

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.				
1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE 3.Jan.00	3. REPORT TYPE AND DATES COVERED THESIS		
4. TITLE AND SUBTITLE ANETHESIA PROVIDERS' ADHERENCE TO THE USE OF GLOVES AND EYE PROTECTION			5. FUNDING NUMBERS	
6. AUTHOR(S) CAPT KOONCE BRIAN T				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) UNIFORMED SERVICES UNIV OF HEALTH SCIENC			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) THE DEPARTMENT OF THE AIR FORCE AFIT/CIA, BLDG 125 2950 P STREET WPAFB OH 45433			10. SPONSORING/MONITORING AGENCY REPORT NUMBER FY99-612	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION AVAILABILITY STATEMENT Unlimited distribution In Accordance With AFI 35-205/AFIT Sup 1			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words)				
14. SUBJECT TERMS			15. NUMBER OF PAGES 66	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT	

DTIC QUALITY INSPECTED 1

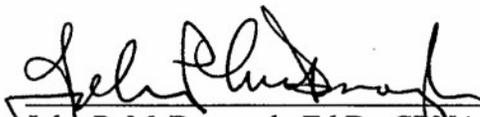
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Standard Form 298 (Rev. 2-89) (EG)
Prescribed by ANSI Std. Z39.18
Designed using Perform Pro, WHS/DIOR, Oct 94

ANESTHESIA PROVIDERS' ADHERENCE TO THE USE OF GLOVES AND EYE PROTECTION

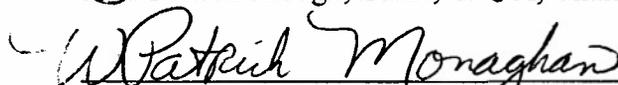
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DISCLAIMER STATEMENT

Department of Defense

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ABSTRACT

The purpose of this study is to determine anesthesia provider adherence to universal precautions, specifically the use of gloves and eye protection. With documented poor adherence to the use of personal protective equipment, anesthesia providers place themselves at risk for occupational exposure to potentially contaminated blood and body fluids on a daily basis. In 1987, the Centers for Disease Control published universal precautions with the basic premise that all patients and their blood and body fluids are to be considered potentially infected. To date, 54 health care workers have seroconverted after having occupational exposure to HIV. Questionnaires were distributed to 33 anesthesia providers with 28 usable surveys returned (85%). Eighteen providers were observed while performing anesthesia related procedures. Survey data revealed that nearly 60% of anesthesia providers are 100% compliant with the use of gloves while performing oropharyngeal procedures, such as laryngoscopy, extubation, and suctioning. However, less than 25% of providers use eye protection 100% of the time when performing these same procedures. Less than 36% providers stated that they were 100% compliant with the use of gloves when performing venous/arterial access procedures. Remarkably, none of the providers surveyed stated that they were 100% compliant with changing their gloves after performing tasks in which their gloves would be contaminated. Observation data showed that nearly 100% of providers used gloves for five procedures that were determined to be high risk for being exposed to a patient's blood or body fluids. The observed use of eye protection was significantly low, corresponding to the provider's survey data.

Key Words: universal precautions, anesthesia providers, gloves, eye protection, compliance, adherence

**ANESTHESIA PROVIDERS' ADHERENCE TO THE USE OF GLOVES AND EYE
PROTECTION**

by

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THESIS

Presented to the Graduate School of Nursing Faculty of

The Uniformed Services University of the Health

Sciences In Partial Fulfillment of the

Requirements for the

Degree of

MASTER OF SCIENCE

UNIFORMED SERVICES UNIVERSITY OF THE HEALTH SCIENCES

October 1999

DEDICATION

I dedicate this thesis, as I have my life, first to God who has created me and carried me through the most difficult times in my life. I thank God for leading me in the path toward anesthesia school so that I could achieve my dream.

I further dedicate this thesis to the four most important people on this earth: my wife, Karen, and my children, Emily, Noah, and Halle. I thank you for your never ending love. You were always there to encourage me to continue on and pursue my dream. Thank you for your patience during the frustrating times and when there seemed to be no light at the end of the tunnel.

Mom, thank you for seeing in me the potential to pursue a nursing career. It was you who sparked the idea of my becoming a nurse, and for that I owe you something I can never repay. Thanks for your love and support of my family and me during this stressful time in our lives.

ACKNOWLEDGEMENT

I am particularly grateful to my thesis committee chairperson, Dr. John McDonough, and committee members Dr. Patrick Monaghan, and Dr. Ken Miller. Without your experience and assistance, this work could have never become a reality. Thank you for your patience and guidance when it seemed I'd lost my focus.

To Major Paula Goodman and Captain John Craig, thank you for your mentoring and encouragement to persevere during the last year. You have helped keep me focused and motivated throughout the last 15 months.

To my classmates at the Uniformed Services University of the Health Sciences, especially, Alesia, Ali, Ken, Melanie, and Wendy, I offer my gratitude for your friendship during this stressful time in our lives.

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CHAPTER I. INTRODUCTION

Background of the Problem

All anesthesia providers are at risk for acquiring an infectious disease when performing patient care inside or outside the operating room. Kristensen, Sloth, and Jensen (1990) described what anesthetic procedures put the anesthesia provider at risk for being in contact with patient body fluids. In a survey of anesthesia providers, they determined that the provider's hand was most likely to be in contact with blood while performing one of fourteen procedures. Although only 36% of common anesthesia procedures produced contact with patient body fluids, this number is significant. During these procedures none of the providers were using universal precautions which placed them at significant risk of acquiring a transmissible disease.

Health care workers (HCWs) have long been at risk for acquiring infectious diseases from their patients, but it was not until the 1980s that the risk came to a heightened awareness. The epidemic of the Human Immunodeficiency Virus (HIV) causing Acquired Immunodeficiency Syndrome (AIDS) created this new risk awareness. With seemingly new risks present, government agencies, such as the Centers for Disease Control and Prevention (CDC), were prompted to alert HCWs to potential risks of transmissible diseases. Subsequently, health care workers were issued guidelines to follow in order to protect themselves and reduce the risk of acquiring an infectious disease from patients receiving their care (Bolyard & Bell, 1997; Essex, 1997; Nash, 1992; Weiss, 1992).

The CDC first received reports of unusual occurrences of *Pneumocystis carinii* pneumonia and Kaposi's Sarcoma in 1981. The unusual aspect was that these conditions, usually seen in older patients or those with a compromised immune state due to cancer chemotherapy, were diagnosed in young, homosexual men. Furthermore, these illnesses were associated with an "acquired cellular immunodeficiency" (Ward & Drotman, 1992, p. 1) that had not previously been seen.

Throughout 1981 and 1982, the CDC continued to receive reports of patients with similar opportunistic infections associated with unexplained compromise of their immune system. However, these cases were no longer isolated to young, homosexual males. They were from patients with hemophilia, recipients of blood or blood products, intravenous drug users and their heterosexual partners. Children were also among these reported cases. From these cases, it was recognized that an infectious agent was transmitted sexually, through exposure to blood, or perinatally from mother to fetus or infant (Ward & Drotman, 1992).

The commonality of all the reported cases was immunosuppression caused by an infectious agent, later recognized as a retrovirus. This being the case, in 1982, the immune disorder and its accompanying illness was entitled Acquired Immunodeficiency Syndrome or AIDS. The causative agent of the infection was isolated in 1984 and given the official title of Human Immunodeficiency Virus, or HIV, in 1986 (Ward & Drotman, 1992).

The HIV/AIDS epidemic has presented a serious risk to the unsuspecting and unprotected health care worker. With knowledge of the potential for transmission of HIV/AIDS being via contact with blood of infected patients, the HCW required reliable protective procedures and equipment.

Bloodborne hepatitis has been recognized as an occupational hazard for almost 100 years, but only in the last 15 years has it been acknowledged as a significant occupational hazard for health care workers" (Lanphear, 1997, p. 717). In the United States, hepatitis B and C account for 43% and 21%, respectively, of the reported cases of acute viral hepatitis. Both diseases are major causes of acute and chronic hepatitis, cirrhosis, and hepatocellular cancer throughout the world. It is possible that an individual infected with hepatitis B or C may never show any overt symptoms of infection thus presenting an increased threat to the unprotected and unsuspecting health care provider (www.cdc.gov., May 12, 1998). Approximately 90% of infants infected at birth, 25 to

50% of children infected between the ages of one and five years old, and five to ten percent of older children and adults progress to chronic disease. Chronic hepatitis, as it leads to other medical sequelae, presents an increased risk of disease transmission to the health care worker (Alter & Mast, 1994).

Hepatitis B (HBV) prevalence is highest among intravenous drug users, homosexual men, and those individuals born in endemic areas. Other groups including sexual partners of HBV carriers, heterosexuals with multiple partners, hemodialysis patients, and health care workers are at substantial risk for acquiring HBV. Transmission of HBV is through routes similar to that of HIV. However, only serum, saliva and semen have been shown to be infectious in the patient with hepatitis B (Alter & Mast, 1994). Infection with the virus following an exposure relates to the number of HBV viral particles that are present in the serum, as well as the presence of the hepatitis e antigen (HBeAg). Those infected individuals that are positive for the HBeAg have greater than ten trillion viral particles/mL of blood (Cardo & Bell, 1997). Related to transmission of the virus, the incubation period, following exposure, averages 120 days. The virus is reported to be infectious during this time period (Alter & Mast, 1994).

The risk of acquiring hepatitis B (HBV) is substantially higher than the risk of acquiring HIV after percutaneous exposure. Following a single percutaneous exposure to hepatitis B surface antigen, the susceptible individual has a 6% to 30% chance of becoming infected with HBV. The risk of acquiring HBV following mucocutaneous exposure has not been quantified (Carbo & Bell, 1997).

Control of hepatitis B has been attempted via the availability of a vaccine. It has been recommended that all adults and children receive vaccines for the virus. The Occupational Health and Safety Administration (OSHA), in their 1991 guidelines, requires all employers to offer the hepatitis vaccine at no cost to employees. Cardo and Bell (1997) explain that HBV seroprevalence rates among health care workers before the availability of the vaccine were three to five times higher than that of the general

population of the United States. According to Alter and Mast (1994), the incidence of hepatitis B infection in health care workers steadily declined from 1981 to around 1986 to 1988. The reported incidence has now been stable since that time.

Hepatitis C (HCV), is "the primary etiologic agent of parenterally transmitted non-A, non-B (NANB) hepatitis..." (Alter & Mast, 1994, p. 445). Nearly all individuals that are infected with HCV progress to chronic conditions. Risk factors for acquiring HCV are the same as those for acquiring HBV and HIV. The highest populations infected with HCV are intravenous drug users and hemophilia patients. Hemodialysis patients and those persons with high risk sexual behaviors have moderate and low risk, respectively, of becoming infected with the virus. Lanphear et al. (1994) indicates that there is approximately a threefold increase in the incidence of HCV among health care workers as compared to the general population. There is presently no vaccine to protect the health care worker from transmission of HCV should one be exposed.

