CIRCUMSTANCES SURROUNDING BLOOD EXPOSURES AND NEEDLE SAFETY PRACTICES IN HOME HEALTH CARE NURSES

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DISSERTATION

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ABSTRACT

CIRCUMSTANCES SURROUNDING BLOOD EXPOSURES AND NEEDLE SAFETY PRACTICES IN HOME HEALTH CARE NURSES

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University of California, San Francisco, 2000

Registered nurses (RNs) working in the rapidly growing home health care setting perform blood access procedures that may place them at risk of blood exposures. The purpose of this descriptive, exploratory study was to understand the context of needle safety practices among home health care nurses and their relationship to blood exposures.

The methods consisted of a preliminary analysis of blood exposures from three home care agencies and two phases of focus groups among home health care RNs. Phase two groups were designed to build upon information obtained from the preliminary study, as well as to validate and expand the themes generated from phase one. The emphasis of phase two was on nurses' perceptions of barriers to and facilitating conditions for safe needle use and practices in this setting.

Thematic content analysis of phase two transcripts (four groups and 26 subjects) produced the following six-components of barriers and facilitators for safe practice: (a) safety devices, (b) environmental factors, (c) organizational factors, (d) personal RN factors, (e) control factors, and (f) patient or situational factors. Key findings illustrated the complex relationship between barriers and facilitating conditions. First, a previous blood exposure was a salient facilitator for future safe needle practice. Next, the home health care environment influenced the ability of nurses to perform safe practice. In addition, nurses'

values regarding patient safety and comfort versus their own safety can be a source of conflict in certain situations. Finally, nurses suggested strategies for improving education regarding safe devices.

Implications from this study suggest the following strategies: simulate circumstances surrounding the needlestick and post-exposure period for those with no previous history of needlesticks, design safety devices specifically for the home health care setting, promote a work environment where patient safety and comfort and nurse safety can be protected without conflict, and improve education on safety device use and availability. To prevent future exposures, barriers to safe practice must be removed or reduced and facilitating conditions promoted. Nurses who work in this unique setting deserve the safest possible working environment.

Marion Gillen

Marion Gillen, R.N., M.P.H., Ph.D.
Committee Chair

DEDICATION

This dissertation has a past and a future dedication. It is dedicated first, with sincere sympathy, to all health care workers who have acquired a bloodborne pathogen infection as the result of a needlestick or other blood exposure. For the future, it is dedicated, with hope, to the prevention of those exposures which can be avoided by using available safety devices and practices.

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Introduction to the Problem

Health care workers in the twentieth century conduct their work amidst a rapidly developing technology, an economy being stretched to support this industry, and with the goal of providing the best possible care to their patients. Despite technological advances that should decrease risk, occupational injuries, specifically percutaneous injuries, are still occurring. The provision of a safe working environment for health care workers is also a challenge for employers, who must comply with numerous guidelines, standards, and regulations for both patient care and employee safety. Employers must do this in spite of financial constraints and time pressures. In the past decade, the health care industry has expanded beyond the hospital setting, into extended care facilities, ambulatory care facilities, and the home care setting (Friedman, Nelson, Webb, Hoffman, & Baer, 1999). The result is an expanded definition of what constitutes a health care setting. How the challenges facing both workers and employers influence the ability of health care workers to perform their work safely in this expanded health care setting is a complex phenomenon, with multiple interacting factors.

The specific problem under study is the context for blood exposures and safety practice in the home health care setting. Understanding the complex phenomenon of health care worker safety is facilitated by progressing from a general discussion of bloodborne pathogen exposures in the health care setting to the specific problem under study.

Bloodborne Pathogen Exposures in the Health Care Setting

According to Howard (1997), "Medical centers today are complex workplace environments that pose an assortment of safety and health hazards for those who labor in them as health care workers" (p. 428). Among the potential hazards are

numerous biologic, chemical, physical and psychosocial ones (Patterson, 1985). Howard adds, "It is not generally appreciated, however, that the occupational hazards faced daily by workers employed in the health care industry can be every bit as dangerous as those found in other industries" (1997, p. 428).

