipment in the NICUs is often inadequate, fails to eliminate micro-organisms, and may even cause further contamination because ward staff are not appropriately trained in equipment cleaning or in the safe use of detergents (Penna et al., 2001; Golan et al., 2005). Incubators should be washed with water and liquid soap every day, and terminal cleaning should be performed every seven days or after the bed is not occupied (Mussi-Pinhata & Nascimento, 2001).

6.3.5 Waste disposal

The compliance to waste disposal process was relatively good (80%), and that can be attributed to the medical waste management system operated by the MoH jointly with the district municipalities. For example, the wastes are collected in the studied units using special containers as sharp boxes that presented in all units with 100% and were discarded appropriately according to the agreed routes by the Palestinian MoH. However, 'Infectious waste is separated from household waste' received lower scores because it was inconvenient due to lack of equipments and materials to support this separation at the unit level and at the national level to have a waste disposal system protocol and guidelines, while above all to have skilled professionals that can apply it.

6.4 Differences in compliance by participant and hospital characteristics

The results show a significantly higher compliance to infection control practices among workers aged 30 years than their younger counterparts (p=0.045). Older workers are experienced and have greater knowledge and skills and are probably better acquainted to neonatal intensive care than junior counterparts. Also, they become more aware with the infant and unit conditions and can make appropriate decisions, especially about practices that could lead to infant harms such as infection control practices. On the contrary, a study by Yassi et al., (2007) revealed that young workers (19-29 years of age) reported better compliance than older workers (50+years).

Also, compliance was higher among health care workers who had both trainings in neonatology and resuscitation (p=0.026). Usually, neonatology trainings include several focused topics on infant care including information regarding the nature of the NICUs, and concerning infection control. The content of infection control part focus on the standard precautions identifying the infection sources, host, pathogen, and their control measures. The resuscitation course is a complementary element to neonatology training. When there are episodes of infection outbreaks, infants enter serious illnesses of septic shocks and the health care workers shall always be ready for resuscitation. This can reveal higher compliance among these health workers as they engage with infant suffering and can convert their casual practices into better controlled practices committed to infection precautions. A study by Wichaikull (2011) showed that good attitudes

and beliefs of workers will promote good practice. Moreover, education and training can raise perceptions and promote good practice.

The hospital characteristics of ownership, unit sizes, occupancy rates, number of patients admitted / month and patient to nurses ratio did not show any effects on the compliance level to infection control protocol. The results were consistent among all studied hospitals whether they were public, private or NGOs.

The patient to nurse ratio is an important issue for infection control, but in this study it did not show a significant association to infection control compliance. Although, from the respondents' viewpoints there were doubts about staffing issues and how that affected to compliance. The patient to nurse ratio appeared below the recommended standard for staffing in NICUs, in 9 NICUs (56.25%) it was 1 nurse to $\geq$3patients, and in 7 NICUs it was 1 nurse to <3 patients. The MoH of Singapore (2001) recommended guidelines for NICU staffing, the minimum nurse to baby ratio shall be 1:0.5 for level 3 and 1:1.1 for level 2 (Chuan, 2001).
In an observational study by Gill et al (2008), two NICUs were studied and the nurse to patient ratios in both NICUs were very high (1:5 in NICU1 vs. 1:13 in NICU 2).

6.5 Differences in compliance by different infection control system elements

Significant association was found between the availability of staff surveillance system in the NICUs and compliance to infection control protocol (p=0.031). It can be said that health care workers feel they are monitored and controlled for their infection control practices by the surveillance measures. Surveillance systems identify the infection among staff and prevent that from transmission to patients.

For the infant surveillance system, there was significant association between the presence of an infant surveillance system and compliance to infection control protocol (p=0.001). The compliance was better in NICUs that have an infant surveillance system which can identify and control the microorganisms at earlier stage. This might be due to the presence of a system that works as a clinical indicator.

This part can be considered an area for future improvement to the other participating NICUs (infant surveillance system was found in only 7 NICUs out of 16).

6.6 Variation in compliance to infection control practices between NICUs

The results showed that NICU 'A' had the highest compliance scores in hand washing, antiseptic usage and decontamination/cleaning, which could be due to the presence of an infection control protocol in NICU A. While, NICU 'N' had the highest compliance in hand gloving and waste disposals which could be due to the presence of a fixed protocol. However, NICU 'H' received the lowest compliance score in all domains that could be a result of lack of adherences with the infection control guidelines. This NICU requires reassurance to identify the needs for unit based infection control protocol.

6.7 Barriers to compliance for infection control protocol

The main barrier to adherence to infection control protocol in Palestinian NICUs was the lack of training on the infection control protocol, where 57.5% of the participants indicated an absence of a continuous educational program in their NICUs. The trainings refer to the hospital infection control committee roles. Education and training were pointed as factors that influenced the application of infection control protocol. Infection protocol trainings and experiences are key factors toward decision making, and infection control practices are every healthcare workers' responsibility. Education is important to every health worker toward infection control practices. This finding can be supported by Yuan et al.(2009), who studied perceptions of hand hygiene practice in China, where it was indicated that positive attitudes and sufficient knowledge of hand hygiene technique can increase rates of proper hand hygiene practices.