The primary route of transmission has been documented to be through contact with large amounts of blood or through repeated percutaneous injury. Receiving a transfusion of blood or blood products from an infected donor is one of the most frequent routes of transmission. With the onset of anti-HCV testing of donors, the incidence of transmission has decreased during the 1980s and 1990s (Olmsted, 1996). The risk of acquiring HCV after percutaneous injury ranges from 3.5% to 10% (Carbo & Bell, 1997). Incubation period for HCV following exposure is more variable than that for HBV with a range of two to 26 weeks. Like hepatitis B, the risk of becoming infected with HCV following mucocutaneous injury has not been quantified.

In the 1970s, in an effort to assist hospitals with their infection control practices, the CDC published recommendations for the care of patients with infectious diseases. These recommendations included seven isolation categories based on epidemiological features of the disease. These recommendations are now obsolete (Bolyard & Bell, 1997).

The CDC in 1983 (Centers for Disease Control and Prevention [CDC], 1988) first

published blood and body fluid precautions. The CDC recognized how AIDS was transmitted and required that precautions be taken in the care of any patient thought to be capable of transmitting an infectious disease. Implementation of these precautions required that the health care workers either know or suspect that the patient had an infectious disease. This proved inadequate with the subsequent report of three health care workers being infected with AIDS leading the CDC to revise the published guidelines (Bolyard & Bell, 1997).

In 1987, following the report of transmission of HIV by mucocutaneous routes among the three HCWs, the CDC published a set of guidelines that is now known as universal precautions, or universal blood and body fluid precautions (Bolyard & Bell, 1997). These new guidelines were based on the assumption "that blood and certain body fluids of all patients are considered potentially infectious for human immunodeficiency virus (HIV), hepatitis B virus (HBV), and other bloodborne pathogens" (CDC, 1988, p. 377). A major emphasis in the publication was that contact with blood was considered the single most important factor in the transmission of HIV, hepatitis and other infectious diseases. Universal precautions includes the use of gloves, gown or apron, masks, and eye protection when the provider suspects that he will be in contact with blood or bloody body fluids.

The American Association of Nurse Anesthetists (AANA) published Infection Control Guidelines (1989, 1993) to assist the anesthesia provider in preventing contact with a transmissible disease. These guidelines support previously published guidelines by the CDC with an emphasis on prevention of transmissible diseases during anesthesia care. Among other barrier precautions, the AANA emphasizes the use of eye protection when splatter of blood is anticipated and the use of gloves at any time the provider has the opportunity to contact blood or bloody body fluids.

In 1991, the Occupational Safety and Health Administration (OSHA) published standards in support of universal precautions (Jackson & Pugliese, 1992). Unlike the

CDC recommendations however, OSHA regulations "have the force of law and must be adhered to by most employers" (Bolyard & Bell, 1997, p. 656) and employees throughout the United States.

Approximately a decade has passed since the CDC recommended the use of universal precautions. There is evidence supporting that numerous HCWs continue to use these recommended precautions inconsistently, putting themselves at risk of acquiring a transmissible disease (DiGiacomo et al, 1997; Gershon, Karkashian, & Felknor, 1994; McKay, 1991). It is the purpose of this study to determine the percentage of anesthesia providers that adhere to universal precautions on a consistent basis.

Significance of the Problem

A total of 688,200 cases of AIDS have been reported to the CDC as of December 31, 1998. Of these, approximately 109,311 are women and approximately 8,461 are children less than 13 years old at the time of diagnosis. Nearly 410,800 persons with AIDS have died (www.cdc.gov, May 13, 1999). The CDC reported 48,269 new AIDS cases in the period from January 1, 1998 to December 31, 1998, slightly less than the previous year's 60,270 (www.cdc.gov, February 11, 1998). It is hypothesized, however, that this decrease in new AIDS cases reported does not necessarily indicate a lower prevalence of HIV infection (personal communication, Dr. Mayers, January 26, 1998). Approximately one million individuals are infected with HIV throughout the United States (www.cdc.gov, Feb. 11, 1998). According to Dr. Mayers (personal communication, January 26, 1998), approximately 200 military members are diagnosed with HIV yearly.

Globally, over 33.4 million people are living with HIV. Approximately 2.5 million individuals with HIV/AIDS have died with a cumulative number of deaths due to AIDS at approximately 13.9 million. An average of nearly 16,000 individuals per day are diagnosed with HIV worldwide (www.cdc.gov, May 13, 1999).

In approximately one-half of the cases reported, information about the individual's occupation was available. Of these individuals, a cumulative total of 4,378 nurses have

been reported with AIDS. However, not all of these individuals had occupational exposure (www.cdc.gov, January 15, 1998).

As of December 31, 1998, the CDC has received reports of 54 health care workers in the United States having had seroconverted to HIV following an occupational exposure. These HCWs tested negative around the time of their exposure and subsequently seroconverted to HIV positive within a year following exposure. Of these, 22 were nurses, with no occupational specialty reported. The CDC reports that an additional 134 health care workers have a history of being exposed to blood, other body fluids, or HIV-infected laboratory materials. These individuals have no reported risk factors for HIV and are without documentation of seroconversion following their exposure. Types of exposure among the 54 seroconverted HCWs and number for each category are as follows: 46 (85%) had percutaneous (puncture/cut injury), five had mucocutaneous (mucous membrane and/or skin), two had both, and one had unknown route of exposure. Forty-nine of the exposures were from HIV-infected blood, three to concentrated virus in a lab, one to visibly bloody fluid, and one to an unspecified fluid transmission (www.cdc.gov, May 13, 1999).

During the past decade, approximately 140,000-320,000 cases of HBV infection and approximately 35,000-180,000 cases of HCV infection have occurred. Furthermore, it is estimated that approximately 1-1.25 million individuals within the United States have chronic hepatitis B. Hepatitis C accounts for approximately 3.5 million documented cases of chronic hepatitis. Death occurs in nearly 5,000 and 8,000-10,000 people yearly as a result of chronic HBV and HCV, respectively (www.cdc.gov, May 15, 1998).

From these data, it is apparent that health care workers are at a significant risk for acquiring HIV and HBV or HCV and that blood is the single most important mode of transmission of these potentially fatal diseases. The CDC reports that exposures from needlesticks or cuts have caused the most infections. "The average risk of HIV infection following a needlestick or cut exposure to HIV-infected blood is 0.3%" (www.cdc.gov,

February 11, 1998). After exposure of the eye, mouth, or nose to HIV-infected blood, the average risk of acquiring HIV is 0.1%. Finally, risk following exposure of skin to HIV-infected blood is less than 0.1%. Risk is increased however if the provider's skin is damaged or if contact involves large volumes of blood.

Of particular significance to the transmission of HIV/AIDS is the lengthy latent period from time of infection to the time of seroconversion, as well as from the time of seroconversion to the onset of symptoms. The time from infection to seroconversion averages six months and the time from seroconversion to the onset of symptoms of AIDS averages 10 years (Weiss, 1997). With the new medication therapies, patients are taking a longer period of time to develop symptoms of AIDS (personal communication, Dr. Mayers, January 26, 1998). Therefore, it is possible that HCWs can be providing care for patients that are infected with HIV but have not yet seroconverted. The blood and body fluids from these patients, however, carries the virus and is known to be infectious. Additionally, the patient could have tested positive for the virus, but unless he presents with symptoms or alerts the provider that he has HIV, there is no consistent avenue for the provider to determine if he needs to use universal precautions with any particular patient.

No data are available that indicates to what extent universal precautions prevents transmission of disease (Gerberding, Lewis & Schecter, 1995). Therefore, it is not possible to estimate what number of the 54 infected health care workers would have been prevented from acquiring AIDS by using universal precautions.

Finally, the cost of providing care to all HIV-infected individuals in the United States is estimated at \$15.2 billion. The cost of treating a single individual with AIDS is approximately \$38,000 per year and for the person that is HIV positive and has not developed AIDS, \$10,000 per year. Lifetime treatment costs are approximately \$102,000. These cost estimates do not include lost revenue from the individual's inability to perform work duties (Durham, 1994).

Numerous studies exist demonstrating that given all of the information about HIV/AIDS transmission, HCWs still continue to be inconsistent with their use of universal precautions. McKay (1991) showed that anesthesia providers showed significant differences in their perceived rate of adherence to universal precautions to an observed rate of universal precautions. Only 43% of the surveyed providers stated that they used universal precautions for all patients. Since this study there have not been any published studies in nurse anesthesia journals, in the United States that attempt to determine the compliance rate of anesthesia providers with universal precautions.

Theoretical Framework

The Protection Motivation Theory (PMT), developed by Ronald Rogers in 1975, provided the framework for this study. It has been utilized in previous studies to attempt to understand self-protection among those that are at risk for acquiring the human immunodeficiency virus (Weinstein, 1993). It has also been used in a study to explain the use of hearing protection devices among industrial workers (Melamed, Rabinowitz, Feiner, Weisberg, & Ribak, 1996). In this study it is used to explain what motivates the anesthesia provider to use or not use universal precautions in accordance with the CDC guidelines.

Updated in 1983, the premise of the theory is "that engagement in advocated health behavior is a direct function of the person's motivation to protect oneself" (Melamed et al, 1996, p 210). Weinstein (1993) explains that the provider's anticipation of a negative health outcome and the desire to avoid this outcome (or reduce its impact) creates the necessary motivation for self-protection.

The theory assumes that the provider has an established knowledge base regarding a given health threat, the risk of contracting a transmissible disease. It is this knowledge base, the individual's personality, and prior experience with similar situations that initiate the cognitive mediating processes leading to protection motivation (Rogers & Prentice-Dunn, 1997).

Rogers and Prentice-Dunn (1997) state that the cognitive mediating processes are the "focus of the PMT" (p. 114). Within this aspect of the theory is appraisal of the health threat (threat appraisal or risk assessment) and appraisal of the mechanisms to avoid this threat (coping appraisal). "The amount of protection motivation elicited is a function of the threat and coping appraisal processes" (p. 116).

Threat appraisal or risk assessment involves the provider's perceived susceptibility/vulnerability of being exposed to a transmissible disease, and having a negative outcome from the exposure. The provider's perceived severity of the negative outcome on his health, as well as the effect it will have on others, influences the risk assessment (Weinstein, 1993). These two factors alone, if valued high enough, would motivate the provider to protect himself from the potential of contracting a transmissible disease. These factors can be low or inconsistently rated for each patient contact, thus leading to a lack of self-protection. However, when factors related to coping appraisal are integrated with the above factors, the provider's level of motivation may be such that he does not comply with self-protection guidelines (Rogers & Prentice-Dunn, 1997).

Coping appraisal examines the provider's perceived effectiveness of taking action to reduce the harm from the threat. A second factor in coping appraisal is the provider's perceived barriers/obstacles to instituting threat-reducing action (Weinstein, 1993). Perceived effectiveness involves the provider's belief that the use of gloves and eye protection will prevent him from being exposed to potentially contaminated blood and blood-containing body fluids. If the provider believes that his proposed precautions are effective, there is a positive effect on motivation. Potential barriers include time and effort, as well as inconvenience and cost. It is the sum of these barriers that potentially negatively influences the provider's use of universal precautions.

