FACTORS AFFECTING MEDICAL-SURGICAL AREA NURSES' COMPLIANCE WITH CONTACT PRECAUTIONS

by

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ABSTRACT

Multidrug-resistant organisms are a significant threat in health care facilities, and are associated with many adverse consequences for infected patients. However, despite these concerns and the evidence that contact precautions are an effective way to address them, compliance with contact precautions guidelines among health care workers remains low (Farr, 2000).

The primary goal of this study was to examine factors affecting medical-surgical nurses' compliance with contact precautions guidelines when caring for patients colonized by or infected with multidrug-resistant organisms. A secondary purpose of this study was to describe demographic characteristics of medical-surgical nurses to determine if certain characteristics (e.g. age, time in practice, level of education) had a relationship with their compliance in using contact precautions guidelines. Finally, this study examined barriers to the use of contact precautions and consequences for failure to follow contact precautions guidelines. A survey tool was developed by the researcher for this study to examine these questions, and an exploratory, cross-sectional, correlation descriptive study was conducted.

The study group was made up primarily of female nurses with associate or bachelor degrees. Nurses from the orthopedic and neurosurgery unit made up the largest percentage of respondents. All respondents indicated that they were familiar with CP guidelines.

Eight primary barriers to the use of contact precautions were listed by participants. Half of the participants listed one of the time management categories ("no time" or "urgency") as the primary barrier to compliance with contact precautions. Participants' age, years experience and level of education were not statistically significant predictors of the participants' level of compliance. There was not a statistically significant difference between the barriers to compliance groups (no time/urgency versus other) on their ability to comply with contact precautions. Lastly, there was not a statistically significant relationship among the primary consequence of non-compliance with CP guidelines (medical versus other) and the participants' level of compliance (low versus high).

CHAPTER 1

INTRODUCTION

Multidrug-resistant organisms include methicillin-resistant staphylococcus aureus, vancomycin-resistant enterococcus, and other extended-spectrum beta-lactamase producing or multidrug-resistant gram-negative bacilli. People may become either colonized (asymptomatic carriers) or infected with these pathogens. Both infection and colonization with multidrug-resistant organisms can result in significant morbidity, mortality, and expense (Centers for Disease Control and Prevention (CDC), 2006).

Despite reports of successful control of multidrug-resistant organisms, their prevalence continues to increase throughout the nation. Infection with a multidrug-resistant organism places patients at an increased risk of many adverse events, such as increased length of stay, increased expenses, need for surgery, and risk for death (Fishbain, Lee, Nguyen, Mikita, J. A., Mikita, C. P. & Uyehara, 2003; Muto et al., 2003). Treatment options for these patients may be limited, and resistance to each new agent used to treat multidrug-resistant organisms has already been demonstrated in clinical isolates (Centers for Disease Control and Prevention (CDC), 2006).

The use of contact precautions when caring for a patient colonized or infected with a multidrug-resistant organism is recommended by the Centers for Disease Control (CDC) and by infection control experts nationwide (Manangan et al., 2001; Montecalvo et al., 2001; Puzniak, Gillespie, Leet, Kollef & Mundy, 2004; Sunenshine, Liedtke,

Fridkin & Strausbaugh, 2005). Contact precautions include the use of gloves and gown when caring for a patient colonized or infected with a multidrug-resistant organism.

Purpose

This study aimed to gain a greater understanding of the factors that affect medical-surgical area nurses' compliance with contact precautions guidelines when caring for a patient colonized or infected with a multidrug-resistant organism. For the purpose of this study, medical-surgical area nurses are defined as nurses working in the medical-surgical "pod" at the hospital. The medical-surgical "pod" includes the general medical, general surgical, oncology, orthopedic and neurosurgery, and rehabilitation units. Additionally, this study examined whether selected demographic characteristics can be used to predict nurses' compliance or noncompliance with contact precautions guidelines. Barriers to the use of contact precautions, and consequences faced by nurses who fail to comply with contact precautions, were also examined.

Background and Significance

There is sound evidence that infection with a multidrug-resistant organism has the potential for significantly increasing a patient's length of stay, the cost of stay, and lethality. Despite the evidence that the use of contact precautions decreases the transmission of multidrug-resistant organisms, the compliance of healthcare workers with contact precautions guidelines remains poor. Several possible barriers and facilitators to

the use of contact precautions have been identified, however, understanding of why nurses do not comply with these guidelines is lacking (Prieto & Macleod Clark, 2005).

Interventions to Address Noncompliance With Contact Precautions

Experts have identified that even with a sound knowledge base and a belief in the efficacy of contact precautions, many healthcare workers remain noncompliant with contact precautions guidelines. It is possible that more targeted interventions, addressing those barriers that the healthcare workers define as factors in their noncompliance, would be more effective in enhancing healthcare workers' compliance with contact precautions. Prieto and Macleod Clark (2005, p. 512) stated that "to date, there has been limited exploration of healthcare practitioners' own perspectives of this issue and their perception of the priorities for practice development have rarely formed the basis of intervention studies designed to improve practice". They go on to state that "further research in this area is essential to inform the development of interventions to address the problems of poor adherence to infection control practice" (Prieto & Macleod Clark, p. 524). Prieto & Macleod Clark also noted that there is an urgent need to determine whether the findings of their study are of general relevance.

Costs Related to MDRO Infection

Costs associated with multidrug-resistant organisms are significant, and increased healthcare worker compliance with contact precautions has the potential to demonstrate significant cost savings. Given that many healthcare acquired infections, including catheter-related urinary tract infections and vascular catheter-associated infections (both

of which may include multidrug-resistant organisms), will no longer be reimbursed by Medicare (Centers for Medicare and Medicaid Services, 2009), there is now a financial, as well as an ethical, imperative to manage the transfer of these pathogens.

Efficacy of Contact Precautions

However, several studies have indicated that the use of contact precautions alone may not be sufficient to prevent the spread of some multidrug-resistant organisms (MDROs) (Bearman et al., 2007; Grant, Ramman-Haddad, & Libman, 2006). Despite this, contact precautions are generally included as interventions in facilities with positive MDRO control (Sunenshine, Liedtke, Fridkin & Strausbaugh, 2005).

Noncompliance with Contact Precautions

Despite the accepted lethality of infection with MDROs, and the substantial evidence supporting the use of contact precautions, compliance of healthcare workers with contact precautions guidelines remains poor. Level of compliance with contact precautions has been shown to be related to several factors, including sex, profession, and the setting in which the contact takes place (Conterno et al., 2007; Manian & Ponzillo, 2007; Weber et al., 2007).

Barriers to the use of contact precautions generally fall into one of three categories: attitude, knowledge, and behavior. There is often a feeling of futility associated with the prevention of transmission of multidrug-resistant organisms. Perception of others' expectations also appears to influence the choice of staff nurses to follow contact precautions guidelines. Institutional barriers may include non-compliance

with contact precaution guidelines, possibly as a cost-savings method (Farr, 2000). Nursing staff may also not be aware of the impact of their actions on the transmission of disease to their patients, or be unaware of the lethality of infection with multidrug-resistant organisms (Prieto & Macleod Clark, 2005).

However, high levels of knowledge and belief do not appear to have a significant impact on the use of contact precautions. Studies show that staff continue to have poor adherence to guidelines for contact precautions (Prieto & Macleod Clark, 2005). Instead, support from administration, expert liaisons in clinical areas who can educate staff members about infection control, and education may be beneficial in the use of contact precautions to prevent the spread of multidrug-resistant organisms (Farr, 2000).

Statement of the Problem and Research Question

Multidrug-resistant organisms are a significant concern in the health care environment. They are associated with many adverse consequences for infected patients. In October 2008, the Centers for Medicare and Medicaid Services (CMS) will no longer reimburse hospitals for costs related to certain hospital acquired infections, including urinary tract infections and certain surgical site infections. Considering that all of these may be related to multidrug-resistant organisms, they also represent a significant financial concern for health care agencies. The evidence indicates that contact precautions (in conjunction with other infection control measures) may significantly deter the transfer of multidrug-resistant organisms (Sunenshine, Liedtke, Fridkin & Strausbaugh, 2005). However, despite these concerns and the evidence that contact

precautions are an effective way to address them, compliance with contact precautions guidelines among health care workers remains low (Farr, 2000).

The question asked in this research study is "What factors affect medical-surgical area nurses' compliance with contact precautions?" The study described demographic characteristics of medical-surgical area nurses to determine if certain characteristics have a relationship with compliance with contact precautions guidelines. Lastly, this study examined barriers to the use of contact precautions and consequences for failure to follow contact precautions guidelines.

Conceptual Framework

This study was guided by the work of Florence Nightingale. One of the most important tenets in Nightingale's work is the responsibility of the health care worker to put the patient in the best position for nature to act on them and allow them to heal (Nightingale, 1969). In the case of this study, the health care worker's responsibility to the patient is to maintain an environment that is not conducive to the transfer of multidrug-resistant organisms.