In addition, it was clear that the use of private reminding letters between colleagues in an intensive care unit in Thailand can improve hand hygiene compliance and other infection control practices (Snow, 2006). This also supports Pyne's (2010) suggestion that several reminders such as visual reminders (i.e. sign and poster) and peer-to-peer hospital staff feedback may improve hand hygiene in physicians (Wichaikull, 2011).

In many organizations, healthcare professionals attend educational sessions on infection control practices on initial employment and then every year thereafter (Horton and Parker, 2002). The Royal College of Nursing (2005) stated that all healthcare staff should undergo mandatory infection control training as part of their induction and on an annual basis.

Other studies had measured these effects by scores that were remarkable after the introduction of an educational program. For example, the overall hand hygiene compliance increased from 40% to 53% before patient contact and 39% to 59% after patient contact by an observational study in an NICU (Lam et al., 2004). Additionally, another study by Conly et al. (1989) showed that hand washing compliance rose from 28% to 81% after the introduction of an education program.

Moreover, significant association was found between the barriers of implementation to the infection control protocol and the hospital ownership at 'insufficient time required for each task' ($P = 0.001$). The recognition of this barrier was higher in public hospitals, which can be explained by the fact that it was said and known that public units do get heavier workloads than the other health providing sectors due to external reasons such as the Palestinian unstable political and economical status.

'Lack of supplies and materials' was also associated with hospital ownership ($p<0.001$). This barrier was greater in public hospitals. Although this study revealed that supplies and materials were always available within units or could be provided upon request. This can be seen only from an economical point of view, saving the flow of supplies to the NICUs, as only limited numbers of items were kept for the daily uses as well as a lack of awareness towards supply shortages from the head of unit and the staff and the absence of monitoring of the vital roles (as wear gloves when dealing with blood) for infection control practices and lack of control on the use of these supplies.

'Lack of necessary equipments' was also associated with hospital ownership ($p<0.001$). This barrier was a little higher in private than public NICUs and widely apart from NGOs NICUs. This can be attributed to the absence of renewing the old equipments or the damaged ones due to limited funding resources and limited hospital budget. This was found more in private units, and could relate to the problem that when equipment is broken, no healthcare worker will confess the

breakdown, fearing penalty or punishment. Therefore, equipment become stuck for long periods due to hospital fixed budgets or due to donated equipments that can't be fixed locally and/or are too expensive to be replaced.

Most hospitals ignore the nature of the work in critical care with vulnerable patients and the related job stress. Both job satisfaction and staff motivations were important factors for compliance with infection control. In addition, staffing was a critical factor. Staffing ratios in participant NICUs was low compared to other studies; in 7 units, there was 1 nurse for two infants, and in 9 units, there was one nurse to $\geq$3 patients.

6.8 Structural settings of NICUs

The structural assessment is very important to identify weakness of the infection control system and available for further improvement.

6.9 Conclusion

This study was the first to assess the compliance to infection control protocol in NICUs in the West Bank and East Jerusalem hospitals. The results can form the basis of the infection control system improvement programme at the NICUs.

The compliance with infection control protocol varies among respondents characteristics, suggesting that efforts to improve availability of equipment and to promote a safety culture are keys. There were no significant differences between any of the barriers with the job of respondents which conclude a census on the barriers.

Training should be offered in regards to infection control protocol to health workers at NICUs. Besides, activation of an infection surveillance system within the NICUs.

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6.10 Recommendation

Assessment of the infection control system in the Palestinian NICUs pointed several recommendations at two levels.

Operational level (hospital level):

1. Hospitals should facilitate the work of the infection control committees and activate their role.
2. Develop specific policies and measures such as guidelines for parents visits, drug preparation protocol to improve adherence to infection control protocol in the NICUs.
3. Providing and maintaining adequate supplies, resources, and equipments which are necessary for adherence to infection control.
4. Provide copies of infection control protocol to the NICUs and train staff on the protocol.
5. Developing comprehensive program of regular training, also training of the health workers as part of on the job especially young health care professionals.
6. Review the nurse to patient ratios that suits NICUs.
7. Conducting a performance feedback and evaluation system of infection control.

National level:

1. The national insurance body (MoH) should ensure that infection control infrastructure and design requirements at NICUs are satisfied prior to the licensing and maintained afterwards.
2. Infection surveillance system for both staff and patients should be implemented.
3. The Palestinian infection control protocol should be fully enforced at all NICUs regardless hospital ownerships (private, public, NGOs).
4. Infection control training courses should be included in the educational curriculum of health professionals and should be one of the main topics of the continuous educational programmes.
5. The infection control protocol should be reviewed and updated regularly to meet the developments in the field.

6.11 Areas for future researches

The results of this study allowed trends for further researches in:

1. Assessment of the impact of patient safety improvement programmes (interventions) on clinical outcomes in NICUs (e.g. neonatal mortality rates, HCAI rate, prolonged hospital stay etc..).
2. Conduct observational studies for infection control system in the NICUs and compare results.
3. Assessment of infection control system at other hospital departments especially maternity and critical care units.