Finally, the cognitive mediating processes of risk assessment and coping appraisal determine the provider's coping mode. According to Rogers and Prentice-Dunn (1997), there are two coping modes, adaptive and maladaptive. The modes are determined by the

sum of all of the above factors. An adaptive coping mode is the provider's consistent use of universal precautions for each contact with a patient or the patient's blood/body fluids. A maladaptive mode involves the inconsistent use of universal precautions or the provider's inability to care for a patient with a potentially transmissible disease.

Anesthesia providers continue to be at risk for acquiring infectious diseases from their patients with inconsistent use of universal precautions, or a maladaptive coping mode. It is important to understand what is involved in the provider's decision making process in order to understand the inconsistent adherence to precautions.

Purpose of the Study

The purpose of this study was to determine the rate of anesthesia provider compliance with universal precautions, specifically the use of gloves and eye protection. Their contact with patient's blood and body fluids inside and outside the operating room place them at risk for acquiring infectious diseases.

Problem Statement

As more individuals are living with HIV/AIDS worldwide, anesthesia providers are at increased risk for acquiring HIV during anesthesia care of a patient. Universal precautions were first implemented by the Centers for Disease Control (CDC) in 1987, with the premise that providers were to protect themselves as if all blood and body fluids are contaminated with an infectious disease (CDC, 1988). Documentation shows that there has been inconsistent adherence among all health care providers to the universal precautions guidelines. When military anesthesia providers are deployed to developing countries with high HIV seroprevalence rates, they are at increased risk for acquisition of transmissible diseases. Furthermore, there is little documentation in nurse anesthesia journals about adherence to universal precautions since 1993.

Research Questions

1. What is the anesthesia provider's rate of adherence to the CDC recommended universal precautions, specifically the use of eye protection and gloves?

2. What is the observed rate of adherence of the use of eye protection and gloves by anesthesia providers?
3. Is there a significant difference in the rates of adherence of the use of eye protection and gloves between male and female anesthesia providers?
4. Is there a significant difference in the use of eye protection and gloves among anesthesiologists, certified registered nurse anesthetists, and student registered nurse anesthetists?

Definitions—Conceptual and Operational

The following key words are used in this study:

1. **Health Care Worker:** Any individual that is involved in the performance of patient care.
2. **Anesthesiologist:** a physician that has completed a residency in anesthesia and performs patient care during the perioperative period.
3. **Certified Registered Nurse Anesthetist:** A licensed registered nurse who has completed an advanced educational program in anesthesia and has successfully passed a national certification examination. This individual also performs care during the perioperative period.
4. **Student Registered Nurse Anesthetist:** A licensed registered nurse who is currently in an advanced educational program in anesthesia.
5. **Universal Precautions:** Recommended guidelines published by the CDC that the HCW utilizes to protect oneself from exposure to blood or body fluids of all patients. These guidelines apply to blood, visibly bloody fluids, semen, vaginal secretions, and amniotic, pericardial, peritoneal, pleural, synovial, and cerebrospinal fluids. They do not apply to feces, sweat, nasal secretions, sputum, tears, urine and vomitus.

Assumptions

Three assumptions have been made in this study.

1. All providers were aware of the barrier precautions listed in the published universal precautions guidelines.
2. The anesthesia providers were aware of the routes of transmission of AIDS/HIV.
3. All survey participants read the survey and answered questions honestly.

Limitations

1. The study was performed in one military medical treatment facility. Therefore, results obtained may not be able to be generalized to civilian facilities.
2. Providers might have changed their protection behaviors knowing that they were being observed.
3. The total sample size of anesthesia providers surveyed and observed was small.
4. Survey results could not be correlated to observation results due to the need for anonymity of the study participants.

Summary

This chapter has provided an insight to the seriousness of HIV/AIDS and the need for the anesthesia provider to protect himself from being in contact with patient's blood and body fluids. It is apparent that HIV infection is a worldwide problem and will influence the military anesthesia provider when he is deployed to developing countries, not just during his work in the United States. With the information available to health care workers regarding the transmission of HIV/AIDS, there is considerable uncertainty surrounding the inconsistent use of protective measures according to universal precautions. In the next chapter, resources will be examined that further illustrate the pathogenesis and the seriousness of HIV/AIDS, as well as the inconsistent use of universal precautions by health care workers.

CHAPTER II. REVIEW OF LITERATURE

Introduction

The purpose of this study was to determine the compliance of anesthesia providers with universal precautions, specifically the use of eye protection and gloves. The unprotected anesthesia provider that comes in contact with a patient's blood or body fluids is potentially at an increased risk of contracting an infectious disease.

Over a decade has passed since the CDC's 1987 revision of the measures for the health care workers to protect themselves from contracting an infectious disease. However, it is well documented throughout the literature that health care workers, including anesthesia providers, continue to be noncompliant regarding the use of barrier precautions for every patient contact. It is evident that many providers increase their use of personal protective equipment as the perceived risk of infection increases. This is shown to be a dangerous strategy for the protection of oneself due to the potential of treating patients that are positive for HIV or hepatitis B or C and without symptoms (Chamberland, Ciesielski, Howard, Fry, & Bell, 1995).

Infection Control Practices

Gerberding, Lewis, and Schechter (1995) offer insight into the history of infection control, particularly in the operating room setting. It was over 100 years ago that the principles of infection control were introduced into the operating room environment. Semmelweis, in the mid-nineteenth century, demonstrated that the mortality rate from puerperal fever among women giving childbirth could be significantly decreased if providers washed their hands in a solution of chlorinated lime prior to examination of the mother. However, his ideas were rejected. "Joseph Lister popularized the use of antiseptics" (p. 1092). His ideas combined with those of the germ theory proposed by Louis Pasteur offered the foundation for modern infection control practices of today. William Halstead proposed the use of rubber gloves in the late 1800s. His interest was in protecting the chapped hands of his scrub nurse from the irritating effects of the antiseptic

solutions. By 1900, surgical asepsis principles were established. These principles focused mainly on the prevention of contamination of surgical wounds by microorganisms. The mid-twentieth century included the advent of antibiotics to prevent infection. The introduction of "the HIV epidemic" (p. 1092) has required a refocusing of attention on prevention of exposure of the health care worker and the patient.

Anesthesia Provider Risk

Much of the literature that discussed universal precautions and the health care worker focused on the risk of infectious disease transmission following needle sticks. Needle sticks have the higher incidence of transmission (0.3%) as compared to mucocutaneous exposure. However, the risk of contracting an infectious disease by mucocutaneous exposure still remains a possibility. As Browne and Chernesky (1988) indicate, the unprotected conjunctiva of the eye and mucous membranes offer no protection against the risk of infectious disease transmission. The natural skin barrier can be breached by excessive handwashing, cuts sustained while opening glass ampules, or skin lesions/injuries sustained outside of the work environment. These factors increase the risk of infectious disease transmission to the anesthesia provider if there is not complete adherence to the use of eye protection and gloves while performing patient care.

Berry (1995) provides numerous examples of procedures in which the anesthesia provider is at significant risk for needle sticks with various sizes of needles. He explains that one of the factors that is necessary for disease transmission is the "number of infectious virus particles in the inoculum" (p. 1124). Of 19 percutaneous injuries to anesthesia providers, 32% were caused by smaller gauge needles with half of these being from recapping.

Kristensen, Sloth, and Jensen (1990) offer a study that further explains the potential risk of disease transmission to anesthesia providers. They studied procedures performed by anesthesia providers in the operating room, the emergency department and on medical wards. In this study anesthesia providers were asked to document their

contact with patient's body fluids while they performed one of fourteen common procedures. They determined that 36% of common anesthetic procedures resulted in contact with patient body fluids. Contacts with saliva occurred during tracheal intubation, extubation, and during suctioning of the mouth, pharynx, or trachea in 99% of the incidents. Gloves were not employed when 17.6%, 4.1%, and 9.3% of providers were in contact with patient's blood while performing intravenous cannulation, tracheal intubation and tracheal extubation, respectively. There was only one incidence of contact with the provider's eye while performing an unidentified procedure. Blood and saliva were the most common contacts. The authors state that 98% of the contacts with patient's blood could have been prevented with the use of protective gloves.

Chrisco and Devane (1992) indicate that it is probable that an anesthesia provider can be in intimate contact with a patient's saliva containing overt or occult blood. "Direct laryngoscopy can produce some damage that could result in the interruption of mucosa..." (p. 380). The authors determined that during atraumatic intubations, 31% of patients tested positive for either occult or overt blood after intubation and 69% following extubation. In those patients that had a potentially traumatic intubation, 50% tested positive for either occult or overt blood after intubation and 86% upon extubation. These data support that the sight of visible blood cannot be used as an indicator on whether or not the provider will choose to use eye protection and gloves when performing intubation and extubation procedures.

Buergler et al., (1992) explain that anesthesia providers are at a significant risk for being exposed to blood and body fluids and therefore at an increased risk for HIV infection. They further point out that students have a lack of familiarity with procedures; therefore they are at an even higher risk for HIV infection if not protected by barrier precautions. These researchers calculated the 30-year risk of anesthesia providers for contracting HIV. The provider that works in a low prevalence work site and does not utilize a double gloving technique has a 0.05% to 0.22% risk in comparison to the

provider that works in a high prevalence area who has a 4.5% to 13% risk. Their research was primarily on the risk of infection following percutaneous exposure, i.e. needle stick. It was concluded that use of a double gloving technique may or may not decrease the risk of infection of the anesthesia provider as compared to the surgeon. The rationale for this was that the anesthesia provider when sustaining an injury with a needle usually experiences a deeper, more direct penetration than the surgeon. However, this study supports previous studies that state that the anesthesia provider who is not fully compliant with universal precautions is potentially at an increased risk of contracting an infectious disease.

The risk of HIV transmission from patient to provider is related to numerous factors to include prevalence of HIV among treated patients, potential for virus transmission following a single exposure to blood or body fluids, and the nature and frequency of occupational blood contact (Chamberland et al., 1995).

Seroprevalence varies widely throughout the United States and is the focus of various studies. A median seroprevalence was 1.0% among approximately 265,000 blood specimens tested. However, there was a 60 fold variation among various hospitals, placing some providers at considerably more risk than others (Chamberland et al., 1995). Of note are the number of patients treated for emergent care that are HIV positive without symptoms. An average of 5.2% to 6% of patients seeking emergency department treatment tested positive for HIV, in 1987 and 1988.

The health care worker has a one in 250 chance of becoming infected with HIV after experiencing a needlestick or sharps cut from an HIV positive patient. One significant factor for risk of transmission after injury is the viral load of the infected individual. Those with a higher HIV titer tend to have more acute illness are the more likely individual for the health care worker to be treating. Hepatitis B has a greater prevalence with one in 20 health care workers being at risk for infection after percutaneous injury if the source patient has negative hepatitis Be antigen. The risk

increases to one in four if the patient is positive for hepatitis Be antigens.

Gardner and Schaffner (1993) have determined that there is an average of 300,000 new cases of hepatitis B reported annually with more than 4,000 individuals dying due to hepatitis infection. Sepkowitz (1996) states that 6500 to 9000 new HBV infections occurred in health care workers just for 1990. He further reports that 300-950 of these individuals will develop chronic hepatitis.