Nightingale also emphasized cleanliness as an important duty in nursing (Nightingale, 1969). While she was speaking of dirt, one might assume that in this day her definition would be expanded to include pathogens and multidrug-resistant organisms as well.

Nightingale's focus on environmental conditions is defined as an important assumption within her philosophy. She believed that the sick would benefit from

environmental improvements (Pfettscher, 2006). The current study focused on the barriers that nurses face in implementing these environmental improvements (in terms of a safer environment of care for their patients, or putting patients in the best position for nature to act on them).

Definition of Terms

Contact Precautions- Contact precautions are a set of practices used to prevent the transmission of multidrug-resistant organisms by direct or indirect contact with a patient or their environment. These practices include placement in a single room, or cohorting with another patient who also carries a multidrug-resistant organism, as well as the wearing of gloves and gowns by the health care worker whenever patient contact or contact with potentially contaminated items may occur. The CDC guidelines do not specify that gloves and gown are worn with any entry into the room of patients on contact precautions. However, this guideline is generally accepted by infection control experts and is the practice followed at the hospital in this study. Gown and gloves are donned before room entry and removed before exiting the room to contain pathogens (CDC, 2006; Muto et al., 2003).

Health care workers- Paid and unpaid persons who work in a health care setting (those who provide patient care, or who provides services that support the delivery of health care such as dietary, housekeeping, or maintenance personnel). In this study, nurses (registered nurses and licensed practical nurses) are the health care workers surveyed.

Multidrug-resistant organisms- Bacteria associated with resistance to one or more classes of antimicrobial agents. The most common examples are methicillin-resistant staphylococcus aureus (MRSA), vancomycin-resistant enterooccus (VRE), and multidrug-resistant gram-negative bacilli (MDR-GNB) (CDC, 2006; Muto et al., 2003).

Assumptions

One of the assumptions in this study is that contact precautions are an effective adjunct to the prevention of transfer of multidrug-resistant organisms. While the research is not as solid as one could hope, there are many indications that this is true. Most studies that have demonstrated positive multidrug-resistant organism control have included contact precautions as an intervention(CDC, 2006; Muto et al., 2003).

The second assumption is that it is the responsibility of the nurse to maintain an environment which facilitates healing, in accordance with Nightingale's theory (Nightingale, 1969). It is further assumed that the use of contact precautions to prevent transfer of multidrug-resistant organisms aids in the health of the environment. Therefore, it is the responsibility of the nurse to comply with contact precautions guidelines.

Limitations

There are several limitations identified in this study. The first is that was a voluntary study. Therefore, nurses with more of an interest in infection control may have been more likely to complete the questionnaire. These nurses may not be representative of the majority of medical-surgical area staff nurses in the units surveyed.

The second major limitation is that this study was self reported. Nurses may have been more likely to give what they perceive as the “right”, or socially correct answers. Anonymity was maintained to ensure that there were no negative repercussions for answers given.

In addition to the above, the researcher is an employee of the health care facility where the study is taking place. Response rates from the unit where the researcher is employed were higher than those from other units. This may have been a result of the researcher being employed on that unit.

CHAPTER 2

REVIEW OF THE LITERATURE

A literature review was conducted to gain a greater understanding of what is already known about contact precautions (CPs) and multidrug-resistant organisms (MDROs). Databases including Medline and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) were searched to obtain articles relevant to the research question. The primary themes uncovered in this literature review were:

1. Overview of multidrug-resistant organisms (MDROs)
2. MDRO-associated complications
3. Overview of contact precautions (CPs)
    a. Use of CPs nation- and world-wide
    b. Other methods to control the spread of MDROs
4. Effects of CPs on patient care
5. The efficacy of CPs
6. Cost-effectiveness of CPs
7. Barriers and facilitators to the adherence to CP guidelines.

The results of this literature review are covered in depth below. The theoretical overview will also be discussed.

Overview of Multidrug-Resistant Organisms

Antibiotic-resistant organisms are a growing threat to public health. In fact, infectious diseases are the leading cause of human death worldwide, and are the third leading cause of death in the United States (Muto et al., 2003). There are many different mechanisms by which organisms become resistant to certain antibiotics. Although the exact reason for the rise in antibiotic resistance is not fully known, what is known is that antibiotic use is, in part, responsible for this problem (Muto et al.).

The CDC noted that, while the names of certain MDROs (such as MRSA and VRE) describe resistance to only one agent (e.g. methicillin, vancomycin), these organisms are often resistant to many antimicrobial agents, and thus are considered to be MDROs. Certain highly resistant organisms, such as MRSA, VRE, and extended beta-lactamase producing gram-negative bacilli, deserve special attention in health care facilities (Siegel et al., 2006).

MRSA may be acquired during a hospital admission, or may present as community acquired (CA) MRSA. In a descriptive analyses of patients presenting with community onset MRSA and hospital-onset MRSA, Rosario-Rosado, Rene, and Jones (2004) found that patients with community-onset MRSA tended to be significantly younger than those with hospital-onset MRSA. It was also found that hospital-onset MRSA occurred more frequently in whites, and community- onset MRSA occurred more frequently in African-Americans. The authors did not find an association between gender and onset of infection (Rosario-Rosado et al.). Fishbain et al. (2003) found that patients colonized with MRSA on hospital admission were more likely to a) be older than

patients without MRSA colonization, b) have received antibiotics within the past year, c) have been hospitalized within the three previous years, or d) have a prior history of MRSA.

Multidrug-Resistant Organism Associated Complications

The CDC states that "the prevention and control of MDROs is a national priority – one that requires that all healthcare facilities and agencies assume responsibility" (Siegel et al., 2006, p. 4). Many studies have demonstrated the significant dangers of infection with MDROs. Several researchers have noted that antibiotic-resistant pathogens result in prolonged hospital stays and increased cost, mortality, need for surgical procedures, and ICU admission (Fishbain et al., 2003; Muto et al., 2003; Siegel et al.).

The CDC also noted that "options for treating patients with these infections are often extremely limited… although antimicrobials are now available for treatment of MRSA and VRE infections, resistance to each new agent has already emerged in clinical isolates" (Siegel, Rhinehart, Jackson, Chiarello & Healthcare Infection Control Practices Advisory Committee, 2006, pp. 5-6). Prevalence of MDROs in U.S. hospitals has also increased steadily over the last several decades (Siegel et al.).

Overview of Contact Precautions

The two most widely used guidelines for hospital infection control practices are the Society for Healthcare Epidemiology of America (SHEA) Guidelines, and the Centers for Disease Control (CDC) Healthcare Infection Control Practices Advisory Committee

(HICPAC) guidelines (Muto et al., 2003; Siegel et al., 2006). Both SHEA and CDC guidelines recommend the use of contact precautions for hospital infection control. However they differ in their recommendations for active surveillance cultures (the screening of patients to determine colonization or infection with MDROs). The SHEA guideline states that "active surveillance cultures are essential to identify the reservoir for spread of [methicillin-resistant staphylococcus aureus] MRSA and [vancomycin-resistant enterococcus] VRE infections and make control possible using the CDC's long-recommended contact precautions" (Muto et al., 2003, p. 362). The CDC notes that the use of active surveillance cultures should be considered in some settings, particularly when other control measures have been ineffective. However the CDC does not make specific recommendations for the use of active surveillance cultures (Siegel et al., 2006).

In regard to barrier precautions for patients known or suspected to be infected or colonized with MRSA or VRE, the SHEA guidelines recommend that "gowns should always be worn as part of contact precautions for all patient and environmental contacts with patients known to be colonized by antibiotic-resistant pathogens… except when there is no direct contact with patient or environmental surfaces" (Muto et al., 2003, p. 378). Similarly, the CDC recommends that health care workers caring for patients with MDROs "wear a gown and gloves for all interactions with the patient or potentially contaminated areas in the patient's environment" (Siegel et al., 2006, p. 24).

There is some support for gown use for patients under CPs, regardless of the level of contact anticipated on room entry (Arnold et al., 2002), a practice commonly known as "modified contact precautions". Because modified contact precautions are used

frequently in the hospital setting, no attempt was made to differentiate between studies using CPs and modified CPs.

Muto et al. (2003) found that those facilities that adopt strict infection control methods, including the use of active-surveillance cultures, barrier (contact) precautions, patient and staff cohorting, and patient isolation, have greater success in MRSA control. While antimicrobial exposure has been implicated as a primary risk factor for acquisition of VRE (Muto et al.), infection control practices have also been shown to significantly impact the transfer and acquisition of vancomycin resistant enterococcus VRE. Muto et al. noted that studies have suggested that contamination of health care workers' clothing may contribute to the transfer of MRSA and VRE, and there have been few reports of successful MRSA or VRE control without the use of CPs.