References

1. Adolf, V., Marisela, M., Águeda, A., Elena, S. & Casilda, A. (2012). Prevention of hospital-acquired infection in VLBW infants. the euroneokiss trial. In 3rd International Congress of UENPS 2012 (pp. 1-4).

2. Allegranzi, B., & Pittet, D. (2009). Role of hand hygiene in healthcare-associated infection prevention. Journal of hospital infection, 73(4), 305-15.

3. Apisarnthanarak, A. & Fraser, V. J. (2009). Feasibility and efficacy of infection-control interventions to reduce the number of nosocomial infections and drug-resistant microorganisms in developing countries: What else do we need?. Clinical infectious diseases, 48(1), 22-24. doi: 10.1086/595121

4. Auriti, C., Ronchetti, M.P., Pezzotti, P., Marrocco, G., Quondamcarlo, A., Seganti, G., Bagnoli, F., De Felice, C., Buonocore, G., Arioni, C., Serra, G., Bacolla, G., Corso, G., Mastropasqua, S., Mari, A., Corchia, C., Di Lallo, D., Ravà, L., Orzalesi, M. & Di Ciommo, V. (2010). Determinants of nosocomial infection in 6 neonatal intensive care units: An Italian multicenter prospective cohort study. Infection Control Hospital Epidemiology, 31(9), 926-33. doi: 10.1086/655461.

5. Awad, N. (2009). Adherence to infection prevention and control protocols in the neonatal intensive care units in the governmental hospitals in Gaza governorates. (Master's thesis).

6. Braimoh, O.B. & Udeabor, S.E. (2013). Hand hygiene practices among community health officers in rivers state,Nigeria. African Health Sciences, 13(2), 507-511.

7. Callaghan, C. (2007). Infection control in the neonatal intensive care unit. Nursing standard. art and science, 22(1), 35-41.

8. CDC. (2011). Basic infection control and prevention plan for outpatient oncology settings. Retrieved from http://www.cdc.gov/hai/pdfs/guidelines/basic-infection-control-prevention-plan-2011.pdf

9. CDC. (2011). Guide to infection prevention for outpatient settings: Minimum expectations for safe care. Retrieved from http://www.cdc.gov/HAI/settings/outpatient/outpatient-care-gl-standared-precautions.html

10. Chuan, T.C. (2001). Guidelines for hospitals with neonatal intensive care service, Singapore.

11. Clark, R., Powers, R., White, R., Bloom, B., Sanchez, P. & Benjamin, D.K. (2004). Prevention and treatment of nosocomial sepsis in the NICU. Journal of perinatology, 24, 446-453. doi: 10.1038/sj.jp.7211125

12. Conly, J.M., Hill, S., Ross, J., Lertzman, J. & Louie T.J.(1989). Hand washing practices in an intensive care unit: the effects of an educational program and its relationship to infection rates. Am J Infect Control. 1989;17:330–339.

13. Cutter, J. & Jordan, S. (2012). Inter professional differences in compliance with standard precautions in operating theatres. International Journal of Nursing Studies, 49(8), 953-968. doi: 00207489

14. Division of Infectious Disease. (2013). Healthcare Associated Infection Program. *CDC*, Retrieved from http://www.maine.gov/dhhs/mecdc/infectious-disease/hai/index.shtml

15. Dougherty, L. & Lister, S. (2011). Infection prevention and control. (8 ed.).U.K., Blackwell Publishing Ltd.

16. EMRO. (2013). (accessed 24 July 2013) http://www.emro.who.int/surveillance-forecasting-response/infection-control

17. Fahmey, S. (2013). Early-onset sepsis in a neonatal intensive care unit in beni suef, egypt: bacterial isolates and antibiotic resistance pattern. Korean J Pediatr, doi: 10.3345/kip.2013.56.8.332

18. Friday, O., Edoja, O., Osasu, A., Chinenye, N., Cyril, M., Lovney, K. & Julia, H. (2012). Assessment of infection control practices in maternity units in southern Nigeria. International journal for quality in health care, doi: 10.1093/intqhc/mzs057

19. Gill, C.J., Mantaring, J.B.V., Macleod, W.B., Mendoza, M., Mendoza, S., Huskins, W.C., Goldmann, D.A. & Hamer, D. H.(2008). Impact of enhanced infection control at 2 neonatal intensive care units in the Philippines. Clinical Infectious Diseases, 48, 13-21.

20. Healthy newborn network. (2006). A situational analysis of newborn health and interventions in Vietnam.
http://www.healthynewbornnetwork.org/sites/default/files/resources/Vietnam_English.pdf

21. http://medical-dictionary.thefreedictionary.com/infection+control (accessed on October 2013).

22. http://en.wikipedia.org/wiki/Infection_control (accessed on August 2013).

23. http://dictionary.cambridge.org/dictionary/british/control_1?q=control (accessed on October 2013).

24. Ibrahim, Y.S., Said, A.M. & Hamdy, G.K. (2011). Assessment of infection control practices in a neonatal intensive care unit (NICU). The Egyptian Journal of Community Medicine, 29(4), 27-45.

25. Jain, M., Dogra, V., Mishra, B., Thakur, A. & Loomba P.S. (2012). Infection control practices among doctors and nurses in a tertiary care hospital. Annals Tropical Medicine and Public Health 2012; *5*(1), 29-33.