AIDS: An epidemic

AIDS is referred to as an epidemic throughout the literature (CDC, 1987; CDC, 1988; Durham, 1994; Grogano, 1989; Kotzan & McMillan, 1995). Grogano (1989) offers a comparison of the AIDS epidemic to historical epidemics. In his discussion he states that the plague is the most well known in history. The bubonic plague killed approximately 25 million individuals throughout Europe in the fourteenth century. The Great Plague killed approximately 70,000 people in London in 1664 and 1665. In the late 1800s and early 1900s, approximately 10 million people throughout the world were killed by the plague. The death rate from AIDS does not compare to previous epidemics, but few other epidemics "have engendered the knowledge, the discussion, and the fear that have accompanied AIDS" (p. 148).

Costs of HIV/AIDS Medical Care

The cost of medical care for a patient with HIV and AIDS is an important consideration due to the economical impact that is incurred with each new infection. Another consideration is the potential prevention of these medical costs had the infected provider been compliant with barrier precautions.

Hellinger (1993) in his review of data from the AIDS Cost and Service Utilization Survey estimates that the "lifetime cost of treating a person with HIV from the time of infection until death is approximately \$119,000" (p. 474). The expense from time of HIV infection to development of AIDS is approximately \$50,000, assuming that the average length of time from infection to AIDS development is 10.3 years. The individual that

develops AIDS incurs a cost of approximately \$69,000 until death. These figures include inpatient and outpatient care, as well as pharmaceutical requirements. He further states that these numbers are in constant flux because of new treatment modalities for the person with HIV and AIDS. The impetus of this study is that the individual seeks treatment as soon as he is infected.

Other researchers to estimate cost savings of HIV prevention then used these above figures. Guinan, Farnham, and Holtgrave (1994) determined that a savings of approximately \$56,000 to \$80,000 is possible with attempts to prevent just one HIV infection. These attempts were not just descriptive for the health care provider, but were generalized for the average individual. These authors state that they have made an "average estimation of gross medical cost savings" (p. 3). Their study did not take in to account costs for social services, or indirect costs relating to lost productivity caused by premature disability and death. As Hellinger (1993) indicated, these authors conclude that these cost savings are approximate figures and are subject to change quickly due to rapidly changing treatment modalities.

Kotzan and McMillan (1995) compare Medicaid costs for the AIDS patient to that of the non-AIDS patient. They determined that the costs for the care of an AIDS patient is increasing at a faster rate than the cost for treating the non-AIDS patient. The cost for treating approximately 1000 AIDS patients was approximately \$263,000 in April, 1988, which increased to approximately \$847,000 in August, 1991. The cost of treating a similar group of non-AIDS patients was \$160,000 in 1988, as compared to \$333,000 in 1991. These authors conclude that the cost of treating an AIDS patient may increase tenfold by the year 2000.

A more recent study performed by Moore and Chaisson (1997) suggests that the "lifetime costs for treating an HIV-infected patient who presents with a CD4⁺ count > 500 cells/mm³ are approximately \$133,500 over 8.3 years of life" (p. 223). These researchers studied 606 HIV infected individuals from July 1992 to June 1995. Their study was

categorized into various stages of the disease according to CD4⁺ cell count. Mean monthly payments ranged from \$2,436 for patients with counts greater than 50 to \$1,015 for patients with counts greater than 500. These authors further determined that costs of medical care increased significantly during the last 6 months of life. Mean monthly costs were \$3,340 when an individual was 4-6 months from death as compared to a mean of \$6,680 in the last 3 months of life. Finally, these authors concluded that pharmaceutical costs were the second most expensive category, being the highest when an individual's CD4⁺ count is less than 50 cells/mm³.

In contrast to the above articles that report expenditures for the medical care of HIV/AIDS patients, Doebbeling and Wenzel (1990) studied the cost of universal precautions within a teaching hospital. Their study examined costs of barrier precautions before the implementation of universal precautions and then again two years after the advent of universal precautions. They reported an increase in the use of gloves from 1.64 million pairs to 2.81 million pairs annually after universal precautions were implemented. Prior to universal precautions, all isolation materials cost \$509,500. This increased to \$860,400 annually two years after universal precautions. Compliance with universal precautions is not inexpensive according to this information.

Universal Precautions Compliance

Numerous studies exist that demonstrate poor compliance with universal precautions. As previously stated, many focus primarily on the incidence of needle sticks and place minimal attention on mucocutaneous exposures. It is clear from these studies that there all health care workers that have patient contact are at risk of contracting an infectious disease. In contrast to previous studies, this study places emphasis on the use of eye protection and gloves by anesthesia providers during their performance of patient care.

Baraff and Talan (1989) performed a study in an urban emergency department two years following the CDC's recommendation that all blood and body fluids should be treated as if they are contaminated. Their observations included 169 health care workers

including nurses, physicians, and emergency medical technicians. Noncompliance with the use of barrier precautions was seen more than compliance in their study. Only 52.5% of health care workers donned gloves when drawing blood or when inserting peripheral intravenous catheters. The use of gloves increased for the care of critical trauma patients, but eye protection was only used by 19% of the care givers. Specifically, during endotracheal intubation, the use of protective goggles was 25% and the use of gloves was 67%.

A survey and observation study was performed by McKay (1991) "to compare the perceived and the actual compliance of anesthesia personnel with CDC recommendations" (p. 360). The survey tool was completed by 68 anesthesia providers, including anesthesiologists, CRNAs, and SRNAs. Only 43% of the providers stated that they utilized universal precautions for all patients. According to her survey, while performing venipuncture, 47% of providers donned gloves. When likely to come into contact with a patient's mucous membranes or secretions, 76% of providers reported the use of gloves. There is no mention of the use of eye protection when performing any of these procedures.

Sixty providers, divided evenly by provider (20 each), were observed in the second phase of her study. It was noted that 55% of providers performing venous or arterial punctures used gloves to protect themselves. Ninety-seven percent of providers recapped needles and 12% experienced skin contact with blood from a patient. The highest incidence of compliance with universal precautions, according to this study, was in the group of student registered nurse anesthetists (McKay, 1991).

Of 1441 procedures observed, only 19% were done in full compliance of universal precautions, according to Naccache, Fortin, Croteau, and Godin (1992). They reported that eye protection, masks and gowns were never utilized when splashing occurred. In this study, nurses had the lowest compliance rate with use of gloves as compared to physicians and laboratory technicians. This study also involved the use of a survey

questionnaire tool. The authors indicate an overestimation of adherence to universal precautions while performing particular procedures. Reasons offered for noncompliance with universal precautions in their survey was nuisance, discomfort, lack of knowledge, forgetfulness, and low risk perception.

O'Donnell and Asbury (1992) in a Great Britain and Ireland study examined the effect of grade, age, sex, and region of employment on the attitude of anesthetists regarding their risk of HIV and hepatitis infection. They determined as other studies have, that the majority of anesthesia providers were fully compliant with universal precautions when they were caring for a known or suspected HIV or hepatitis positive patient. It was also noted that a greater number of anesthesia trainees wore gloves when performing patient care than did staff anesthesia providers but the percentage was still low (19.4% as compared to 13.1%). There was no significant difference in needle recapping, but more of the trainees were less likely to recap needles if they thought their patient could potentially transmit an infectious disease. Younger anesthesia providers were more likely to don gloves during routine procedures than were the older providers. The authors reported minimal differences in the use of universal precautions among male and female providers. There was no report of statistical significance in the use of barrier precautions among the regions of the country with the highest incidence of HIV and hepatitis.

Tait and Tuttle (1994) performed a study to determine how anesthesiologists varied their personal protection behaviors when thought to be caring for a patient with an increased risk of transmitting an infectious disease. Their survey received a response rate of 44%, or 493 questionnaires returned. Only 59% of the providers had read the CDC guidelines for the use of personal protective equipment, but 85.2% stated that they were familiar with the guidelines. According to this study, anesthesiologists have a self-reported significant increase of their adherence to universal precautions when presented with a high risk of transmission of infectious disease. When confronted with a low risk patient, only 25% to 27% of providers complied fully with universal precautions. Similar

to the previous data in this study, gloves were used significantly more when the provider encountered a patient with increased risk of having a potentially transmissible disease. Number of years in practice related to the use of gloves was also statistically significant. Anesthesiologists with < 5 years experience had a compliance rate of 55.6% for the use of gloves in patients with low risk. Providers with > 20 years experience had a compliance rate of 38.9% when working with low risk patients. Eye protection was utilized in high risk patients by 83.4% of the providers compared with a 49.3% use of gloves for such patients. The decision to use universal precautions according to perception of risk is dangerous due to the incidence of unrecognized HIV infection among patients.

Of the anesthesia providers surveyed in Tait and Tuttle's (1994) research, only 58% stated that they had significantly changed their practices. Thirty five percent of the providers stated that they had altered their practice somewhat and 6.8% had made no changes. On a scale of one to ten, anesthesiologists had a higher perception of risk to hepatitis B than to HIV infection.

Gershon et al. (1995) studied the compliance with universal precautions among three hospitals. These hospitals were considered to be in low risk, intermediate risk and high risk areas for the number of patients to be potentially infected with HIV and hepatitis. Their study had a questionnaire response rate of 57%, with the majority of questionnaires returned by female nurses. The researchers determined a compliance rate of approximately 97% for the use of gloves and a 63% compliance rate for the use of eye protection. As anticipated, adherence to the use of barrier precautions was higher at the hospital in a high risk infectious disease area.

Compliance was found to be lower in those health care workers with higher levels of education, and those that worked > 50 hours per week. Compliance was also lower for those providers that scored high on a "risk taking personality scale" (Gershon et al., 1995, p. 229). Amount of work stress inversely effected the use of universal precautions. Those with higher work stress were less compliant.

Observers in a study of prehospital providers recorded how sharps were handled and the appropriate use of universal precautions in one of four situations, including intravenous line placement, endotracheal intubation, large wound and body fluid management. The study shows that during the placement of intravenous catheters, 92% of providers donned gloves, but the use of gloves universally was not apparent. The use of eye protection by these providers was only 6%. Rationale for the poor compliance among these providers includes low risk perception, lack of time, discomfort, and interference with ability to perform procedures. (Eustis, Wright, Wrenn, Fowle, & Slovis, 1995).

It has been proposed that the use of gloves increases the risk of incidence of percutaneous injury in anesthesiologists. However, in a study performed by Ben-David and Gaitini (1996) this was shown not to be the case. During the phase of this experiment where gloves were not in use, there were eight needlesticks reported. When gloves were worn in the second phase of the study, the number of needlesticks decreased to three. Other percutaneous injuries, such as cuts from glass ampules, were also lower when gloves were worn (0.32% as compared to 0.17%).

A second consideration in this study was to determine if gloves increased surface contamination in the anesthesia workplace. It was again determined that the use of gloves actually decreased the number of areas contaminated. At a time when gloves were not utilized, 46 sites tested positive for occult blood as compared to 34 positive sites when gloves were used. This is not a statistically significant difference, however there is a notable trend toward reduction when gloves are employed (Ben-David & Gaitini, 1996).