Use of CPs Nation- and World-Wide

Richet et al (2003) surveyed 90 health care facilities in 30 countries to evaluate regional variations in the diagnosis, surveillance, and control of MRSA. They found that most facilities routinely used wearing of gloves (62.2%) and gowns (44.4%), hand washing by health care workers (53.3%), use of an isolation sign on the door of the room (43%), hospitalization in a private room (34.4%), or all of these practices.

The only factor significantly associated with health care facilities with high incidence rates of methicillin-resistant staphylococcus aureus (MRSA) ($\geq$ 0.4 per 1,000 patient days), compared to those with low incidence rates (<0.4), was having a higher mean number of beds per infection control nurse (Richet et al., 2003). This finding underscores the importance of infection control nurses in preventing the spread of

MRSA. Furthermore, because MRSA and other multidrug-resistant organisms are a threat to public health worldwide, these results "emphasize the urgent need to strengthen the microbiologic and epidemiologic capacities of HCFs [healthcare facilities] worldwide to prevent MRSA transmission and to prepare them to address the possible emergence of vancomycin-resistant S. [staphylococcus] aureus" (Richet et al., p.334).

The infection control community is divided on several aspects of MDRO control. This division may contribute to the apathy seen in many health care workers regarding CP compliance. In a survey of infectious disease consultants in the United States, Sunenshine, Liedtke, Fridkin and Strausbaugh (2005) found that most favored the use of contact precautions for patients colonized with MRSA, VRE, or multidrug-resistant gram-negative bacilli. Those caring for pediatric or transplant patients were more likely to support the use of contact precautions for colonized patients than those caring for adult patients on general wards. In contrast, infectious disease consultants were divided on the use of active surveillance cultures, with higher support for this practice in transplant units and intensive care units than on general wards. Although many infectious disease specialists favored the practice of active surveillance cultures, few reported that their facilities actually employed this practice (Sunenshine et al.).

In a survey of a representative sample of United States hospitals, Ward et al. (2005) found that most respondents had implemented some measures to address the CDC's guidelines (Siegel et al., 2006), but that much more was needed. Specifically in regards to the use of barrier precautions, most respondents indicated that they had increased "adherence to policies and procedures, especially hand hygiene, barrier

precautions, and environmental control measures" to "a great extent" (Ward et al., 2005, p.24). The authors conclude that hospitals must "increase their efforts to detect, report, and control the spread of antimicrobial resistance" (Ward et al., p.27)

Other Methods to Control the Spread of MDROs

There are several methods used to control the spread of MRSA, VRE, and other MDROs. Other than CPs and active surveillance cultures, screening and treatment of colonized health care workers and colonized or infected patients on admission may help prevent the spread of MDROs. Studies suggest that while routine screening of health care workers may not be feasible or cost effective in most environments, it may have a place in controlling MRSA transfer in an endemic setting (Arnold et al., 2002; Ben-David, Mermel & Parenteau, 2008). Ben-David et al. reported an outbreak of MRSA in a trauma intensive care unit in which transmission was decreased after health care workers colonized with MRSA were identified and decolonized. Additionally, Fishbain et al. (2003) suggested that patients colonized with MRSA or VRE on admission to the hospital are a major factor in the transmission of nosocomial MDROs

Effects of Contact Precautions on Patient Care

There is compelling evidence to suggest that patients under CPs receive less care than those not under CPs. Specifically, while there is contradictory evidence regarding health care workers' perceptions of their treatment of patients (Bearman et al., 2007), there is significant evidence to suggest that these patients may be under-assessed and

receive less care (Khan, Khakoo & Hobbs, 2006; Saint, Higgins, Nallamothu & Chenoweth, 2003).

In a survey of health care workers (e.g., nurses and physicians), Bearman et al. (2007) found that 48% reported less frequent entry into a patient room because of contact precautions. Khan et al. (2006) found that nursing staff in general did not believe that their care of patients in CPs was different (74%), However 72% of attending physicians believed that the care of patients in contact isolation was adversely affected.

In general, nursing staff and physicians did not believe that there tended to be a delay in delivery of medications (88% of nurses, 64% of physicians). However this number correlated with the number of patients being cared for in contact isolation. With more patients in contact isolation there was an increasing chance of delay in medication delivery (Khan et al., 2006).

In the same study, 70% of physicians and 55% of nurses perceived patients under CPs to be more depressed than patients not under CPs, and 54% of physicians agreed with the statement that patients under CPs "do not get adequate attention from healthcare workers" (Khan, Khakoo, & Hobbs, 2006, p. 410). Physicians were also more likely than nursing staff to believe that patients under CPs consumed too much time (50% of physicians, 14% of nursing staff) (Khan et al.).

Physicians also reported being less likely to examine patients under CPs, with a significant difference between attending physicians (69%) versus resident physicians (58%) (Khan et al., 2006). This is similar to the findings of Saint et al. (2003), who noted that senior physicians were about half as likely to examine patients under CPs as those

who were not under CPs. Specifically, almost two thirds of their patients under CPs were not examined during the observation period (morning rounds). In contrast, resident physicians did not appear to alter their assessment behavior for patients on CPs versus those not on CPs (Saint et al.). Given that patients with MDROs are often more seriously ill than their non-MDRO infected counterparts, this may have devastating effects on morbidity and mortality.

Efficacy of Contact Precautions

There is support both for and against the efficacy of CPs to prevent the spread of MDROs. Srinivisan et al. (2002) found a decrease in nosocomial transmission of MDROs with the use of CPs, while Bearman et al. (2007) found similar transfer rates with CPs and with universal gloving. Others have suggested that CPs may be necessary only in certain situations, such as when there is a high likelihood of contamination or contact with soiled articles (linens, etc.) (Boyce, Havill, Kohan, Dumigan & Ligi, 2004; Grant, Ramman-Haddad, Dendukuri & Libman, 2006).

Bearman et al. (2007) found a similar efficacy between CPs and universal gloving, as well as greater compliance with the practice of universal gloving, but poorer compliance with hand hygiene during the universal gloving phase. Health care workers also felt that patients received better care with the practice of universal gloving (Bearman et al.).

Although CPs have demonstrated the ability to decrease the transmission of MDROs in the hospital setting, they may not be effective in all situations. Boyce et al.

(2004) note that MRSA control is "unlikely to occur in facilities that rely on standard (universal) precautions, contact precautions alone, or contact precautions plus improved hand hygiene" (p. 400). They conclude that active surveillance cultures are an important part of a successful program of MRSA control (Boyce et al.). Similarly, Grant et al. (2006) found little difference in MRSA transmission after gowns were removed from the infection control intervention, and concluded that gown use may not be necessary for all MRSA patients, and may be a more effective intervention during periods with a higher prevalence of MRSA colonization.

Srinivasan et al. (2002) assessed the effect of disposable cover gowns to prevent the nosocomial transmission of VRE and found that VRE acquisition was 1.80 cases per 100 days with gown and glove use, compared to 3.78 in the gloves only period. They also found gloves-only precautions to be the only independent risk factor for VRE acquisition. The authors concluded that this study supported the Healthcare Infection Control Practices Advisory Committee recommendations for the use of cover gowns to reduce nosocomial transmission of MDROs (Siegel et al., 2006).

Experts remain divided on whether or not it is appropriate to try to detect and isolate patients with certain MDROs. For example, a survey of infection control experts at the 4th Decennial International Conference found that experts were divided on whether or not to detect and isolate VRE, as well as on the best methods to do this (Ostrowsky et al., 2001). As previously noted, this division of infection control experts may be a contributing factor to the lack of compliance with infection control guidelines by the health care community.

Cost-Effectiveness of Contact Precautions

Muto et al. (2003) noted that "the significantly higher costs of MRSA and VRE infections (than of those due to MSSA [methicillin-susceptible staphylococcus aureus] and VSE [vancomycin-susceptible enterococcus], respectively) suggest that effective control of these antibiotic-resistant pathogens would result in cost savings" (p. 375). Study results to support this assertion are mixed.

A study by Conterno et al (2007) evaluated the cost of infection control measures for patients with extended-spectrum beta-lactamase producing organism colonization or infection. This study used isolation for all patients with extended-spectrum beta-lactamase producing organisms, and contact precautions only for those with a high risk of transmission (admission to an ICU, uncontained drainage from a culture-positive site, diarrhea, or urinary or fecal incontinence). Of note, active surveillance cultures to identify asymptomatic carriers were not used. The researchers found a decreased transmission of extended-spectrum beta-lactamase producing organisms but no decrease in nosocomial extended-spectrum beta-lactamase producing organism rates. The researchers calculated a cost of infection control measures per patient of $3,191.83 (Canadian dollars). However, because they did not calculate the cost of infection per patient, it is difficult to determine how cost-effective these practices truly were. However, Cromer et al. (2004) found the cost of a MRSA infection to be over $35,000 per case. Given these figures, it is quite possible that the cost of infection control measures represented a cost savings compared to the cost of MRSA infection.