26. Jones, C. L. A. (2002). Infection control health article. Retrieved from http://health.yahoo.net/galecontent/infection-control/2

27. Kirkland, K.H. (2011). Nurses and standard/universal precautions analysis of barriers affecting strict compliance. (Master's Thesis).

28. Kültürsay, N. (2010) Nosocomial infections in neonatal units in turkey: Epidemiology, problems, unit policies and opinions of healthcare workers. The Turkish Journal of Pediatrics, 52(1), 50-57.

29. Lam, B.C.C., Lee, J. & Lau, Y.L. (2004). Hand hygiene practices in a neonatal intensive care unit: A multimodal intervention and impact on nosocomial infection. official journal of the American Academy of Pediatrics, doi: 10.1542/peds.2004-1107 http://pediatrics.aappublications.org/content/114/5/e565.full.html (accessed September 2012)

30. Lam, B., Leung, M., Chan, H.B., Chan, P., Chow, C.B., Kwong, N.S., Law, C.W., Lee, W.H., Lyon, D.J., Ng, P.C., Seto, W.H., Tsoi, N.S. & Yuen, R. (2001). Infection control in the NICU, recommended standards. Informally published manuscript, Study Group for the Control of Infection in NICUs.

31. Lever, A. & Mackenzie, I. (2007). Sepsis: definition, epidemiology, and diagnosis. British medical journal, *335*(7625), 879-883.

32. Lux, J. (2001). Infection control for nursing students.

http://faculty.ccc.edu/tr-infectioncontrol/

33. Mehta, R., Mavalankar, D.V., Ramani, K.V., Sharma, S. & Hussein, J. (2011). Infection control in delivery care units, Gujarat state, India: A needs assessment. BMC, 11, doi: 10.1186/1471-2393-11-37

34. Ministry of Health. (2004). Infection Prevention and Control Protocols. Palestinian National Authority, MARAM Project, 2004

35. Mussi-Pinhata, M.M. & Nascimento, S.D.D. (2001). Neonatal nosocomial infections. Jornal de Pediatria, 77.

36. Palestinian health information center. (2011). MoH, Health annual report palestine 2010.

37. Pittet, D., Mourouga, P. & Perneger, T.V. (1999). Compliance with hand washing in a teaching hospital. Infection control program. Annals of internal medicine, 130(2), 126-130. doi: 10.7326/0003-4819-130-2-199901190-00006

38. Pittet, D. (2005). Infection control and quality health care in the new millenium. American Journal of Infection Control, 33(5), 258-267. Retrieved from http://www.ajicjournal.org/article/S0196-6553(04)00641-8/abstract

39. Quality assurance committee, The East Jerusalem hospitals infection control manual, 2005.

40. Siegel, J.D., Rhinehart, E., Jackson, M., Chiarello, L. (2007). Guideline for isolation precautions: Preventing transmission of infectious agents in healthcare settings .CDC, Retrieved from http://www.cdc.gov/ncidod/dhqp/pdf/isolation2007.pdf

41. Silva, C. P. R. & Lacerda, R. A. (2011). Validation of a proposal for evaluating hospital infection control programs. Revista de Saúde Pública, 45(1), doi: 10.1590/S0034-89102010005000052

42. Stein, A.D., Makarawo, T.P. & Ahmad, M.F. (2003). A survey of doctors' and nurses' knowledge, attitudes and compliance with infection control guidelines in Birmingham teaching hospitals. Journal hospital infection, 54(1), 68-73.

43. Stone, P.W. (2009). Economic burden of healthcare-associated infections: an American perspective. NIHPA Author Manuscripts,9(5), 417-422. doi: 10.1586/erp.09.53

44. Togan, D.R. & Imam, A. (2011). Assessment of standards of quality care and nurses performance in neonatal units at governmental hospitals in the West Bank. Joint commission international.

45. Van der Zwet, W.C., Kaiser, A.M., Van Elburg, R.M., Berkhof, J., Fetter, W.P.F., Parlevliet, G.A. & Vandenbroucke-Grauls,C.M.J.E. (2005). Nosocomial infections in a Dutch neonatal intensive care unit: surveillance study with definitions for infection specifically adapted for neonates. Journal of Hospital Infection, 61(4), 300-311.

46. White, R.D. (2006). Recommended standards for newborn ICU design. USA. Journal of perinatology, 26 (S2-S18).

47. WHO. (2002). Prevention of hospital-acquired infections.

http://www.who.int/csr/resources/publications/whocdscsreph200212.pdf

48. Wichaikull, S. (2011). A comparison of the factors which influence infection control in paediatric wards in England and Thailand. (Doctoral dissertation).

49. Yalaz, M., Çetin, H., Akisu, M., Aydemir, S., Tunger, A. & Kültürsay, N. (2006). Neonatal nosocomial sepsis in a level-iii nicu: Evaluation of the causative agents and antimicrobial susceptibilities. The Turkish Journal of Pediatrics, 13-18.