The authors of the study noted that the decrease in needlesticks may have been due to a "modest deflective behavior" (Ben-David & Gaitini, 1996, p. 627). Additionally, the gloves may have produced clumsiness requiring increased vigilance. The decrease in percutaneous injury was most likely due to the gloves serving as a protective barrier.

Rationale for the trending decrease in surface contamination may have been related to the practice of changing gloves once they have become soiled.

Summary

This literature demonstrates that there continues to be a deficiency in provider's use of universal precautions, particularly eye protection and gloves. This poor adherence to barrier precautions may place the provider at significant risk for contracting serious infectious disease.

CHAPTER III. METHODOLOGY

Introduction

The purpose of this study is to determine anesthesia provider compliance with the use of universal precautions. McKay (1991) showed that anesthesia providers do not consistently utilize protective equipment for every patient. However, she did demonstrate that providers are more likely to protect themselves from potential transmissible diseases if the patient is suspected to be high risk. Tait and Tuttle (1994) verified this by stating that greater than 90% of anesthesia providers use barrier precautions when the patient is suspected to be high risk, but approximately 25-27% use barrier precautions when the patient is suspected to be low risk. This study used a self-assessment survey tool as well as observations to show anesthesia provider compliance with universal precautions.

Research Design and Procedures

This study is a descriptive, correlational study. All data has been derived from one of three types of anesthesia providers following completion of the study survey and observations. Following Institutional Review Board (IRB) approval at the Uniformed Services University and at each facility involved in data collection, a survey with instructional cover letter was delivered to anesthesia providers individually. Consent for participation was obtained from each provider following verbal and written explanation about the study (see Appendix C). Observations were performed after all surveys were returned. Specific questions and procedures inquired about in the survey tool were the focus of observations. Only this author performed observations at unannounced times to avoid a Hawthorne effect in which providers might change their routine practice if given a specific date for observation to take place. Data were recorded on the separate observation tool. No attempt was made to correlate the provider's specific survey responses to observed practices. In this regard, there were no identifying codes placed on either the survey or the observation tool. Data collection occurred from February, 1999 to March, 1999.

Sample

Anesthesiologists, certified registered nurse anesthetists, and student registered nurse anesthetists were asked to participate in this study. A convenience sample was taken from the entire population of anesthesia providers at one clinical site. This population consisted of approximately eight anesthesiologists, 19 certified registered nurse anesthetists, and six student registered nurse anesthetists. Data collection took place in one large military medical treatment facility in the Midwestern United States.

Measurement

The self-assessment survey and observation tools used in this study were adaptations of the tools used by McKay (1991). Permission was obtained from the author for use of the tools. The survey tool consisted of 35 questions, focusing on demographic information and rates of compliance with use of universal precautions while performing specific anesthetic procedures (see Appendix A). Procedures delineated in the survey were those that have been identified as high risk for contamination or those that have been indicated to have a high degree of noncompliance with universal precautions. Also included in the survey were questions regarding awareness of guidelines directing the provider's use of universal precautions.

Three experts in their field, including a certified registered nurse anesthetist (CRNA), an anesthesiologist and an infectious disease clinician were requested to examine the survey questionnaire for content validity. Both of the anesthesia providers are experienced clinicians practicing in large military medical centers. They also serve as professors in their fields at a large university. The infectious disease clinician is associated with a major clinical and research facility in the southeastern United States.

Protection of Human Rights

This study consisted of anonymous survey and observation through voluntary participation. Following approval by the IRB at the Uniformed Services University and at the site used for data collection, all participants were provided with verbal and written

information about the study. Prior to data collection from any provider, informed consent was obtained (see Appendix C). Included in the consent was the option to withdraw from the study at any time. There was no correlation drawn between provider's demographic data on the survey tool and their subsequent responses. Furthermore, other than demographic data, there were no identifiers/codes placed on either the questionnaire or the observation tool. Finally, there was no attempt to correlate data from the survey questionnaire with data received from observations.

Plan for Data Analysis

Descriptive statistics and frequencies were used to analyze data collected from the survey questionnaire and observations. Data for analysis included demographic information that was derived from questions asked in the survey tool and observations of practice. Initial comparison was made regarding difference in compliance rates between the three groups of anesthesia providers. Secondly, data analysis focused on the difference in compliance rates between male and female providers. Analysis of variance was performed to compare the compliance rates among individual groups.

Summary

Sites for this study included one military medical treatment facility in the Midwestern United States. The overall purpose of the study was to determine the rate of compliance with universal precautions among three types of anesthesia providers, both male and female. All data were taken from the survey questionnaire and the observation tool. Analysis of the data focused on frequencies of compliance with universal precautions while comparing the three groups of anesthesia providers as well as gender. Chapter four explores data presentation, analysis, and interpretation.

CHAPTER IV. DATA ANALYSIS

Introduction

The purpose of this study was to determine the anesthesia provider's adherence to universal precautions, particularly gloves and eye protection, while performing specific high risk procedures. Demographics of the sample, data presentation, analysis and interpretation of the data will be presented in this chapter. The four research questions presented in chapter one will be reexamined and answered.

Demographics

Questionnaires were distributed to 33 anesthesia providers with 28 usable returned. This corresponds to an 85% return rate. Anesthesiologists, certified registered nurse anesthetists, and student registered nurse anesthetists were invited to participate in the study (see Table 1).

Table 1.

Providers Responding to Questionnaire

Provider	n	Percent
Anesthesiologist	7	25
CRNA	16	57.1
SRNA	5	17.9

Consent for observation was obtained from 19 of the 28 (68%) anesthesia providers completing the questionnaire. A total of 18 observations (95%) were completed (see Table 2).

Table 2.**Providers Observed**

Provider	n	Percent
Anesthesiologist	4	22.2
CRNA	10	55.6
SRNA	4	22.2

One subject was unavailable for observation accounting for the difference in the number of providers consented and those actually observed. It was not possible to observe each provider performing all the tasks listed on the Observation Data Collection Form (see Appendix B) for several reasons. The anesthesiologist and the CRNA work predominantly as a team at the facility used for data collection. This team approach to delivery of the anesthetic made it difficult to observe the anesthesiologist performing more than intravenous line insertion. Furthermore, during the time of data collection the number of anesthetics delivered was not optimal for observing each provider while performing all of the tasks listed on the Observation Data Collection Form.

Other demographic data derived from the questionnaire was the provider's gender, military or civilian status, and years of professional experience in clinical patient care. Sixteen males and 12 females, including two civilian and 26 military anesthesia providers completed the survey. Providers' years of experience were divided into four categories. The majority of the providers indicated that they had either six to 10 years (32.1%) or greater than 15 years (32.1%) of experience. Two providers (7.1%) indicated that they had less than five years of experience, while eight respondents (28.6%) had 11-15 years of experience.

The low number of providers available creates difficulty in interpreting the results and drawing meaningful conclusions. Despite the low number of subjects, it will be shown

throughout this chapter that data collected from this institution is consistent with previous studies as discussed in chapter two.

Analysis of Data

In order to answer the research questions presented in chapter one regarding the providers' adherence to the use of gloves and eye protection, descriptive statistics, frequencies and Oneway ANOVA were performed on the survey data. Data collected from observations was only subjected to descriptive statistics and frequencies.

Questionnaire Data

Oropharyngeal Procedures

Ten of the survey questions attempt to determine adherence to the use of gloves and eye protection while anesthesia providers perform oropharyngeal procedures. Table three shows the number and percent of providers that indicated 100% adherence to the use of gloves while performing specific oropharyngeal procedures.

Table 3.

Oropharyngeal Procedures: Sample Size (n) of Providers and Percent of Sample with 100% Stated Adherence to Use of Gloves

Procedure	n	Percent
Laryngoscopy	17	60.7
Extubation	19	67.9
Suctioning	16	57.1
Removing/placing NG/OG	18	64.3
Contact w/mucous membranes	7	25.0
Emergency intubation	17	60.7

Similarly, the number of providers that responded with 100% adherence to the use of eye protection while performing oropharyngeal procedures is illustrated in Table 4.

Table 4.

Oropharyngeal Procedures: Sample Size (n) of Providers and Percent of Sample with 100% Stated Adherence to Use of Eye Protection

Procedure	n	Percent
Routine intubation	6	21.4
Awake intubation	6	21.4
Emergency intubation	5	17.9
Extubation	6	21.4

As noted above, 17 providers stated 100% adherence to the use of gloves while performing laryngoscopy. Eleven providers indicated on their questionnaires that they were not 100% adherent to the use of gloves for laryngoscopy. Ten stated that they use gloves for this task 80-99% of the time, while one provider indicated a 20-39% adherence.

The majority of anesthesia providers (14, or 50%) indicated less than 20% adherence to the use of eye protection during routine, awake and emergency intubations. Four providers (14.2%) responded with 60-99% adherence to using eye protection while performing routine intubations. Another four providers indicated that they use eye protection for routine intubations 20-59% of the time. Six respondents (21.4%) stated a 60-99% adherence, while two providers indicated a 40-59% adherence to the use of eye protection during awake intubations. Five providers (17.8%) stated that they use eye protection for emergency intubations 60-99% of the time. Two of the responding providers indicated a 20-59% adherence to the use of eye protection during emergency intubations.

While 19 providers responded with 100% adherence to the use of gloves when extubating patients, seven (25%) stated that they use gloves 80-99% of the time for this task. Two providers (7.2%) responded with an adherence of 40-79%.

Data for the use of eye protection for extubation were similar to the use of eye protection for intubation. The majority of providers, 15 (57.1%), stated that they use eye protection when extubating patients less than 20% of the time. Four providers indicated that they use eye protection 60-99% of the time, while three providers stated that they protect their eyes 20-59% of the time during extubation.

A total of ten providers (35.7%) indicated that 80-99% of the time they use gloves when suctioning patients. Two providers stated that they suction patients with gloves on 40-79% of the time.

When inserting or removing nasogastric/orogastric tubes, nine providers (32.1%) stated that they use gloves 60-79% of the time. Only one provider indicated a use of gloves 40-59% of the time for this task.

When in contact with a patient's mucous membranes, the majority of the respondents, 15, indicated that they use gloves 80-99%, rather than 100% of the time. A total of six providers stated an adherence of 20-79% when in contact with a patient's mucous membranes.

As illustrated in Table 3, the majority of providers wear gloves 100% of the time when performing emergency intubations. Six other providers stated that they protect themselves with gloves 80-99% of the time during situations requiring emergency intubations. Finally, three providers showed their adherence to be 20-59% for this specific task.

Venous/Arterial Access Procedures

Venipuncture, as defined in the questionnaire, includes puncture of a peripheral vein for phlebotomy or intravenous cannulation. Providers were asked to indicate their percentage of compliance with the use of gloves when performing venipuncture, difficult

venipuncture and drawing blood from arterial or central venous lines. The number and percent of total providers that indicated a 100% adherence to the use of gloves when performing the above-mentioned tasks is illustrated in Table 5.

Table 5.