Cromer et al. (2004) found that "utilization of contact precautions as recommended by CDC is an effective policy in terms of patient safety and cost" (p. 454). In their study of cost effectiveness of CPs, the researchers found an avoided cost of over two million dollars over a two year period with the use of CPs. Similarly, in a study evaluating the cost-effectiveness of gown use in control of VRE, Puzniak, Gillespie, Leet, Kollef and Mundy (2004) found that infection control policies (specifically, gown use) caused an initial increase in the cost of health care, but were beneficial to both the hospital and to patients and their families in terms of cost-efficacy (with an annual net benefit of $419, 346) and preventing the spread of MDROs.

Barriers and Facilitators to Implementation

Barriers and facilitators to the implementation of CPs are varied, and not all have been consistently demonstrated in the research. There is strong evidence to suggest that certain subsets of health care workers are more compliant than other subsets with CPs (Manian & Ponzillo, 2007). Some studies have found educational interventions to be effective (Cromer et al., 2004), while others found them to be almost entirely ineffective (Prieto & Macleod-Clark, 2005).

Farr (2000) suggested several reasons for noncompliance with contact isolation guidelines. These reasons include a lack of understanding or belief in: a) the importance of contact precautions as a means to prevent the transmission of microbes, b) the need to prevent transfer from infected or colonized patients to prevent endemic spread, or c) the fact that colonized, rather than infected, patients represent the largest reservoir for MRSA

transmission (Farr). Farr also noted that physicians and other health care workers have a long history of noncompliance with guidelines.

In a survey of infection control experts, Manangan et al. (2001) discovered that many participants still hold a firm belief in practices that have not demonstrated evidence of efficacy, as well as a lack of belief in some practices that do carry evidence of efficacy. The researchers note that "old dogmas die hard and old habits are hard to break" (Manangan et al., p. 247). It is interesting to note that participants were significantly divided on several aspects of infection control in general, as well as contact isolation specifically. This suggests that the infection control community is not united on several aspects of infection control (Manangan et al.).

Manian & Ponzillo (2007) discovered significant differences in compliance among different subsets of health care workers. The researchers observed compliance with CPs in ICUs and general wards, and found that: a) females (79%) were more likely than males (66%) to be compliant, b) staff in the ICU was more likely to be compliant (83%) than on general wards (71%), c) there was a slight increase in compliance with the presence of others (77% versus 75%), and d) nonphysicians were significantly more compliant (78%) than physicians (67%) (Manian & Ponzillo). Moreover, the researchers noted a significant difference in physician compliance based on their specialty, with intensivists being the most compliant (89%), followed by house staff (69%), internal medicine/family practice (59%), and finally, surgery (41%) (Manian & Ponzillo). Respiratory therapists had a higher, and physicians a lower, rate of compliance than nurses. The researchers found an overall gown compliance rate of 73%. They went on to

suggest that in order to improve compliance with gown use and CPs, education may need to be targeted to those subsets of health care workers who are less compliant with these guidelines (Manian & Ponzillo).

Weber et al. (2007) observed healthcare workers and visitors, and found a 73.3% compliance rate with contact precautions. Furthermore, they found that in all units, staff members had equal or higher compliance with CPs than did visitors. Compliance with CPs was highest in ICUs (100% for both staff and visitors). Visitors had significantly lower compliance rates in pediatric units (23.1%) than adult floors (50%) (Weber et al.). These findings suggest that to prevent the spread of MDROs to other patients or to households, visitor compliance with CPs may need to be targeted as well.

The SHEA guidelines suggest that "educational programs should be conducted to ensure that HCWs understand why antibiotic-resistant pathogens are epidemiologically important, why prevention of spread is critically necessary for control, and which measures for preventing spread have proven effective" (Muto et al., 2003, p. 378). Ward et al. (2005) found that "strategies to control antimicrobial resistance were linked to having educational sessions and to orientating patient care staff pertaining to infection control and antimicrobial resistance policies" (pp. 28-29). They go on to note that educational interventions in the area of infection control have been shown to be particularly effective (Ward et al.).

Cromer et al. (2004) described a study that included an educational intervention in the form of a comedy skit as well as the incorporation of infection control education into nursing and patient care technician orientation. They also conducted surveillance rounds

and feedback in the form of awards and alarms. The researchers noted a significant increase (12-fold) in compliance (the ratio of awards to alarms) in the first year (Cromer et al.).

Prieto & Macleod-Clark (2005) conducted a supportive intervention for nursing staff, with markedly different results. The researchers created infection control guidelines based on staff feedback, but did not note a significant increase in understanding or compliance with CPs. They noted that staff members' "capacity to understand and implement these recommendations was hampered, not only by a lack of knowledge, but also by irrational beliefs, inaccurate perceptions of risk, both in relation to themselves and patients, and a lack of ability or willingness to exercise clinical judgment" (Prieto & Macleod-Clark, p. 511). These findings demonstrate that staff education is certainly not effective in all situations.

Theoretical Overview

The major theoretical underpinnings of this research study and associated literature review are taken from Florence Nightingale's philosophy of nursing. In this review of literature, no studies relating to the concepts of CPs or MDROs utilized Nightingale's theory.

While Nightingale did not believe in germ theory as described in her day, she clearly understood "the concept of contagion and contamination through organic materials from the patient and the environment" (Pfettscher, 2006, p. 78). Her emphasis

on hygiene and cleanliness both in the home and in the health care setting was a major step forward in public health and infection control.

Nightingale believed that the duty of the nurse was to put the patient in the best situation for nature to act on them (Nightingale, 1969). This philosophy relates significantly to the research topic, as it is an underlying assumption that it is the duty of the nurse to keep the patient from environmental harm (thus placing them in the best position for nature to facilitate healing).

In a discussion of the ethics of infection control, Bryan, Call and Elliott (2007) defined the two most common frameworks used to view the ethics of infection control. The first is a rights- or duty-based (deontological) framework, and the second is a results-based (consequentialist) framework. Duty-based ethics would tend to promote most the good of the individual, while results-based ethics promote the good of the greatest number (Bryan et al.). In regards to the use of infection control measures to prevent the spread of MDROs, one can see how the good (health) of all is held as the highest goal.

It is unclear which framework (rights-based or results-based) Nightingale would have used to. In her seminal work "Notes on Nursing" (1860), she focused on the care of the individual patient. However the consequentialist framework is evident in the results she achieved in Crimea and elsewhere, where she improved the health of thousands. Nurses must be concerned with both the care of the individual and the health of the public. In terms of MDROs, this means minimizing negative effects of MDRO colonization or infection and CPs on the individual patient, while adhering to the

evidence-based recommendations of the CDC and others to prevent the transfer of MDROs to other patients.

Gaps in the Literature

Much research has been done on the topics of CPs and MDROs. This research has touched on the topic of health care workers' compliance with contact precautions, primarily through observational studies. However, little research has been done on the reasons for health care workers' noncompliance with CPs or the barriers and facilitators to compliance (Farr, 2000; Manangan et al., 2001), and only one study included in this literature review used survey methodology to evaluate the reasons for noncompliance (Manangan et al., 2001). Additionally, only one study included in this literature review addressed factors influencing the choice of nurses to use contact precautions (Prieto & Macleod-Clark, 2005), and no studies have specifically addressed medical-surgical area nurses.

Conclusion

Research has demonstrated that there are significant differences in infection control practices and preferences between facilities, regions, and infection control experts. It is clear MDROs place patients at significant risk for serious sequelae. However the implementation of CPs may place them at risk for receiving inadequate care. Furthermore, CPs may not be effective in all scenarios for the prevention of MDRO transmission. In addition, compliance with CPs is often inadequate among both health

care workers and visitors, and this compliance appears to differ among subsets of health care workers and between units within the health care facility.

The results of interventions to improve adherence to CPs are mixed. The research to date demonstrated the need for a greater understanding of the barriers and facilitators health care workers face in adhering to CP guidelines. Only with this understanding will the infection control community be able to target effective interventions to improve compliance with CPs and decrease the transfer of MDROs. Florence Nightingale's philosophy will be used to guide the research, as a greater understanding of these factors will allow nursing to place the patient in the best condition for nature to act on them (Nightingale, 1969).

CHAPTER 3

METHODS

The primary goal of this study was to examine factors affecting medical-surgical area nurses' compliance with contact precautions guidelines when caring for patients colonized by or infected with multidrug-resistant organisms. A secondary purpose of this study was to describe demographic characteristics of medical-surgical area nurses to determine if certain characteristics (e.g. age, time in practice, level of education) had a relationship with their compliance in using contact precautions guidelines. Finally, this study examined barriers to the use of contact precautions and consequences for failure to follow contact precautions guidelines.

A survey tool was developed by the researcher for this study to examine these questions, and an exploratory, cross-sectional, correlation descriptive study was conducted. The methodology used for the study is discussed in this chapter. The chapter is organized into four sections: participant selection, instrumentation, data collection, and data analysis.