50. Yassi, A., Lockhart, K., Copes, R., Kerr, M., Corbiere, M. & Bryce, E. (2007). Determinants of healthcare workers' compliance with infection control procedures. Healthcare Quarterly, 10 (1).

51. Yuan, C.T., Dembry L.M., Higa, B., Fu, M., Wang, H.& Bradley, E.H. (2009). Perceptions of hand hygiene practices in china. Journal of Hospital Infection, 71(2), 157-162.

Annexes

Annex 1

دراسة تقييم نظام مكافحة العدوى والإجراءات المتبعة في قسم العناية المركزة لحديثي ووجهات نظر العاملين حول قضايا سلامة المريض

عزيزي/عزيزتي المشارك في هذه الدراسة

تحية طيبة و بعد،

يهدف هذا البحث إلى تقييم نظام مكافحة العدوى والإجراءات المتبعة في أقسام العناية الحثيثه لحديثي الولادة (NICU) ومستوى المعرفة لدى العاملين في هذه الأقسام والتقييد بالبروتوكولات الموصى كما يهدف الى التعرف على آراء ووجهات نظر العاملين حول قضايا سلامة المريض في أقسام الرعاية المركزة لحديثي الولادة في المستشفيات الفلسطينية في الضفة الغربية.

مع العلم أن هدا البحث يتم بالتعاون مع دائرة الجودة في وزارة الصحة.

ونود أن ننوه إلى أن المشاركة في الدراسة طوعية وان السرية التامة حول هوية الشخص الذي قام بتعبئة الاستبانة مضمونة في هذا البحث. كذلك نود إعلامكم بأنه لن يكون بمقدور إدارة المشفى أو الباحثون معرفة هوية المشاركين في البحث.

شكرا جزيلا لتعاونكم
الباحثون، كلية الصحة العامة، جامعة القدس

QUESTIONNAIRE

Personal and Professionals Information

1.Gender: ☐ M ☐F	**Age: …….**	**Hospital: ……..**
2 . Job Position:	☐ **Neonatal nurse** ☐ **Staff /qualified Nurse** ☐ **Nurse Assistant(diploma)** ☐ **Neonatologists** ☐ **Specialist Doctor** ☐ **General practitioner** ☐ **Resident Physician**	
3. Years of experience	☐ **Less than 1 year** ☐ **1-3 years** ☐ **3-5 years** ☐ **6-10 years** ☐ **+ 10 years**	
4. Have you got any of the following training/education in Neonatology	☐ **Neonatal nursing diploma** ☐ **resuscitation program** ☐ **Neonatology specialty** ☐ **others, specify_____**	

5. Have you received any infection control training courses in the last two years?	☐	Yes	☐	**No**
6. Do you have access to infection control protocol when you need it?	☐	Yes	☐	**No**
7. Do you feel you need to learn more about infection control training protocol?	☐	Yes	☐	**No**
8. System enforce implementation of infection control protocol at the hospital	☐	Yes	☐	**No**

Please indicate your agreement or disagreement with the following statements that describe your perception/behavior:

	Hand Washing	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
9.	Routinely wash hands with plain soap and running water					
10.	Wash hands immediately when arriving at work/unit					
11.	Wash hands before and after touching the newborns					
12.	Wash hands before performing invasive procedures					
13.	Wash hands when visibly soiled, or after touching mucus membranes, blood and body fluids.					
14.	Replace hand wash with alcohol hand rub when hands are visibly clean (manugel).					
	Hand Gloving					
15.	Wear gloves prior to contact with blood and body fluids from any infant.					
16.	Wear sterile gloves for invasive procedures only					
17.	Gloves always used when working with isolated or immune suppressed infants					
18.	Gloves are discarded (thrown) after each task and between infants.					
	Antiseptics					
19.	Wash hands with antiseptics prior to starting invasive procedure(surgical hand scrub)					
20.	Wash hands with antiseptics prior to touching neonates susceptible to infection.					
21.	Use antiseptic solution for preparing the infant skin prior to invasive procedures					

22.	Use the hospital approved antiseptic solution effective against the microorganisms.					
	Decontamination and cleaning	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
23.	Surfaces that come with direct contact to body fluids as counters, beds etc, are cleaned using a hospital approved disinfectants.					
24.	Sinks and toilets are cleaned daily or more often as needed					
25.	Instruments are cleaned with soap and water prior to sterilization					
26.	Infants who stay long in NICU should be transferred to a clean incubator once a week.					
	Waste disposal					
27.	Infectious waste is separated from household waste					
28.	Infectious wastes are discarded in special containers as sharp boxes, heavy plastic bottle..					
29.	Liquid wastes are poured down in a utility sink drain or through a flushable toilet.					
30.	Waste containers are kept away from sterile instruments and equipments.					