Venous/Arterial Access Procedures: Sample Size (n) of Providers and Percent of Sample with 100% Adherence to Use of Gloves

Procedure	n	Percent
Venipuncture	6	21.4
Difficult venipuncture	9	32.1
Drawing blood from arterial/central venous line	10	35.7

It is evident from Table 5 that the majority of providers are not 100% compliant with the use of gloves when performing these three procedures. Notably, 15 and 10 providers, respectively, stated that they use gloves for uncomplicated and difficult venipuncture 80-99% of the time. Six providers indicated a compliance of 40-79% for the use of gloves for uncomplicated venipuncture, while five stated an equal percentage for their compliance with use of gloves for difficult venipuncture. Three providers indicated that they use gloves 20-39% of the time for difficult venipuncture. Only one provider stated a compliance of less than 20% for each classification of venipuncture.

Seven providers indicated a compliance of 80-99%, while six stated a 60-79% adherence to the use of gloves when drawing blood from an arterial or central venous line. Two providers responded with 20-59% compliance when performing this task and two providers indicated less than 20% adherence.

Only two questions from the survey requested information regarding the use of eye

protection when performing venipuncture-like procedures with similar results obtained. The majority of providers, 15 (53.6%) and 16 (57.1%) respectively, indicated that they wear eye protection less than 20% of the time when inserting invasive lines and drawing blood from arterial or central venous lines. Six providers stated a 100% adherence when inserting invasive lines, while five providers wear eye protection 100% of the time when drawing blood from arterial or central venous lines. For both of these procedures, three providers indicated a compliance of 60-99%, while four stated that they wear eye protection 40-59% of the time.

Changing Gloves after Tasks

None of the providers stated a 100% compliance with changing gloves after performing tasks in which gloves may become contaminated. Illustrated in table 6 is the number and percentage of providers related to their stated frequency of changing gloves after each task.

Table 6.

Provider Stated Percentage of Changing Gloves After Each Task

Percentage	n	Percent of total providers
80-99	15	53.6
60-79	7	25.0
40-59	1	3.6
20-39	4	14.3
<20	1	3.6

Recapping of Needles

On the questionnaire, providers were asked to note their frequency of recapping contaminated needles, in percentages. There was not a large majority of providers in one

frequency percentage than another, however 12 providers indicated that they recap contaminated needles greater than 60% of the time. Of note, there were no providers that indicated a 100% frequency (see Table 7).

Table 7.

Providers Stated Frequency of Recapping Contaminated Needles with Number and Percent of Total Providers

<u>Frequency</u>	<u>n</u>	<u>Percent of Total</u>
<20	6	21.4
20-39	5	17.9
40-59	5	17.9
60-79	8	28.6
80-99	4	14.3

Use of Universal Precautions in High Risk Patients

While 12 providers (42.9%) stated that they do not use universal precautions on all patients, 23 (82.1%) indicated that they use extra precautions when caring for high risk patients. Notably, 13 providers (46.4%) stated that they believe that surgical patients should be routinely tested for HIV, HBV and HCV.

Needlestick or Exposure to blood/body fluids

An overwhelming majority of respondents, 27 (96.4%), indicated that they have experienced some kind of skin exposure to a patient's blood or body fluids. It is unknown if the providers were using universal precautions at the time or what type of exposure it was. Additionally, 17 (60.7%) providers stated that they have had a needlestick with a contaminated needle. The questionnaire responses further indicates that there has been underreporting of these instances by the providers that experience them (Table 10).

Observation Data

The use of gloves and eye protection while performing specific procedures was noted as yes or no on the Observation Data Collection Form. The observed use of gloves for specific procedures is noted in Table 8.

Table 8.

The Observed Use of Gloves by Anesthesia Providers While Performing Specific Procedures

Procedure	n observed	Yes	No
Venipuncture	17	11	6
Intubation	10	10	0
Extubation	7	7	0
Suctioning	7	7	0
Removing NG/OG	5	4	1

For three of four oropharyngeal type procedures on the data collection form, providers were 100% compliant with the use of gloves. One provider however, was seen not using gloves when removing an orogastric tube. The majority of providers were observed using gloves when performing venipuncture; however 35% did not use gloves for this task.

The number of providers using eye protection is significantly less than those seen wearing gloves. None of the providers observed used eye protection when performing venipuncture, removing an nasogastric/orogastric tube, or when placing a spinal (see Table 9). Less than 15% of providers were observed using eye protection for such oropharyngeal procedures as intubation, extubation and suctioning.

Table 9.

The Observed Use of Eye Protection by Anesthesia Providers While Performing Specific Procedures

Procedure	n observed	Yes	No
Venipuncture	17	0	17
Intubation	10	1	9
Extubation	7	1	6
Suctioning	7	1	6
Removing OG/NG	5	0	5
Placing spinal	5	0	5

Recapping contaminated needles was a task observed on the Observation Data Collection Form. Of 16 providers observed, 100% were seen recapping contaminated needles. The majority of these instances occurred just prior to venipuncture when providers injected Lidocaine intradermally and subsequently recapped the contaminated needle.

Eleven anesthesia providers were observed using contaminated gloves when touching equipment. This is 100% of those observed. This primarily occurred after the patient was intubated and the provider touched the reservoir bag and/or turned on the vaporizer.

Table 10.

Number and Percent of Total Providers Having Experienced an Exposure to a Patient's Blood/Body Fluids and/or Needlestick with Incidence of Reporting

	<u>Never</u>		<u>Past month</u>		<u>Past Year</u>		<u>>1 year ago</u>	
	n	%	n	%	n	%	n	%
Skin exposure	1	3.6	5	17.9	13	46.4	9	32.1
Needlestick	11	39.3	0	0	1	3.6	16	57.1
Reported	14	50.0	0	0	3	10.7	11	39.3

Analysis of Data Using Oneway ANOVA

Two Oneway ANOVAs were performed to determine the presence of statistically significant differences in providers' survey responses. Anesthesiologists, CRNAs, and SRNAs constituted the variables for the initial ANOVA while provider gender was the variable for the second analysis. The only statistically significant difference noted was in the initial analysis between types of provider. This was seen in the variable of providers changing gloves after each task ($p=0.05$).

Summary

The four research questions presented in chapter one have been addressed in this chapter. An overall adherence to the use of gloves and eye protection by anesthesia providers has been illustrated by questionnaire and observation data without attempt at correlation of the two variables. Information obtained from the questionnaire indicates that the majority of providers are 100% adherent to the use of gloves when performing most oropharyngeal procedures. It has also been shown that the majority of providers do not wear eye protection when performing procedures with potential for contact with a patient's blood or body fluids. Furthermore, it is evident that providers do not universally use personal protective equipment when performing venipuncture. Observation data has

been presented regarding providers' adherence to the use of gloves and eye protection. The majority of providers were not seen wearing eye protection, while there was 100% compliance with the use of gloves for three out of five procedures performed. Finally, most of the providers stated that they have had a skin exposure to a patient's blood or body fluids or a needlestick with an underreporting of this data. Chapter five will present conclusions and interpretations of the data presented.

CHAPTER V. SUMMARY

Introduction

With over 30.6 million people worldwide infected with the Human Immunodeficiency Virus, anesthesia providers have an increased risk for being exposed to contaminated blood or body fluids. The anesthesia providers' risk of contracting hepatitis B or hepatitis C is greater following exposure to contaminated blood/body fluids (Cardo & Bell, 1997).

In 1987, the Centers for Disease Control recommended guidelines known as universal precautions. The basic assumption of universal precautions is that all patients and their blood/body fluids should be considered contaminated with HIV, HBV or other pathogens. Furthermore, these guidelines recommended the use of personal protective equipment when coming in contact with a patient's blood or body fluids.

The purpose of this descriptive study was to determine the anesthesia providers' compliance with universal precautions, particularly the use of gloves and eye protection. Provider's self-assessment of their adherence to universal precautions was performed using a questionnaire format. Following completion of the questionnaire, observations were performed to determine an observed rate of adherence to universal precautions. In this study, there was no attempt to correlate data obtained from questionnaires and observations.

Characteristics of Sample

The original plan for this study was to collect data from anesthesiologists, certified registered nurse anesthetists and student registered nurse anesthetists at three large medical treatment facilities in the Midwestern United States. All data was collected at one military medical treatment facility from each of these three types of providers. Questionnaires were distributed to 35 providers, with 28 usable returned. Table one in chapter four illustrates the number and types of providers responding to the questionnaire. Following return of the questionnaires and consent for observation, 18 providers were observed performing tasks for which potential for contamination with patient's blood or

body fluids is high. Due to the low number of anesthetics delivered during the observation period, not all consenting providers were able to be observed performing each of the tasks noted on the Observation Data Collection Form (see Appendix B). With a low number of providers available for self-assessment and observation, the data presented in chapter four and the conclusions presented in this chapter must be interpreted cautiously.

Conclusions

Questionnaire Data

While 96% of the anesthesia providers surveyed are aware of the recommended guidelines, universal precautions, proposed by the CDC they remain poorly compliant. By their own self-assessment, 32 to 43% of anesthesia providers stated that they use gloves less than 100% of the time when performing basic oropharyngeal procedures. A surprising 40% of providers are less than 100% compliant with the use of gloves when performing routine and emergency intubations, placing themselves at an increased risk for exposure to infectious diseases. When extubating patients, only 68% of providers stated that they use gloves 100% of the time. This slight increase possibly indicates the providers' belief that their risk of exposure is greater with extubation than intubation. Only seven providers stated that they use gloves 100% of the time when performing procedures in which they may come in contact with a patient's mucous membranes. McKay (1991), in her study did not separate these questions into individual tasks; however, for general oropharyngeal procedures 76% of the providers that she surveyed stated that they used gloves 100% of the time.

The percentage of providers using eye protection 100% of the time when performing oropharyngeal procedures has been shown to be less than 25%. The majority of providers stated they use eye protection less than 20% of the time, while six others indicated compliance 60-99% of the time. There is potential for overestimation of the percentage of adherence to using eye protection among the providers surveyed because of possible misunderstanding of what constitutes acceptable eye protection. Following completion of

questionnaires it was brought to the attention of this author that some providers considered their own corrective eyeglasses to be protective eyewear. McKay (1991) noted a higher percentage of adherence to the use of eye protection when performing awake and routine intubations, 43% and 34% respectively.

Venous/arterial access procedures again met with a lower percentage of adherence than was presented in the study performed by McKay (1991). Only 21% and 32% respectively, of providers stated that they use gloves 100% of the time when performing venipuncture and difficult venipuncture. McKay stated that 47% of providers wore gloves 100% of the time when performing each of the above procedures.

The low number of providers surveyed is a possible reason for the difference between the percentages noted in this study and the study performed by McKay (1991). An additional reason for a low percentage of adherence at this facility, is the type of population receiving care. One provider stated that she uses gloves and eye protection more frequently when working in a civilian facility because of a perceived higher risk among the patients there.

In McKay's (1991) study, she stated 19% of providers change gloves 100% of the time between performing tasks and touching other equipment. This study has illustrated that none of the providers were 100% compliant with changing gloves after each task. While 53% of the providers stated that they change their gloves 80-99% of the time, there remains considerable possibility for contamination of equipment. Six providers stated that they recap contaminated needles less than 20% of the time, while four indicated that they recap needles greater than 80% of the time. In McKay's study, 27% of providers stated that they frequently recap needles, while 49% and 21% respectively, indicated that they recap needles sometimes or never. It is difficult to compare this data when the scales are presented in such a different format. As previously indicated, the majority percentage of providers that have become infected with HIV, HBV and HCV have received a percutaneous needlestick.