Participant Selection

This research study was conducted using a convenience sampling of nurses from four of the five units in the medical-surgical "pod" of a tertiary care hospital located in the Western United States. The units comprising the medical-surgical "pod" of the hospital included an: a) general medical unit, b) general surgical unit, c) oncology unit, d)

orthopedic and neurosurgery unit, and e) rehabilitation unit. Because of the high-risk population specific to the oncology unit, and the significant potential for increased use and awareness of contact precautions guidelines among staff of the oncology unit, this unit was excluded from the study. The nursing staff (registered nurses and licensed practical nurses) of the remaining four units made up the convenience sample for this study.

The nursing units included in this study employed a total of 96 nurses. The makeup of the nursing staff is shown below:

Table 1. Makeup of Nursing Staff

Staff	General medical	General surgical	Orthopedic and neurosurgery	Rehabilitation
Total nurses	28	26	25	17
Registered nurses	25	22	18	13
Licensed practical nurses	3	4	7	4

An information letter (Appendix A) was attached to each survey. This letter provided information about the study, procedure for completion of the survey, risks and benefits to the participant, confidentiality, and the researchers' contact information. Consent was implied in completion and return of the survey tool.

Instrumentation

A survey tool was developed by the primary researcher for use in this study (see Appendix B). This survey tool was titled "Infection Control Questionnaire" and consisted of a demographic data section and a section that explored factors affecting staff nurses'

compliance with contact precautions. The demographic data section included: a) age, b) gender, c) level of education, d) years of experience in nursing practice, e) shift worked, f) marriage status, and g) information about dependents.

The survey questions included four "yes/no" questions related to contact precautions guidelines and infection control in general, four short-answer questions related to contact precautions guidelines and infection control in general, and seventeen questions related to contact precautions guidelines only. The seventeen questions were scored on a Likert scale with three negative questions and fourteen positive questions.

Power analysis was done using a large effect size of 0.8, an alpha level of 0.05, a .80 power, and a 2-tailed analysis (G*Power, 2009). This analysis determined a necessary sample size of 52 participants. Reliability, using Cronbach's alpha, and factor analysis were also done and are included in Chapter 4.

Data Collection

An introductory e-mail was sent through the hospital's intranet to all nurses on each of the participating units. This e-mail included the study purpose, a brief description of the survey tool, and the researchers' contact information. The surveys were then delivered by the researcher to each of the participating units. Completed surveys were collected by the researcher from each of the units on an every-other-day basis.

Twice weekly, the researcher visited the units and brought small tokens of appreciation (bags of candy, donuts, etc) with information about the survey attached. Reminder e-mails were sent to all nurses on each of the participating units each week.

The surveys were available to all participants for a total of three weeks. Forty seven surveys were returned, for a response rate of 49%.

Data Analysis

The demographic data was analyzed to obtain a descriptive evaluation of the participants' characteristics. The characteristics included gender, age, education, and marital status. Additionally, participants were asked about number of children, ages of children at home, and number of dependents at home.

Research question number one asked "what are the identified barriers to medical-surgical area nurses' compliance with contact precautions?" Responses were stratified into eight primary categories. Frequencies and percents were calculated on responses in each of these eight categories.

Research question number two asked "are the participants' age, years experience and level of education statistically significant predictors of the participants' level of compliance?" To learn more about the relationship between the independent variables (age, experience, level of education) and the dependent variable (level of compliance), a multiple regression analysis was conducted.

Because levels of education were significantly disproportionate, answers were divided into two groups – low and high. The education variable was dummy coded for entry in the regression model. The following coding scheme was utilized: education (0 = low, 1 = high). The low education group included the LPV/LVN and Associate Degree RNs. The high education group included the individuals with a Diploma RN or higher.

The breakdown for this dummy coding scheme was limited by the sample size, so the low and high groups were based solely upon statistical criteria (i.e., cell sample sizes and degrees of freedom).

Research question number three asked "Is there a statistically significant difference between the barriers to compliance groups (no time/urgency versus other) on their ability to comply with contact precautions?" There were eight primary barriers to contact precautions compliance cited by participants. "No time" and "urgency" were two of the most common responses. Because these responses both pertain to time management, and because half of the participants listed one of the time management categories as their primary barrier to compliance with contact precautions, the data was dichotomized into two groups – "urgency/no time" and "other". An independent samples t-test was conducted to determine if there was a significant difference between the individuals who stated no time/urgency as the primary barrier to compliance and individuals who listed other reasons on their reported compliance with contact precautions. The compliance score was created by computing a mean composite score from the seventeen items on the infection control questionnaire. The compliance scores were standardized, and the resulting z-scores were used to identify outliers. Participants with a z-score greater than $\left|3\right|$ were removed. Levene's test was performed to assess equality of variances (Polit and Beck, 2008).

Research question number four asked "is there a statistically significant relationship among the primary consequence of non-compliance with CP guidelines (medical versus other) and the participants' level of compliance (low versus high)?" A

chi-square test of independence (used to assess differences in proportions) was conducted to determine if there was a significant relationship between the primary consequence of non-compliance listed by the participant and their level of compliance. The compliance variable was dichotomized with a median split. Participants with a score below the median were considered low on compliance, and participants with a compliance score above the median were considered high on compliance.

CHAPTER 4

RESULTS

This study investigated factors affecting medical surgical nurses' compliance with contact precautions. Research questions included:

1. What are the identified barriers to medical-surgical area nurses' compliance with contact precautions?
2. Are the participants' age, years experience and level of education statistically significant predictors of the participants' level of compliance?
3. Is there a statistically significant difference between the barriers to compliance groups (no time/urgency versus other) on their ability to comply with contact precautions?
4. Is there a statistically significant relationship between the primary consequence of non-compliance with CP guidelines (medical versus other) and the participants' level of compliance (low versus high)?

The purpose of this study was achieved by using descriptive statistics and quantitative analysis to examine participants' responses to the survey questions. This chapter presents the results of the data analysis to the four stated research questions.

Instrument Reliability

Reliability of the instrument was analyzed using SPSS software (SPSS, 2007). Reliability statistics showed a Cronbach's alpha of 0.116. Factor analysis could not be computed due to the small number of respondents.

Descriptive Statistics

Study participants responded to a number of demographic questions. Their responses are listed in Tables 2 and 3. The majority of study participants (97.8%) were female. The average participant age was 40.84 years (SD=12.22). The participants' education was reported as follows: 7 (14.9%) LPN/LVN, 17 (36.2%) Associate RN, 3 (6.4%) Diploma RN, 18 (38.3%) BSN RN and 2 (4.3%) MN RN. Most of the participants were married (66.7%) and had children less than 21 years of age (91.7%). The average participant had 1 child (M=1.11, SD=1.20) living at home.

The participants also responded to a number of items pertaining to their nursing experience and factors affecting their compliance with contact precautions. The descriptive statistics for these items are listed in Table 4. The participants' medical unit was reported as follows: 20 (42.6%) orthopedics and neurosurgery, 13 (27.7%) surgical, 8 (17.0%) medical and 6 (12.8%) rehab. The average participant had 13.01 (SD = 11.42) years of nursing practice experience. The participants worked many different shifts. Fifteen (32.6%) of the participants worked an 8 or 12 hour day shift. All 47 individuals indicated that they were aware of the CP guidelines. A majority (42, 89.4%) of the

respondents stated that the CP guidelines are easy to find. In most cases (45, 95.7%) the participants indicated that the CP guidelines were posted on the hospital intranet.

Table 2. Descriptive Statistics for the Participants' Demographics(a)

Variable	n	%
Gender		
Female	45	97.8
Male	1	2.2
Did not answer	1	
Education		
LPN/LVN	7	14.9
Associate RN	17	36.2
Diploma RN	3	6.4
BSN RN	18	38.3
MN RN	2	4.3
Marital Status		
Single	14	31.1
Married	30	66.7
Significant Other	1	2.2
Did not answer	2	
Age of Children		
0 – 21	22	91.7
21 +	2	8.3
Did not answer	23	

Table 3. Descriptive Statistics for Participants' Demographics (b)

Variable	N	Min.	Max.	M	SD
Age	45	23	63	40.84	12.22
Number of Children home	47	0	4	1.11	1.20
Total number of dependants	38	0	4	1.08	1.22

Most (42, 89.4%) of the participants laundered their uniform daily, and 27 (57.4%) reported wearing their uniform while running errands. Forty-three of the participants revealed that they change their shoes and clothes when they come home daily. Lastly, the participants indicated the primary consequence of non-compliance with the CP guidelines. The participants' responses were reported as follows: 14 (31.1%) verbal reprimand, 12 (26.7%) spread germs, 8 (17.8%) no consequence, 5 (11.1%) disciplinary actions, 2 (4.4%) personal guilt and 4 (8.9%) other.