Please indicate your agreement/ disagreement with the following statements about the barriers that influence the implementation/ adherence to the infection control practices in the NICU in this hospital:

	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	Lack of knowledge and skills of the infection control practices					
2.	Lack of training on the infection control protocol					
3.	lack of recognition of hand hygiene opportunities during patient care					
4.	Lack of teamwork environment in the NICU					
5.	Lack of follow up and supervision					
6.	Lack of staff and high workloads					
7.	Insufficient time required for each task					
8.	Lack of supplies and materials					
9.	Lack of necessary equipments					
10.	The hospital recommended antiseptic that irritates my skin					
11.	Lack of job satisfaction					
12.	Lack of motivation					
13.	Lack of quality improvement and patient safety program					
14.	Poor culture towards patient safety					
15.	Lack of surveillance and performance measures system					
16.	Lack of hand rub dispensers per patient beds (manugel)					

Annex 2

NICU Checklist

This part includes information about the NICU in the hospital to be completed by the
NICU' nursing supervisor or the head of the unit

Hospital General Information

Hospital Name	
Ownership of the hospital (private, public…)	
No. of Beds	
No. of NICU beds	
NICU Occupancy Rate (average %)	_____% ☐ monthly ☐ yearly
Average number of patients admitted monthly	
No. of doctors at NICU	
No. of nurses at NICU	
Estimation of the infection rate (%)?	_____%
Estimation for the infant mortality rate (%)?	_____%

Is there an infection control committee in the hospital?	☐ **Yes**	☐ **No**

If your answer YES complete the statement below please,

Who is responsible for infection control in the hospital?(position)	_____
Are infection control guidelines available?	☐**Yes** ☐**No**
For IC committee, **Who are the IC representatives (members)?** Please specify: 1. 2. 3.	
How often they do meet?	
What are the main duties of the infection control committee in the NICU? 1. 2. 3.	

Structure of NICU:

Isolation room within NICU	☐ **Yes**	☐ **No**	
Ventilation system for isolation room separate from other units	☐ Yes	☐ No	
Mechanical, electrical and gas supply at each infant bed	☐ Yes	☐ No	
Running water available always	☐ Yes	☐ No	
Antiseptic soap available always	☐ Yes	☐ No	
Ratios of sinks per beds			Ratio
Alcohol hand rub is used in the NICU	☐ Yes	☐ No	

Ratios of alcoholic hand rub per beds			Ratio
Microbiological laboratory at the hospital	☐ Yes	☐ No	
Availability of sharp disposals, as sharp box..	☐ Yes	☐ No	
Incineration of sharps done	☐ Yes	☐ No	
Patient to nurse Ratio			Level 1 :: Level 2 :: Level 3 ::

Parental Nutrition and medications preparation

Preparation of medications done in   **☐ Special room ☐ Beside patient**
Preparation of feeding in   **☐ Special room ☐ Beside patient**
Preparation of Intravenous Fluids ☐Special room ☐ Beside patient ☐ Under sterile field ☐ Under laminar flow ☐ On the nurses counter

Staff Surveillance system

			Comment/ how often
Does the hospital have a surveillance system for staff towards hospital acquired infection?	☐ Yes	☐ No	
Does the hospital have a surveillance system for infants towards hospital acquired infection?	☐ Yes	☐ No	
Which microorganisms are surveyed at your hospital? Please specify: 1. 2. 3. 4.			
Does the hospital produce regular reporting for infection surveillance?	☐ Yes	☐ No	Weekly, monthly, yearly
Reporting to whom?	☐ Unit manager ☐ supervisor ☐ Chief medical officer ☐ Hospital Manager ☐ Ministry of Health ☐ Other ,specify:_____		
What actions or decisions are made? 1. 2. 3. 4.			

Patient single use equipment

Isolation room structure:

Thermometer	☐ **Yes**	☐ **No**	**Negative pressure**	☐ **Yes**	☐ **No**
stethoscopes	☐ Yes	☐ No	Centralized air conditioning	☐ Yes	☐ No
Tourniquet	☐ Yes	☐ No	Window air conditioning	☐ Yes	☐ No
Mask & ambu bagging	☐ Yes	☐ No	Window opens to non public area	☐ Yes	☐ No
Blood Pressure Cuff	☐ Yes	☐ No	Window opens to public area	☐ Yes	☐ No
			Door able to be closed	☐ Yes	☐ No

Equipment availability:

Sterile gloves	☐ **Yes**	☐ **No**
Disposable gloves	☐ Yes	☐ No
Head Masks	☐ Yes	☐ No
Overshoes	☐ Yes	☐ No
Disposable gowns	☐ Yes	☐ No
Head Covers	☐ Yes	☐ No

Visitors' protocol

No. of visitors permitted to visit each baby at a time	
No. of visitors permitted to visit each baby for the whole time	
Specify visitors position	

Annex 3

Annex 3.1 Structure and setting conditions

Hospital code	Number of hospital beds	Number of NICU beds	Number of admissions/ month	Occupancy rate	Mortality rate
A	65	7	55	65	1
B	53	8	15	40	4
C	56	12	15	70	6
D	300	24	80	80	12
E	250	8	18	100	15
F	75	12	25	70	7
G	36	18	40	80	3
H	35	10	23	85	6
I	300	33	80	75	8
J	26	20	38	60	1
K	200	8	19	100	5
L	70	10	40	55	1
M	35	6	25	70	2
N	214	32	33	80	10
O	219	16	75	100	15
P	46	4	18	40	1