Finally, near one-half (43%) of providers surveyed stated that they do not use universal precautions on all patients as the CDC recommends; however, 23 (82.1%) providers indicated that they use extra precautions on patients considered high risk. In her study, McKay (1991) showed that 43% of providers used universal precautions on all patients, which is slightly less than what has been shown in this study. Additionally, in her study, McKay states that 72% of surveyed providers use extra precautions when there is a perceived higher risk.

Observation Data

As previously stated, the number of providers observed for each task is not consistent due to the low number of anesthetics delivered during the data collection period. Of 17 providers observed performing venipuncture, 11 used gloves, while six did not. None of the observed venipunctures were considered difficult. All providers observed used gloves 100% of the time when intubating, extubating, and suctioning. Only one provider was seen using eye protection when performing oropharyngeal procedures.

Providers were also observed for recapping of contaminated needles. A total of 16 providers were available to be observed for this task and 100% of them recapped contaminated needles. This primarily occurred after injection of a subcutaneous wheal of Lidocaine prior to venipuncture.

Finally, 100% of the 11 providers observed touched equipment with contaminated gloves. As previously indicated, this primarily occurred following intubation when the provider touched either the reservoir bag or the anesthetic vaporizer.

The data presented from observations indicates that providers are not consistent in their use of universal precautions and thus the protection of themselves. Again, this may be related to the providers' belief that the patients are at lower risk because of their military status. Although there was no comparison made between amount of experience and the providers' adherence to universal precautions, it is conceivable that providers with more experience were trained to perform venipuncture before universal precautions were

recommended. Therefore, these providers may find it difficult to use gloves when performing venipuncture. Finally, the providers' lack of use of eye protection is possibly related to a misconception regarding the routes of transmission of an infectious disease. Although the risk of transmission via a mucocutaneous route is not highly prevalent, it still exists and should be protected against.

Over 50% of the providers experienced either an exposure to a patient's blood/body fluids or a needlestick during their career. Interestingly, there is significant underreporting of these exposures. Without directly asking providers why they do not report exposures, their reasoning is a mystery.

According to the data presented it is apparent that anesthesia providers are inconsistent in their use of universal precautions and continue to maintain a poor compliance with the use of gloves and eye protection. Providers have said that they are more consistent with their use of universal precautions when working in civilian facilities because of a perceived higher risk among that population. This statement indicates that these providers do not see that caring for patients in the military population carries similar risk as caring for patients in a civilian setting. Additionally, many providers have discussed personal examples in which they have had mucocutaneous and percutaneous exposures to a patient's blood/body fluids, yet their use of personal protective equipment is inconsistent and compliance is poor.

Limitations of the Study

The limitations of this study are based in part on the study sample. The sample was one of convenience. The providers surveyed and observed were unique in that they provide care at a military facility. Providers working full-time in civilian facilities were not included in this study. Additionally, there were an unequal number of providers included in each group. This inequality may have skewed results when attempting to compare difference between groups of providers.

Furthermore, the questionnaire was one adapted from a previous study and had not been used for any other previous studies for validity and reliability assessment purposes. The questionnaire also contained recall bias, therefore a Likert Scale, using descriptors such as always, frequently, seldom, never, may have been more appropriate for these questions. Provider's awareness of federal law requiring universal precautions when anticipating exposure to blood/body fluids was not addressed in this questionnaire. A panel of experts reviewing the survey for content validity noted that question 25, pertaining to the use of eyewear when in the operating room, is not task-based and therefore has no significant contribution to the questionnaire. Additionally, the panel recommended that emphasis be placed on the words "extra precautions" in question 30. This question should also encourage providers to note what extra precautions they use since these behaviors may or may not be based on scientific data. As previously mentioned, it may not have been made as clear as necessary what constitutes acceptable eye protection.

At times, providers were aware of the observer's presence when attempting to perform observations. This contributed to a potential Hawthorne effect in which providers may have changed their usual practice knowing that the observations were being made. Furthermore, an inconsistent number of observations were made for each task and each type of provider. Again, this may have potentially altered results.

Military Relevance

This particular study has relevance to the military in that it demonstrates that military providers at this facility are inconsistent with their use of universal precautions. Therefore, providers are placing themselves at risk for exposure to infectious diseases such as HIV, HBV and HCV. If a provider is exposed to one of these infectious agents and seroconverts, the military will have the expense of caring for the provider. Furthermore, the provider may have limited duty and possibly will not be qualified for worldwide duty.

Recommendations

Anesthesia providers need to be aware of routes of transmission for infectious diseases as well as the necessary procedures to limit their exposure to these diseases. It should be mandatory that all providers attend formal infection control training classes regarding the above issues. Furthermore, random inspections should be performed to assess the individual's compliance with the use of universal precautions and included in their annual Performance Feedback and Officer Performance Record.

Future studies should be conducted using a larger sample size, including military and civilian facilities. Additionally, comparisons should be made with regards to years of experience in performing patient care. The questionnaire should also be refined using a Likert Scale and including questions pertaining to other high risk procedures in which exposure is possible. A future study using a larger sample and comparing questionnaire and observation data would have considerable significance to the perceived rate of adherence to universal precautions and the actual observed adherence. Finally, more than one observer in a future study would optimize observations and limit the risk of a Hawthorne effect.

Summary

This is one of few studies in the literature regarding anesthesia providers' adherence to the use of universal precautions. While previous studies have focused on prehospital health care providers and other non-anesthesia provider adherence to universal precautions in general, this study focused specifically on three types of anesthesia providers and their use of gloves and eye protection while performing certain high-risk procedures. Review of the literature has noted that while providers are at significant risk of being exposed to contaminated blood/body fluids, and cost of AIDS care is continuing to rise, anesthesia providers continue to be inconsistent in their use of universal precautions. This study showed that the military providers at this large medical treatment facility are also inconsistent with their use of gloves and eye protection. It has validated

previous studies. While there was no statistical significance between the groups of providers, the adherence rate of anesthesia providers to the use of gloves and eye protection has clearly been demonstrated. Despite a wealth of literature illustrating the risks and consequences of poor compliance with universal precautions, it remains unclear why some health care providers continue to disregard the proposed CDC guidelines for self-protection. Perhaps further studies can focus on the providers' beliefs regarding exposure and risk of contracting an incurable disease such as HIV, HBV and HCV.

REFERENCES

- American Association of Nurse Anesthetists (1989). AANA develops infection control guidelines for anesthesia. Journal of the American Association of Nurse Anesthetists, *57*, 299-302.
- American Association of Nurse Anesthetists (1993). Infection control guide. Park Ridge, Illinois: AANA.
- Alter, M., & Mast, E. (1994). The epidemiology of viral hepatitis in the United States. Gastroenterology Clinics of North America, *23*, 437-455.
- Baraff, L., & Talan, D. (1989). Compliance with universal precautions in a university hospital emergency department. Annals of Emergency Medicine, *18*, 654-657.
- Ben-David, B., & Gaitini, L. (1996). The routine wearing of gloves: Impact on the frequency of needlestick and percutaneous injury and on surface contamination in the operating room. Anesthesia and Analgesia, *83*, 623-628.
- Berry, A. (1995). Injury prevention in anesthesiology. Surgical Clinics of North America, *75*, 1123-1132.
- Bolyard, E & Bell, D. (1997). Universal precautions in the health care setting. In V. DeVita, Jr., S. Hellman, & S. Rosenberg (Eds.), AIDS. Etiology, diagnosis, treatment and prevention (4th ed., pp. 655-664). Philadelphia: Lippincott-Raven.
- Browne, R., & Chernesky, M. (1988). Infectious diseases and the anaesthetist. Canadian Journal of Anaesthesia, *35*, 655-665.
- Buergler, J., Kim, R., Thisted, R., Cohn, S., Lichtor, J., & Roizen, M. (1992). Risk of human immunodeficiency virus in surgeons, anesthesiologists, and medical students. Anesthesia and Analgesia, *75*, 118-124.
- Centers for Disease Control and Prevention (1987). Revision of the CDC surveillance case definition for acquired immunodeficiency syndrome. Morbidity and Mortality Weekly Report, *36*(1S), 3S-14S.

Centers for Disease Control and Prevention (1988). Update: Universal precautions for prevention of transmission of human immunodeficiency virus, hepatitis B virus, and other bloodborne pathogens in health-care settings. Morbidity and Mortality Weekly Report, *37*, 377-388.

Cardo, D., & Bell, D. (1997). Bloodborne pathogen transmission in health care workers. Infectious Disease Clinics of North America, *11*, 331-346.

Chamberland, M., Ciesielski, C., Howard, R., Fry, D., Bell, D. (1995). Occupational risk of infection with human immunodeficiency virus. Surgical Clinics of North America, *75*, 1057-1070.

Chrisco, J., & DeVane, G. (1992). A descriptive study of blood in the mouth following routine oral endotracheal intubation. Journal of the American Association of Nurse Anesthetists, *60*, 379-383.

DiGiacomo, J., Hoff, W., Rotondo, M., Martin, K., Kauder, D., Anderson, H., Phillips, G. & Schwab, C. (1997). Barrier precautions in trauma resuscitation: Real-time analysis utilizing videotape review. American Journal of Emergency Medicine, *15*, 34-39.

Doebbeling, B., & Wenzel, R. (1990). The direct costs of universal precautions in a teaching hospital. Journal of the American Medical Association, *264*, 2083-2087.

Durham, J. (1994). The changing HIV/AIDS epidemic. Nursing Clinics of North America, *29*, 9-18.

Essex, M. (1997). Origin of acquired immunodeficiency syndrome. In V. DeVita, Jr., S. Hellman, & S. Rosenberg (Eds.), AIDS. Etiology, diagnosis, treatment and prevention (4th ed., pp. 3-14). Philadelphia: Lippincott-Raven.

Eustis, T., Wright, S., Wrenn, K., Fowle, E., & Slovis, C. (1995). Compliance with recommendations for universal precautions among prehospital providers. Annals of Emergency Medicine, *25*, 512-515.

Gardner, P., & Schaffner, W. (1993). Current Concepts: Immunization Of Adults. The New England Journal of Medicine, *328*, 1252-1258 .