Table 4. Descriptive Statistics for the Participants' Nursing Experiences

Variable	n	%
Unit		
Ortho/neuro	20	42.6
Medical	8	17.0
Surgical	13	27.7
Rehab	6	12.8
Shift		
7AM – 3PM	10	21.7
3PM – 11PM	10	21.7
7AM – 7PM	5	10.9
7PM – 7AM	7	15.2
Other	14	30.4
Did not answer	1	
CP Guidelines Easy to Find		
Yes	42	89.4
No	5	10.6
Location of CP Guidelines		
Intranet	45	95.7
Don’t Know	1	2.1
Other	1	2.1
Launder Uniforms		
Daily	42	89.4
Other	5	10.6
Wear Uniforms When Run Errands		
Yes	27	57.4
No	20	42.6
I Change My Clothes at Home		
Yes	43	91.5
No	4	8.5
Consequences of Non-Compliance		
Verbal Reprimand	14	31.1
Spread Germs	12	26.7
None	8	17.8
Disciplinary Actions	5	11.1
Personal Guilt	2	4.4
Other	4	8.9
Did not answer	2	

Quantitative Analysis

Research question number 1 asked "what are the identified barriers to medical-surgical area nurses' compliance with contact precautions?" Eight primary barriers to contact precaution compliance were listed by participants. These identified barriers, as well as their frequencies and percents, are shown in Table 5.

The most common responses were no time (14, 33.3%), availability of supplies (10, 23.8%) and urgency (7, 16.7%). Both urgency and no time pertain to constraints on time management. Half of the participants listed one of the time management categories as the primary barrier to compliance with contact precautions.

Table 5. Frequencies and Percents of Reported Barriers

Barrier	N	%
Urgency	7	16.7
No Patient Contact	1	2.4
No Time	14	33.3
Availability of Supplies	10	23.8
Reason for the CP	1	2.4
Not Aware of CP	1	2.4
Uncomfortable	4	9.5
Other	4	9.5
Did not answer	5	

Research question number 2 asked “are the participants’ age, years experience and level of education statistically significant predictors of the participants’ level of compliance”? The descriptive statistics for the dependent variable and the continuous predictor variables are listed in Table 6. The standardized residuals indicated that there were no outliers in the data.

Review of the variance inflation factors and tolerance levels did not reveal evidence of multicollinearity, and a plot of standardized residuals did not reveal model heteroscedasticity. The omnibus model was not a significant predictor of the participants’ level of compliance with contact precautions, F (3, 32) = 0.25, $p > .05$, $R^2 = .02$. This indicates that together the predictors did not account for a significant amount of variation in the criterion. The regression coefficients are listed in Table 7. The coefficients indicated that none of the predictors were significant within this model.

Table 6. Descriptive Statistics for Regression Predictors

Variable	N	M	SD
Compliance	36	4.03	0.38
Age	36	40.06	10.96
Years Experience	36	12.96	11.09

Table 7. Regression Coefficients for Research Question 2

Predictor	B	SE	β	*t*	Sig.
Age	0.01	0.01	0.23	0.85	.403
Years Experience	-0.01	0.01	-0.21	-0.75	.460
Years Experience	0.01	0.14	0.02	0.09	.930

Research question number 3 asked “is there a statistically significant difference between the barriers to compliance groups (no time/urgency versus other) on their ability to comply with contact precautions”? The descriptive statistics for the individual compliance items are listed in Appendix C.

The compliance scores were standardized, and the resulting z-scores were used to identify outliers. Participants with a z-score greater than $\left|3\right|$ were removed. This process revealed no outliers in the data. Histograms (Figures 1 and 2) were created for each group, and the bell-shaped curve created by the distribution of scores suggested normality for each group. Levene’s test was not significant, suggesting that the two groups had equal variances. The means and standard deviations of compliance scores for both groups are listed in Table 8. The t-test (Table 9) failed to reveal a significant difference between the two barrier groups on compliance scores, $t\ (33) = 0.79$, $p > .05$.

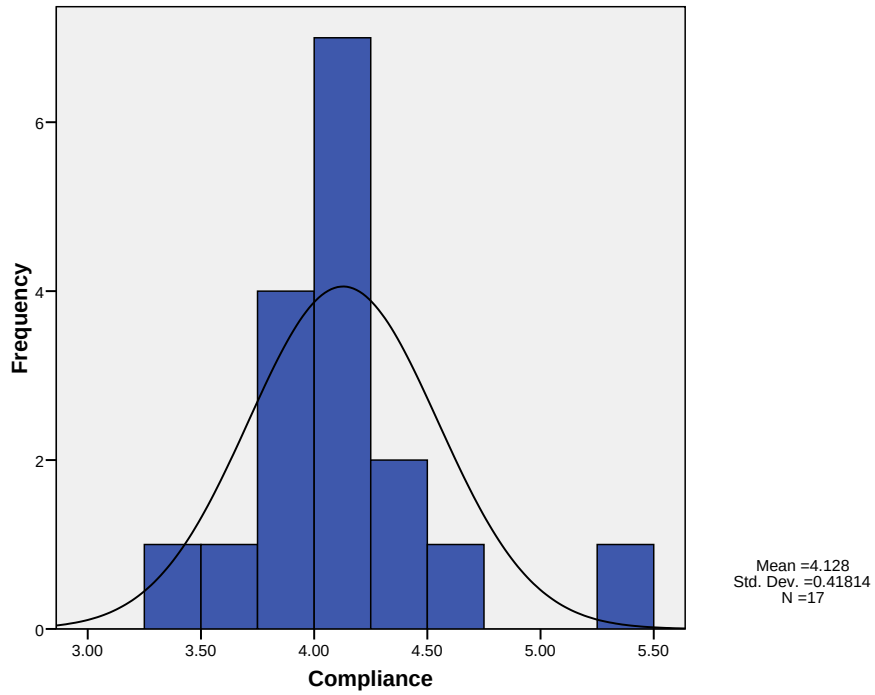

Figure 1. Distribution of Compliance Scores for No Time/Urgency Group

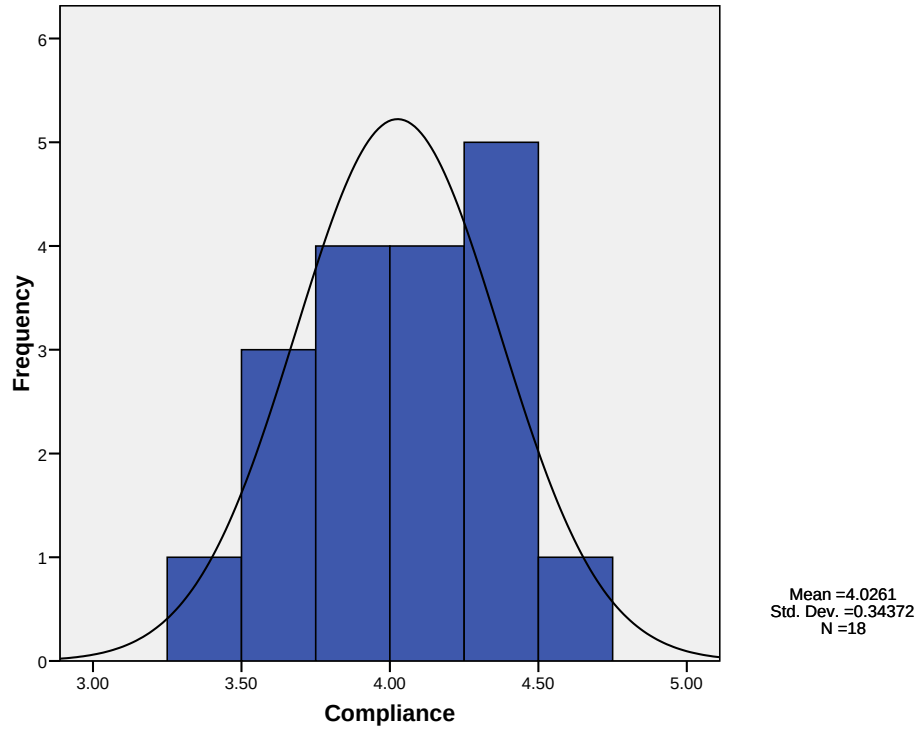

Figure 2. Distribution of Compliance Scores for Other Group

Table 8. Means and Standard Deviations of Compliance Scores by Group

Barrier	N	M	SD
No Time/Urgency	17	4.13	0.42
Other	18	4.03	0.34

Table 9. Independent Samples t-test for Research Question 3

						95% CI of the Difference	
Dependent Variable	*t*	df	Sig.	Mean Difference	SE	Lower Bound	Upper Bound
Compliance	0.79	33	.436	0.10	0.13	-0.16	0.36

Research question number 4 asked "is there a statistically significant relationship among the primary consequence of non-compliance with CP guidelines (medical versus other) and the participants' level of compliance (low versus high)"? The observed (i.e., observed in the data) and expected frequencies (i.e., frequencies that would be found if there were no relationship between the variables) (Polit and Beck, 2008) are listed in Table 10. The chi-square (Table 11) failed to reveal a significant relationship between the two variables, $\chi^2 (1) = 1.91$, $p > .05$.