Foremost among the biological hazards facing health care workers are exposures that may result from needlesticks, cuts, splashes in the eyes, face, or mouth, or blood contact to open wounds or non-intact skin. The concerns with such exposures are the resultant risks of acquisition of a bloodborne pathogen or other type of infection. More than twenty pathogens have been transmitted through percutaneous and blood exposures (Marcus, 1988; Vason, 1999). However, those which pose the greatest risks for transmission to health care workers are hepatitis B, hepatitis C, and HIV. One thousand health care workers were estimated to have developed hepatitis B infection in 1994 (Shapiro, 1995). The risk of hepatitis B from a needlestick injury ranges from 6-30% in unvaccinated health care workers (Centers for Disease Control and Prevention [CDC], 1997c; NIOSH, 1999). Approximately 4 million persons in the United States are infected with hepatitis C and about 560 to 1,120 cases of this infection occurred among health care workers in this country in 1995 (CDC, 1998). In a recent report (Campbell et al., 1999), the risk of seroconversion from a hepatitis C source was 1.8%. It has been estimated that as many as two percent of percutaneous and other blood exposures are from HIV positive source patients (Tereskerz, Bentley, & Jagger, 1997). From the voluntary surveillance program conducted by the Centers for Disease Control and Prevention (1999) for health care workers occupationally exposed to HIV infected sources, the risk of infection is estimated to be 1 in 300, or 0.3%. Thus, blood exposures, particularly percutaneous exposures in nurses and other health care workers, can be a serious occupational hazard.

The magnitude of the percutaneous injury problem can be appreciated by the approximately 800,000 needlestick or other sharp object injuries that occur annually among the 4.4 million health care workers in the United States (Cardo et al., 1997; Gerberding, Lewis, & Schecter, 1995; Tereskerz, Pearson, & Jagger, 1996). Exposures occur in nurses, physicians, technicians, and environmental service personnel, however, the job category of personnel most often reported to sustain occupational blood exposures is the nurse (registered nurses, licensed vocational nurses, and nurse aides) (English, 1992; Haiduven, DeMaio, & Stevens, 1992; Williamson et al., 1988). Of the 55 documented and 136 possible occupational cases of HIV infection in health care workers as a result of exposures, the highest number and percentage have occurred in nursing personnel (CDC, 1999). Fifty percent of percutaneous and mucocutaneous injuries reported by the Exposure Prevention Information Network were in nurses and licensed practical nurses (Ippolito et al., 1997).

Percutaneous injuries from needles account for 80% of accidental blood exposures in health care facilities (Jagger, Hunt, Brand-Elnagger, & Pearson, 1988). The device most often involved in injuries is the syringe. The risk of HIV seroconversion, for example, is greater if the device involved in the exposure is blood-filled (Ippolito et al., 1997, 1999). Therefore, intravenous catheters, butterfly needles, and phlebotomy needles have been involved frequently when seroconversion to a bloodborne infection occurs in a health care worker (CDC, 1999; OSHA, 1995).

<u>Conditions Contributing to Underreporting of Exposures</u>

Understanding the magnitude of the percutaneous injuries in health care workers is clouded by underreporting of exposures (Haiduven, Simpkins, Phillips, & Stevens, 1999; Hamory, 1983). Workers' Compensation programs do not adequately compensate a worker who has acquired hepatitis B, C or HIV

infection as the result of an occupational injury, and employees' loss of confidentiality as a result of this may contribute to the underreporting of exposures (Tereskerz & Jagger, 1997). It has also been found that health care workers do not believe themselves to be at risk from such exposures, also contributing to underreporting (Haiduven et al., 1999; Hainey & Krantz, 1999; Ippolito et al., 1997).

Occupational Prevention Efforts

Given the magnitude of the needlestick injury problem and the physical, emotional and organizational costs associated with each injury, it is not surprising that there has been a high priority placed on prevention by those concerned with occupational safety and health. Guidelines from the Centers for Disease Control and Prevention on Universal Precautions (CDC, 1985, 1987, 1988) as well as federal and state Occupational Safety and Health Administration's (OSHA) Bloodborne Pathogens (BBP) Standards mandating these guidelines (Cal/OSHA, 1998; OSHA, 1991), place the responsibility on employers for protecting workers from bloodborne pathogen exposures in the workplace. Health care facilities are required to supply engineering controls (e.g., needle disposal containers, needle safety products), training, and post-exposure evaluation and follow-up to their health care workers (Cal/OSHA, 1998; CDC, 1988; NIOSH, 1999; OSHA, 1991 & 1999). Health care workers, in turn, are required to follow Universal Precautions and use sharps with engineered protection for contact with all patients.

As a result of these guidelines and standards, in the past decade, safety products designed to prevent or reduce the risk of percutaneous injuries have been introduced. Since 1984, there have been more than 1,000 patents issued for devices specifically designed to prevent needlesticks (Jagger, 1996; Pugliese, 1997). Much work has gone into the development of devices with engineering

controls and through safer work practices designed to prevent or reduce these exposures.