- Gerberding, J., Lewis, F., & Schechter, W. (1995). Are universal precautions realistic? Surgical Clinics of North America, *75*, 1091-1104.
- Gershon, R., Karkashian, C., & Felknor, S. (1994). Universal precautions: An update. Heart & Lung, *23*, 352-358.
- Gershon, R., Vlahov, D., Felknor, S., Vesley, D., Johnson, P., Delclos, G., & Murphy, L. (1995). Compliance with universal precautions among health care workers at three regional hospitals. American Journal of Infection Control, *23*, 225-236.
- Grogono, A. (1989). AIDS: Where are we now? Current Reviews for Nurse Anesthetists, *10*, 147-151.
- Guinan, M., Farnham, P., & Holtgrave, D. (1994). Estimating the value of preventing a human immunodeficiency virus infection. American Journal of Preventive Medicine, *10*, 1-4.
- Hellinger, F. (1993). The lifetime cost of treating a person with HIV. Journal of the American Medical Association, *270*, 474-478.
- Jackson, M. & Pugliese, G. (1992). The OSHA bloodborne pathogens standard. Today's O.R. Nurse, *14*(7), 11-16.
- Kotzan, J., & McMillan, C. (1995). The ratio of AIDS to non-AIDS Medicaid medical costs from 1992 to 2000. Clinical Therapeutics, *17*, 320-329.
- Kristensen, M., Sloth, E., & Jensen, T. (1990). Relationship between anesthetic procedure and contact of anesthesia personnel with patient body fluids. Anesthesiology, *73*, 619-624.
- Lanphear, B., Linnemann, C., Cannon, C., DeRonde, M., Pendy, L., & Kerley, L. (1994). Hepatitis C virus infection in healthcare workers: Risk of exposure and infection. Infection Control and Hospital Epidemiology, *15*, 745-750.
- Lanphear, B. (1997). Transmission and control of bloodborne viral hepatitis in health care workers. Occupational Medicine: State of the Art Reviews, *12*, 717-730.

McKay, L.G. (1991). Identifying risks and comparing methods of prevention of occupationally acquired Human Immunodeficiency Virus in anesthesia personnel. Unpublished master's thesis, St. Mary's College, Minnesota.

Melamed, S., Rabinowitz, S., Feiner, M., Weisberg, E. & Ribak, J. (1996). Usefulness of the protection motivation theory in explaining hearing protection device use among male industrial workers. Health Psychology, 15, 209-215.

Moore, R., & Chaisson, R. (1997). Costs of Medicaid of advancing immunosuppression in an urban HIV-infected patient population in Maryland. Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology, 14, 223-231.

Naccache, H., Fortin, C., Croteau, A., Godin, G., (1993). Universal precautions in a teaching hospital: Compliance and perception. AIDS Patient Care, 7, 134-137.

Nash, G. (1992). Epidemiology of HIV infection. In J. Mitchell (Ed.), Pathology of AIDS and HIV infection (pp. 3-14). Philadelphia: W.B. Saunders Company.

O'Donnell, N., & Asbury, A. (1992). The occupational hazard of human immunodeficiency virus and hepatitis B virus infection. Anaesthesia, 4, 929-935.

Olmsted, R. (1996). What is the risk of acquiring hepatitis C for health care workers and what are the recommendations for prophylaxis and follow-up after occupational exposure. American Journal of Infection Control, 24, 411-416.

Rogers, R. & Prentice-Dunn, S. (1997). Protection motivation theory. In D. Gochman (Ed.), Handbook of Health Behavior Research I. Personal and Social Determinants (pp. 113-132). New York: Plenum Press.

Sepkowitz, K. (1996). Occupationally Acquired Infections in Health Care Workers: Part II. Annals of Internal Medicine, 125, 917-928.

Tait, A., Tuttle, D. (1994). Prevention of occupational transmission of human immunodeficiency virus and hepatitis B virus among anesthesiologists: A survey of anesthesiology practice. Anesthesia and Analgesia, 79, 623-628.

Ward, J. & Drotman, D. (1992). Epidemiology of HIV and AIDS. In G. Wormser (Ed.), AIDS and other manifestations of HIV infection (2nd ed., pp. 1-15). New York: Raven Press.

Weinstein, N. (1993). Testing four competing theories of health-protective behavior. Health Psychology, 12, 324-333.

Weiss, S. (1992). Infection control considerations in HIV infection. In G. Wormser (Ed.), AIDS and other manifestations of HIV infection (2nd ed., pp. 599-608). New York: Raven Press.

Weiss, S. (1997). Risks and issues for the health care worker in the human immunodeficiency virus era. Medical Clinics of North America, 81, 555-575.

APPENDICES

Appendix A: Questionnaire

Appendix B: Observation Data Collection Form

Appendix C: Informed Consent

APPENDIX A

Questionnaire

Questionnaire

There are five pages with 35 questions. Please answer all the questions to the best of your ability by circling the appropriate response.

Definitions:

Venipuncture: puncture of peripheral vein for phlebotomy or intravenous cannulation

Protective eyewear: goggles, eye shields, or corrective lenses with side shields that minimize the potential for contamination of eyes from splashed fluids

1. What type of anesthesia provider are you?
 - a. anesthesiologist
 - b. CRNA
 - c. SRNA

2. Are you
 - a. military
 - b. civilian

3. Are you
 - a. male
 - b. female

4. How many years of professional experience do you have in clinical patient care? (all experience up to and including anesthesia training and practice)
 - a. 1-5 years
 - b. 6-10 years
 - c. 11-15 years
 - d. >15 years

5. Are you aware of a hospital policy directing the use of universal precautions?
 - a. yes
 - b. no

6. Have you ever seen/read the hospital policy on the use of universal precautions?
 - a. yes
 - b. no

7. Are you aware of the Center for Disease Control recommendations regarding the use of universal precautions?

- a. yes
- b. no

8. Are you aware of guidelines published by your professional association directing the use of universal precautions?

- a. yes
- b. no

9. How often do you wear gloves when performing venipuncture?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

10. How often do you wear gloves when performing difficult venipuncture?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

11. How often do you wear gloves when performing laryngoscopy and intubation?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

12. How often do you wear gloves when performing extubation?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

13. How often do you wear gloves when suctioning a patient?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

14. How often do you wear gloves when inserting or removing a nasogastric/orogastric tube?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

15. How often do you wear gloves when removing an indwelling epidural catheter?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

16. How often do you wear gloves when performing any other task in which you are likely to have contact with the patient's mucous membranes?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

17. How often do you wear gloves for emergency intubation outside the anesthesia department?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

18. How often do you change gloves immediately after each task before touching other anesthesia equipment?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

19. How often do you wear gloves when drawing blood from an arterial line or central venous access catheter?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

20. How often do you wear protective eyewear when performing awake intubations?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

21. How often do you wear protective eyewear when performing routine intubations?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

22. How often do you wear protective eyewear when performing emergency intubations?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

23. How often do you wear protective eyewear when performing extubation?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

24. How often do you wear protective eyewear when performing epidural/spinal anesthetic procedures?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

25. How often do you wear protective eyewear while in the operating room?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

26. How often do you wear protective eyewear when inserting invasive lines, such as arterial lines or central venous access catheters?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

27. How often do you wear protective eyewear when drawing blood from an arterial line or central venous access catheter?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

28. How often do you recap contaminated needles?

- | | | |
|-----------|-----------|-----------|
| a. 100% | c. 60-79% | e. 20-39% |
| b. 80-99% | d. 40-59% | f. < 20% |

29. Do you use universal precautions on all patients?

- a. yes
- b. no

30. Do you use extra precautions for high risk patients, those that potentially have a transmissible disease, such as HIV or Hepatitis B or C?

- a. yes
- b. no

31. Have you had a skin exposure to a patient's blood or body fluids?

- a. never
- b. during the past month
- c. during the past year
- d. greater than one year ago

32. Have you ever experienced a needlestick with a contaminated needle?

- a. never
- b. during the past month
- c. during the past year
- d. greater than one year ago

33. Have you reported a skin exposure, mucous membrane, or parenteral exposure to a patient's blood or body fluids?

- a. never
- b. during the past month
- c. during the past year
- d. greater than one year ago

34. Do you feel surgical patients should be routinely tested for the presence of HIV or Hepatitis B or C?

- a. yes
- b. no

35. Do you feel health care workers should be screened periodically for the presence of HIV or Hepatitis B or C?

- a. yes
- b. no

Again, thank you for your cooperation in completing this survey. Please refer to the survey cover sheet for further instructions.

APPENDIX B
Observation Data Collection Form

APPENDIX C
Informed Consent



UNIFORMED SERVICES UNIVERSITY OF THE HEALTH SCIENCES

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Informed Consent Form

Research Study

Anesthesia Providers' Adherence to the Use of Gloves and Eye Protection

You are being asked to participate in this research study. Before you decide to be a part of the research study, you need to understand any associated risks and benefits so that you can make an informed decision. This is known as informed consent. This consent form provides information to you about the research study. Once you understand the study and what it involves, you will be asked to sign this form if you wish to be part of the study. Your decision to take part in the study is voluntary. This means that you are free to choose if you will take part in the study.

Dr. John McDonough, CRNA, and Capt Brian Koonce, SRNA, of the Uniformed Services University of the Health Sciences (USUHS), Graduate School of Nursing, Nurse Anesthesia Program are conducting a research study to determine anesthesia provider compliance with the use of gloves and eye protection. According to the 1987 Centers for Disease Control recommendations, health care workers should treat all blood and body fluids as potentially infectious in order to protect themselves from acquiring a transmissible disease. It has been shown through many research studies that anesthesia provider compliance with universal precautions continues to be low despite the risk of transmissible diseases, such as Human Immunodeficiency Virus, Hepatitis B, and Hepatitis C.

This study consists of two parts. Anesthesia providers are asked to complete a 35 question survey and following the completion of the survey, the provider will be observed while performing their usual duties. Observation will be done randomly for a period of 2-4 weeks following your completion of the questionnaire. Completion of the survey will take 5-10 minutes of your time. Observation will be while you are performing the usual patient directed tasks associated with your anesthesia duties, therefore it involves no additional time on your part.

This study should not entail any physical or mental risks outside of those associated with your occupation as an anesthesia provider. Should you feel that there is any risk to you, you may terminate your participation at any time. If you choose to end your participation in this research study for any reason, you may do so without reservation. You should notify the study researchers immediately of your desire to terminate your participation. Termination of your participation will in no way be



reflected in your professional relationship with the study researchers, other anesthesia providers, faculty or staff.

The results of this study will be given to the sponsor, USUHS, Department of Nurse Anesthesia. In addition, any Institutional Review Board or human subject oversight agency may see records from this study. All information that you provide as a part of this study will be confidential and will be protected to the fullest extent of the law. Information that you provide and other records related to this study will be kept private, accessible only to those persons directly involved in conducting this study and members of the facility's Institutional Review Board or any human oversight agency. All questionnaires and forms will be kept in a restricted access, locked cabinet while not in use. However, please be advised that under UCMJ, a military member's confidentiality cannot be strictly guaranteed. To enhance your privacy of the answers that you provide, data from questionnaires will be entered into a database in which individual responses are not identified. After verification of the database information, the hard copy of the questionnaires containing identifiers will be shredded.

If you have any questions about this research study, you should contact Dr. John McDonough, CRNA, at 301-295-6565. If you have any questions about your rights as a research subject, you should call the Director of Research Programs in the Office of Research at the Uniformed Services University of the Health Sciences at 301-295-3303. This person is your representative and has no connection to the individuals conducting this study.

By signing this consent form you are agreeing that the study has been explained to you and that you understand the study. You are signing that you agree to take part in both parts of this study. You will be provided with a copy of your consent form.

Printed Name _____

Signature _____

Date _____

Witness Signature _____

I certify that the research study has been explained to the above signed individual, by me and that the individual understands the nature and purpose associated with the study. Any questions that have been raised have been answered.

Brian T. Koonce, SRNA, Capt, USAF, NC

Date