Table 10. Observed and Expected Frequencies for Research Question 4

			Primary Consequence		
			Medical	Other	Total
Compliance	Low	Observed	8	13	21
		Expected	6.1	14.9	21.0
	High	Observed	3	14	17
		Expected	4.9	12.1	17.0

Table 11. Chi- Square for Research Question 4

Statistic	Value	df	Sig.
Pearson Chi-Square	1.91	1	.167

Summary

The study group was made up primarily of female nurses with associate or bachelor degrees. Nurses from the orthopedic and neurosurgery unit made up the largest percentage of respondents. All respondents indicated that they were familiar with CP guidelines.

Eight primary barriers to the use of contact precautions were listed by participants. Half of the participants listed one of the time management categories (“no time” or “urgency”) as the primary barrier to compliance with contact precautions. Participants’ age, years experience and level of education were not statistically significant predictors of the participants’ level of compliance. There was not a statistically

significant difference between the barriers to compliance groups (no time/urgency versus other) on their ability to comply with contact precautions. Lastly, there was not a statistically significant relationship among the primary consequence of non-compliance with CP guidelines (medical versus other) and the participants' level of compliance (low versus high).

CHAPTER 5

DISCUSSION

In the preceding chapter, the data analysis and findings were presented. Chapter 5 consists of a summary of the study, discussion of the findings, implications for practice, recommendations for further research, and conclusions. The purpose of this chapter is to expand upon the concepts in the study in order to provide a greater understanding of their influence on nursing and infection control practice, and to present suggestions for future research targeting the factors that enhance or hinder compliance with contact precautions.

Summary of the Study

The purpose of this study was to analyze factors related to medical-surgical area nurses' compliance with contact precautions. A survey tool was developed by the researcher for use in this study. This survey tool was distributed to nurses working on the general medical, general surgical, orthopedic and neurosurgery, and rehabilitation units. The survey was made available for three weeks to the 96 nurses working on the previously mentioned units, and 47 surveys were returned, for a response rate of 49%. Respondents completed a demographic data sections and answered yes/no, short-answer, and Likert-scale type questions. The demographic data was analyzed to obtain a descriptive evaluation of the participants' characteristics. Additionally, the data was further analyzed in a variety of ways to yield answers to the four primary research questions.

Instrumentation

The survey instrument was developed by the researcher for this study. Inherent in the survey process is the risk for inaccurate participant response, either due to a lack of understanding or due to the perceived social desirability of their answers. In relation to the topic surveyed and its sensitive nature, the latter was considered to be a significant concern. Fowler (1995, p. 30) suggested three general classes of steps the researcher can take to limit response distortion:

1. Assure confidentiality of responses and communicate effectively that protection is in place.

2. Communicate as clearly as possible the priority of response accuracy.

3. Reduce the role of an interviewer in the data collection process.

These steps were all taken when developing and distributing the survey instrument for this study. The confidentiality of responses was assured and this was communicated to participants in the introduction letter. The priority of response accuracy was also communicated to the participants in the introduction letter. Finally, the role of the interviewer in the data collection process was also reduced, as the surveys were left on each of the units and picked up by the researcher several times weekly.

Discussion of the Findings

Demographic Data

The average age of nurses participating in this study was 40.84 years. This is similar to the nation as a whole, as the average age of RNs is expected to be 44.5 years by 2012 (AACN, 2009). Most of the nurses surveyed were prepared at the associate degree level (36.2%) or the bachelor's degree level (38.3%). It is encouraging to see such a large number of BSN prepared staff nurses, as many nursing groups have called for the BSN as the entry-level degree into the profession (American Association of Colleges of Nursing [AACN], 2000). In addition, many studies have clearly demonstrated significant improvements in care when there is a higher percentage of BSN-prepared nurses (AACN, 2009). A large majority (97.8%) of respondents were female, as is also the trend nationally.

Respondents from the orthopedics and neurosurgery unit made up 42.6% of the surveys returned and had a significantly higher rate of return than any other unit. This may have been affected in part by the researchers' employment as a staff nurse on the orthopedics and neurosurgery unit.

All 47 respondents indicated that they were aware of the contact precautions guidelines, and a large majority (89.4%) stated that the contact precautions guidelines are easy to find. Most (95.7%) correctly stated that the contact precautions guidelines were posted on the hospital intranet. The respondents either knew or believed they knew and understood where the guidelines are located and all indicated that they are aware that

contact precautions guidelines exist. However they may not be fully aware of what the guidelines mean, as evidenced by later survey questions.

Barriers to the Use of Contact Precautions

Research question number one asked "what are the identified barriers to medical-surgical area nurses' compliance with contact precautions?" Half of the respondents (50%) listed one of the time management categories (urgency or no time) as the primary barrier to compliance. Other responses included no patient contact (2.4%), availability of supplies (23.8%), failure to understand the reason for contact precautions (2.4%), not being aware that the patient was on contact precautions (2.4%), the discomfort associated with wearing required contact precautions (9.5%), and other (9.5%).

Farr (2000) suggested several reasons that healthcare workers may be noncompliance with contact precautions guidelines. These reasons included a lack of understanding or belief in the importance of contact precautions, as well as a long history of healthcare worker noncompliance with guidelines. The findings of this study support Farr's statements, as many participants agreed that they did not always comply with contact precautions. These results also underline the important role that time management plays in nurses' compliance with contact precautions.

Predictors of Compliance With Contact Precautions

Research question number two asked if participants' age, years of experience, and level of education were statistically significant predictors of participants' level of compliance with contact precautions guidelines. The researcher expected to find a

positive correlation between level of education, years of experience, and compliance with contact precautions guidelines.

Participants were divided into two groups: “low” education (LPN/LVN and associate degree RNs) and “high” education (RNs with a diploma degree or higher), with this division occurring solely for statistical purposes, as responses were truncated into two equal categories. None of the predictors were found to be statistically significant. This suggests that participants’ age, years of experience, and level of education were not significant predictors of their compliance with contact precautions guidelines.

While there is minimal research related to nurses’ age, years of experience, and levels of education, and compliance with contact precautions, research has demonstrated that among different subsets of healthcare workers, level of education may not play a significant role in compliance with contact precautions. Manian & Ponzillo (2007) found that nonphysicians were significantly more compliant with contact precautions guidelines than were physicians. Given that physicians tend to have higher levels of education than any other subset of healthcare workers, it may be that level of education plays little to no part in an individual’s compliance with contact precautions.

Barriers to and Ability to Comply With Contact Precautions

Research question number three asked if there was a statistically significant difference between the barriers to compliance group (no time/urgency versus other) on their ability to comply with contact precautions. There was no statistically significant difference between the two barrier groups on compliance scores. This suggests that ,

while the presence of barriers may hinder compliance with contact precautions, the type of barrier may not affect compliance.

Consequences and Level of Compliance With Contact Precautions

Research question number four asked if there was a statistically significant relationship among the primary consequence of noncompliance with contact precautions guidelines (medical versus other) and the participants' level of compliance (low versus high). Analysis of the results failed to reveal a significant relationship between the two variables, suggesting that the type of consequence faced has little to do with nurses' compliance with contact precautions guidelines.

Implications for Practice

Florence Nightingale was used as the guiding theorist for this research study. Her work in Crimea demonstrated the importance of infection control to prevent patient illness and death (Nightingale, 1969). She believed that it was the duty of the nurse to put the patient in the best position for nature to act on them and allow them to heal (Nightingale, 1969). Nurses today are obligated to continue that work, and the use of contact precautions is an important part of putting patients in the best position for nature to act on them, by preventing the spread of multidrug-resistant organisms which undoubtedly impair a patient's ability to heal.

Hospitals are also increasingly being held accountable for hospital acquired infections, many of which are caused by multidrug-resistant organisms. These infections

can be prevented by the proper use of contact precautions (Srinivisan et al., 2002), and there have been very few reports of successful MDRO control without the use of CPs (Muto et al., 2003). By gaining a greater understanding of factors that relate to medical-surgical area nurses' compliance with contact precautions guidelines, hospitals may better develop interventions designed to increase compliance with these guidelines.

While this study failed to identify statistically significant predictors of participants' level of compliance with contact precautions guidelines, or statistically significant relationships among the primary consequence of noncompliance with contact precautions guidelines and the participants' level of compliance, it did identify several barriers to the use of contact precautions. These barriers include lack of: a) time, b) supplies, c) knowledge that contact precautions were in place or the reason for them, d) no anticipated patient contact, and e) discomfort associated with wearing contact precautions. By decreasing the barriers nurses face in order to comply with contact precautions guidelines, hospitals may increase compliance with these guidelines.

Recommendations for Further Research

The goal of this study was to analyze factors relating to medical surgical nurses' compliance with contact precautions guidelines. The relatively small sample size may have been a factor in the lack of statistically significant results, as demonstrated by the statistical power analysis. It is also possible that the effect size was not as large as anticipated, and that a smaller effect size, such as 0.5, would have yielded more

significant results. For this reason, the researcher recommends repeating the study with a larger sample size.