Annex 3.2 Requirement of infection control

Hospital code	I C committee	I C guidelines	Microbiologic laboratory	Water available	Sink to bed ratio	Antiseptic soap available	handrub available	handrub to bed ratio
A	Yes	Yes	Yes	Yes	1:=>5	Yes	Yes	1:=>5
B	Yes	Yes	Yes	Yes	1: < 5	Yes	No	-
C	Yes	Yes	Yes	Yes	1:=>5	Yes	No	-
D	Yes	Yes	Yes	Yes	1:=>5	Yes	No	-
E	Yes	Yes	Yes	Yes	1:=>5	Yes	Yes	1:=>5
F	Yes	Yes	Yes	Yes	1: < 5	Yes	Yes	1:<5
G	No	No	Yes	Yes	1: < 5	Yes	Yes	1:<5
H	No	No	Yes	Yes	1: < 5	Yes	Yes	1:<5
I	Yes	Yes	Yes	Yes	1:=>5	Yes	Yes	1:<5
J	Yes	Yes	Yes	Yes	1:=>5	Yes	Yes	1:<5
K	Yes	Yes	Yes	Yes	1:=>5	Yes	Yes	1:=>5
L	Yes	Yes	Yes	Yes	1: < 5	Yes	Yes	1:<5
M	Yes	Yes	Yes	Yes	1:=>5	Yes	Yes	1:=>5
N	Yes	Yes	Yes	Yes	1:=>5	Yes	Yes	1:<5
O	Yes	No	Yes	Yes	1:=>5	Yes	Yes	1:=>5
P	Yes	Yes	Yes	Yes	1: < 5	Yes	Yes	1:<5

Annex 3.3 Surveillance and reporting system

Hospital Code	Staff surveillance	Infant surveillance	Infection surveillance report	Reporting to	Visitors protocol
A	No	No	Yes	Unit manager	Not restricted to parents
B	Yes	No	Yes	Infection control	Restricted to parents
C	Yes	No	Yes	Infection control	Restricted to parents
D	No	No	Yes	Infection control	Restricted to parents
E	No	Yes	Yes	Unit manager	Restricted to parents
F	No	Yes	Yes	Hospital manager	Restricted to parents
G	No	Yes	Yes	Unit manager	Restricted to parents
H	Yes	No	Yes	MOH	Restricted to parents
I	Yes	Yes	Yes	Unit manager	Restricted to parents
J	Yes	Yes	Yes	Unit manager	Restricted to parents
K	No	No	Yes	Hospital manager	Restricted to parents
L	Yes	Yes	Yes	Unit manager	Restricted to parents
M	No	No	No	No reporting	Restricted to parents
N	Yes	Yes	Yes	Unit manager	Not restricted to parents
O	Yes	No	Yes	Infection control	Restricted to parents
P	No	No	Yes	Unit manager	Restricted to parents

Annex 3.4 Structure requirement

Hospital Code	Mechanical, Electrical and gas supply at each NICU bed	Isolation room within NICU	Isolation window opens to public area	Isolation door able to be closed	Ventilation system for isolation is separate from the unit	Isolation room supported with negative pressure
A	No	No	No	No	No	No
B	Yes	Yes	No	No	No	No
C	Yes	Yes	No	Yes	No	No
D	Yes	Yes	Yes	Yes	Yes	No
E	Yes	Yes	No	No	No	No
F	Yes	Yes	No	Yes	Yes	No
G	Yes	Yes	Yes	Yes	No	No
H	Yes	Yes	Yes	Yes	No	No
I	Yes	Yes	---	Yes	Yes	No
J	Yes	Yes	No	No	No	No
K	Yes	Yes	Yes	Yes	Yes	No
L	Yes	Yes	No	Yes	Yes	No
M	Yes	Yes	No	Yes	No	No
N	Yes	Yes	Yes	Yes	Yes	No
O	No	Yes	Yes	Yes	No	No
P	Yes	No	Yes	Yes	Yes	No

Annex 3.5 Feed and medications management

Hospital Code	Medications prepared	Feeding prepared	Intravenous solution prepared
A	Beside patient	Beside patient	On the nurses counter
B	Beside patient	Special room	Beside patient
C	Beside patient	Beside patient	Beside patient
D	Special room	Special room	On the nurses counter
E	Beside patient	Beside patient	Beside patient
F	Special room	Special room	Special room
G	Beside patient	Special room	Under laminal flow
H	Beside patient	Special room	Under sterile field
I	Beside patient	Beside patient	On the nurses counter
J	Beside patient	Special room	Beside patient
K	Beside patient	Special room	Beside patient
L	Special room	Special room	Special room
M	Beside patient	Special room	Beside patient
N	Beside patient	Special room	Beside patient
O	Beside patient	Beside patient	Beside patient
P	Beside patient	Beside patient	Beside patient

Annex 3.6 Equipment use

Hospital Code	Thermometer	Stethoscope	Tourniquet	Mask and Ambu bagging	Blood pressure cuff
A	No	No	No	No	No
B	Yes	Yes	Yes	No	No
C	Yes	Yes	Yes	Yes	No
D	Yes	No	Yes	No	No
E	No	No	Yes	Yes	Yes
F	Yes	Yes	Yes	Yes	Yes
G	Yes	Yes	Yes	Yes	Yes
H	Yes	Yes	Yes	Yes	Yes
I	Yes	No	Yes	No	No
J	Yes	No	Yes	Yes	Yes
K	Yes	Yes	Yes	Yes	Yes
L	Yes	Yes	Yes	No	No
M	Yes	Yes	Yes	Yes	Yes
N	Yes	Yes	Yes	Yes	Yes
O	Yes	Yes	Yes	No	No
P	Yes	Yes	Yes	Yes	Yes