It is also possible that the researcher's employment on the orthopedic and neurosurgery unit influenced the high response rate from that unit. Future research should include randomly selected participants from units other than the home unit of the primary researcher to avoid influencing survey return rates.

Future research should also include direct observation of participants' compliance with contact precautions guidelines, as well as targeted interventions addressing the barriers identified by participants in this and future research studies. Additionally, qualitative studies may be helpful in gaining a more in-depth understanding of issues related to compliance with contact precautions, and the efficacy of interventions meant to target compliance with contact precautions.

Conclusions

This study found eight categories of barriers faced by medical-surgical area nurses when caring for patients requiring the use of contact precautions. Addressing these barriers may help facilities increase nurses' compliance with contact precautions, thereby decreasing the incidence of hospital-acquired infections. Further research should include larger participant groups and targeted interventions to increase compliance with contact precautions. It is the hope of this researcher that by understanding the barriers faced by medical-surgical area nurses when caring for patients requiring the use of contact

precautions, compliance with these guidelines will be enhanced, resulting in safer patient care and a decrease in the incidence of hospital-acquired infections.

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APPENDICES

APPENDIX A

INFORMATION LETTER

Title: Factors Affecting Medical-Surgical Nurses' Compliance with Contact Precautions.

Principal Investigator: Anne Kathryn Eby, RN, BSN

Co-investigator (Instructor): Clementine Rice, PhD, RN, CNS

INFORMATION LETTER

A. Introduction and Purpose

You are being asked to participate in a research study conducted by a graduate student from Montana State University, College of Nursing. The purpose of this study is to examine factors that influence medical-surgical nurses' compliance with contact precautions guidelines when caring for patients colonized by or infected with multidrug resistant organisms. A secondary purpose of this study is to describe selected demographic characteristics of medical-surgical nurses to determine if selected characteristics (e.g. age, time in practice, level of education) correlate with their compliance with contact precautions guidelines. Finally, this study will examine barriers to the use of contact precautions and consequences for failure to follow contact precautions guidelines.

B. Procedure

You will be asked to complete a questionnaire which has been distributed to your unit by the researcher. The estimated completion time for this questionnaire is 10 minutes.

C. Benefits

There is no direct benefit to you for participation in this study. The results from this study will provide information that may be used to help hospitals and infection control personnel better understand factors which affect compliance or noncompliance with contact precautions guidelines.

D. Risks

No risks or additional effects are likely to result from your participation in this study. In the unlikely event of harm arising from your participation, no reimbursement, compensation, or free medical treatment will be offered by Montana State University, Benefis Hospital, or the researcher.

E. Voluntary Participation/Withdrawal

Your participation in this study is voluntary and you are free to withdraw at any time. If you should choose to withdraw from the study you will in no way be compromised. Because you are not asked to sign this survey or for any other identifier, after your information has been returned to the researcher it will no longer be identifiable.

F. Costs

There are no costs involved in your participation in this study.

G. Compensation

There is no compensation being offered for your participation in this study.

H. Confidentiality

All information collected from the course of this study will be kept confidential to the extent permitted by law. All identification in the research records will be identifiable by unit only, and the completed questionnaires will be stored in a locked file cabinet that will be accessible only to the investigator and instructor. All results will be summarized and presented in aggregate; no individual study participant will be identifiable.

I. Questions

If you have any questions about the items on the questionnaire or the purpose of the study, please feel free to contact the investigators at your earliest convenience. Anne Eby or Dr. Rice can be contacted at 406-771-4450. If you would like information regarding your rights as a research participant, please feel free to contact Dr. Mark Quinn, chairman of Montana State University Internal Review Board at 406-994-5721.

J. Consent to participate in a research study

The return of your completed questionnaire is evidence of your willingness to participate in this study. You will not be asked to sign a separate "willingness to participate" document because of participant anonymity. Please retain this information letter in case you have any questions or would like additional information about this study.

APPENDIX B

INFECTION CONTROL QUESTIONNAIRE

Infection Control Questionnaire

Thank you for choosing to participate in this infection control research project. This is an anonymous survey meant to evaluate factors affecting medical-surgical nurses' compliance with contact precautions.

DEMOGRAPHICS:

Age: ___

Gender: Male / Female

Level of Education:

LPN or LVN
Associate degree RN
Diploma degree RN
Bachelor degree RN
Master degree RN
Doctorate Nursing Practice
PhD
Other_____

Years of experience in nursing practice: ___

Shift:

7-3 3-11 11-7 7am-7pm 7pm-7am Other (explain)_____

Single Married Significant Other

Number of children at home: _____Ages:_____

Total number of dependents: _____Ages:_____

SURVEY QUESTIONS:

Please answer each question to the best of your knowledge

I am familiar with the contact precaution guidelines of my institution. Yes No

The contact precaution guidelines for my institution are easy to find. Yes No

On your unit, where are the guidelines located? _____

How often do you launder your uniforms? _____

I wear my uniform to run errands before or after work. Yes No

I change my clothes and shoes when I arrive home daily. Yes No

Part 1. INFECTION CONTROL QUESTIONNAIRE: Please rate the extent to which you agree or disagree with each of the following statements regarding contact precautions.	**Strongly Disagree**	**Disagree**	**Somewhat Disagree**	**Somewhat Agree**	**Agree**	**Strongly Agree**
1. The contact precaution guidelines are easy to follow.	☐	☐	☐	☐	☐	☐
2. Following contact precaution guidelines protects my patients from pathogens.	☐	☐	☐	☐	☐	☐
3. Following contact precautions guidelines protects me from pathogens.	☐	☐	☐	☐	☐	☐
4. My peers expect me to follow the contact precaution guidelines.	☐	☐	☐	☐	☐	☐
5. My supervisor, manager, and the administration expect me to follow contact precaution guidelines.	☐	☐	☐	☐	☐	☐
6. Patient rooms with patients on contact precautions are clearly identified.	☐	☐	☐	☐	☐	☐
7. Gloves, gowns, and masks are available for contact precautions at the entryway to all rooms of patients on contact precautions.	☐	☐	☐	☐	☐	☐
8. I faithfully follow the contact precaution guidelines.	☐	☐	☐	☐	☐	☐
9. If no one is watching, I break contact precautions.	☐	☐	☐	☐	☐	☐
10. When I am pressed for time, I break contact precautions.	☐	☐	☐	☐	☐	☐
11. There are barriers to implementing contact precaution guidelines.	☐	☐	☐	☐	☐	☐
12. If my coworkers break contact precaution guidelines, I correct their action.	☐	☐	☐	☐	☐	☐
13. If my supervisor breaks contact precaution guidelines, I correct their action.	☐	☐	☐	☐	☐	☐
14. If a health provider or physician breaks contact precaution guidelines, I correct their action.	☐	☐	☐	☐	☐	☐
15. If my coworkers, supervisor, or a health care provider break contact precautions, I am more likely to also break contact precautions.	☐	☐	☐	☐	☐	☐
16. If I break contact precaution guidelines, there are consequences.	☐	☐	☐	☐	☐	☐
17. Employees who follow contact precaution guidelines are rewarded.	☐	☐	☐	☐	☐	☐

Please list the three most significant barriers you face to consistently using contact precautions._____

_____

What consequences do you face if you do not follow the contact precaution guidelines set by your institution? _____

APPENDIX C

DESCRIPTIVE STATISTICS FOR COMPLIANCE ITEMS

Table 11
Descriptive Statistics for Compliance Items

Item	N	Min.	Max.	M	SD
Contact precautions are easy to follow	47	2.00	6.00	5.00	0.83
Following CP protects patients from pathogens	47	2.00	6.00	5.26	0.82
Following CP protects me from pathogens	47	3.00	6.00	5.23	0.84
My peers expect me to follow CP	47	2.00	6.00	5.15	0.91
My supervisor etc expect me to follow CP	47	3.00	6.00	5.55	0.65
Patient CP rooms are identified clearly	47	3.00	6.00	5.30	0.88
Gloves gowns masks are available	47	3.00	6.00	5.30	0.75
I faithfully follow CP guidelines	47	2.00	6.00	4.64	0.87
If no one is watching I break CP	46	1.00	6.00	2.43	1.42
When I am pressed for time I break CP	46	1.00	6.00	2.87	1.51
There are barriers to implementing CP	47	1.00	6.00	3.60	1.70
If coworkers break CP guidelines I correct them	46	1.00	6.00	3.72	1.34
If my supervisor breaks CP I correct them	47	1.00	6.00	3.94	1.42
If a HCP or doc breaks CP	47	1.00	6.00	3.57	1.43
If someone else breaks I'm more likely to	47	1.00	5.00	2.40	1.31
If I break CP there are consequences	44	1.00	5.00	3.11	1.37
Employees who follow CP are rewarded	46	1.00	6.00	2.02	1.13