Annex 3.7 Disposables supply use

Hospital Code	Sterile gloves	Disposable gloves	Face masks	Overshoes	Disposable gown	Head covers
A	Yes	Yes	Yes	Yes	Yes	Yes
B	Yes	Yes	Yes	Yes	Yes	Yes
C	Yes	Yes	Yes	Yes	Yes	Yes
D	Yes	Yes	Yes	Yes	Yes	Yes
E	Yes	Yes	Yes	Yes	Yes	Yes
F	Yes	Yes	Yes	Yes	Yes	Yes
G	Yes	Yes	Yes	Yes	Yes	Yes
H	Yes	Yes	Yes	Yes	Yes	Yes
I	Yes	Yes	Yes	Yes	Yes	Yes
J	Yes	Yes	Yes	Yes	Yes	Yes
K	Yes	Yes	Yes	Yes	Yes	Yes
L	Yes	Yes	Yes	Yes	Yes	Yes
M	Yes	Yes	Yes	Yes	Yes	Yes
N	Yes	Yes	Yes	Yes	Yes	Yes
O	Yes	Yes	Yes	Yes	Yes	No
P	Yes	Yes	Yes	Yes	Yes	Yes

Annex 3.8 Waste management

Hospital Code	Sharp dispensers available	Sharps and medical wastes are treated properly according to Palestinian protocol
A	Yes	Yes
B	Yes	Yes
C	Yes	Yes
D	Yes	Yes
E	Yes	Yes
F	Yes	Yes
G	Yes	Yes
H	Yes	Yes
I	Yes	Yes
J	Yes	Yes
K	Yes	Yes
L	Yes	Yes
M	Yes	Yes
N	Yes	Yes
O	Yes	Yes
P	Yes	Yes

Annex 3.9 Human resources

Hospital Code	Number of doctors	Number of nurses	Patient to nurse ratio
A	5 and more	11-20	1:=>3
B	<5	5-10	1:=>3
C	<5	11-20	1:=>3
D	5 and more	11-20	1:=>3
E	<5	11-20	1:=>3
F	<5	11-20	1:<3
G	5 and more	11-20	1:=>3
H	5 and more	11-20	1:<3
I	5 and more	21-34	1:<3
J	<5	11-20	1:=>3
K	5 and more	5-10	1:<3
L	<5	11-20	1:<3
M	5 and more	5-10	1:=>3
N	5 and more	21-34	1:<3
O	<5	11-20	1:=>3
P	<5	5-10	1:<3

Annex 4

الموضوع: مساعدة الطالبة تريز خير

تحية طيبة و بعد،

تقوم الطالبة تريز خير بإجراء بحث كمتطلب لرسالة الماجستير من كلية الصحة العامة في جامعة القدس بعنوان:

Assessment of Infection Control System in Neonatal Intensive Care Units

In West Bank Hospitals

يهدف هذا البحث إلى تقييم نظام مكافحة العدوى والإجراءات المتبعة في أقسام العناية الحثيثه لحديثي الولادة ومستوى المعرفة لدى لعاملين في أقسام الخداج والتقييد بالبروتوكولات الموصى بها بالإضافة الى تقييم ثقافة سلامة المرضى لدى العاملين في هذه الأقسام في جميع المستشفيات في الضفة الغربية. مع العلم أن هدا البحث يتم بالتعاون مع دائرة الجودة في وزارة الصحة.

ستقوم الباحثة بجمع المعلومات في المستشفيات بواسطة الاستبانه. أرجو من حضرتكم التكرم بتسهيل مهمة الطالبة والسماح لها بجمع المعلومات في مشافي وزارة الصحة ذات العلاقة (مستشفى رفيديا،مستشفى الوطني, مستشفى عالية ,ومستشفى طولكرم ومجمع فلسطين الطبي) . علما بأن هذه المعلومات ستستعمل لهدف البحث العلمي فقط مع المحافظة التامة على سرية وأسماء المستشفيات والمشاركين بالدراسة وحيث أن مشاركة العاملين في الدراسة ستكون طوعية .

سيتم البحث العلمي بإشراف الدكتور معتصم حمدان من كلية الصحة العامة، الرجاء الاتصال به في حال الحاجة لمزيد من المعلوماتmhamdan@med.alquds.edu(0599-736929,).

اشكر لكم حسن تعاونكم و تقبلوا بقبول فائق الاحترام,,

د. أسمى الامام
عميدة كلية الصحة العامة

الموضوع: مساعدة الطالبة تريز خير

حضرة الدكتور.....

مدير مستشفى .....

تحية طيبة و بعد،

تقوم الطالبة تريز خير بإجراء بحث كمتطلب لرسالة الماجستير من كلية الصحة العامة في جامعة القدس بعنوان:

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