Although a safety product might initially appear to solve the problem of percutaneous exposures, there is evidence that complete acceptance of and compliance with use of such products by nurses, physicians, and other health care workers has not occurred (Courington, Patterson, & Howard, 1991). Not using needle safety products in institutions where they have been made available or use of unnecessary needles to perform procedures, have been reported as reasons contributing to percutaneous injuries (Haiduven et al., 1992, 1995; Tereskerz, Bentley, & Jagger, 1997). There is also recent evidence from California that many health care facilities do not provide a comprehensive array of safety devices as required by the Cal/OSHA BBP Standard revision (Martha Davis, personal communication, September 30, 1999). These findings are disturbing and imply that even with the revision of the Cal/OSHA BBP Standard, employers do not consistently provide the devices and health care workers do not consistently use safe devices when they are provided. Labor unions have become involved in safety and health issues in many health care facilities (Levy & Wegman, 1995). In California, for example, the unions have provided educational materials for health care workers on protection from bloodborne pathogen exposures and have worked to make more safety devices available in health care institutions (SEIU, 1997).

The Shift from Hospital to Home Care

The health care industry has experienced a shift in services from hospitals to settings such as clinics and homes, which are less costly (Friedman et al., 1999, p. 419). The home care industry has experienced a remarkable growth in the past decade (Munchus, Roberts, Rivers, & Gingerich, 1999). Over 20,000 home care agencies were operating in the United States in 1996, representing an 89%

increase over the past ten years (Friedman et al., 1999; National Association of Home Care [NAHC], 1999). Factors contributing to this growth include economic constraints resulting in shorter hospital stays, medical technological advances, and the desire of patients to receive care at home (Friedman et al., 1999).

Registered nurses, along with nursing aides, comprise the largest number and percentage of workers employed in the home care industry (NAHC, 1999). Of the 197,152 registered nurses with active licenses working full or part time in California in 1998, approximately 15,772 (8%) were working in home health care (Sechrist, Lewis, & Rutledge, 1999).

Statement of the Problem

Most of the information about percutaneous injuries has been collected from hospitals and other acute care facilities. In addition, studies on Universal Precautions among health care workers have been conducted primarily in acute care settings. However, it is obvious that the shift in health care from hospitals to alternate settings has already occurred. Very little information exists about the conditions under which home care nurses provide care and their safety. In fact, according to Smith and White (1993), "... health care workers in the home setting may face the same risks as their counterparts in institutions, but the work environment is less standardized, predictable and controlled and may present additional risks" (p. 180). Whether the conditions in the home care environment place nurses at higher risk of needlesticks and other blood exposures is unknown but an important issue to consider.

The specific problem under study in this project is the ability of home care nurses to perform safe practice in relation to blood exposures in this unique setting. The focus of the study is home health care nurses' perception of barriers to as well as facilitating conditions for use of needle safety devices and practices in the home health care setting.

Conditions unique to this setting include poor structural integrity of the dwellings, poor lighting, lack of availability of necessary supplies in the home, and presence of others in the home setting (e.g., family members, friends, children and animals (Kendra, Weiker, Simin, Grant, & Shullick, 1996; Smith & White, 1999). A relatively recent condition of this setting is that home care visits are now being made during evening and nighttime hours, raising concerns about personal safety in certain geographic areas or high-crime areas (Kendra et al., 1996). These conditions may complicate giving care.

The rationale for studying both barriers and facilitators to safe practice can be illustrated by the statement, "Benefits and barriers...are positive and negative versions of perceptions and feelings about the consequences of the intended behavior"(Zimmerman & Vernberg, 1994, pp. 49-50). These authors add that, "Benefits minus costs of action have been the most consistent predictor of preventive health behavior and perceived severity of consequences has been the weakest predictor" (p. 47). Thus, information on the circumstances surrounding exposures and identification and exploration of both barriers to and facilitators for safe needle use and practices are necessary for understanding the context for which home care nurses practice.

Purpose and Specific Aims of the Study

The purpose of this study is to understand the context of needle safety practices in home health care and their relationship to blood exposures, particularly needlestick injuries. The specific aims of this study are: (a) to explore the types of blood exposures and the circumstances contributing to these exposures in home health care nurses, (b) to identify perceived barriers to and facilitating conditions for registered nurses' use of safer needles and practices in this setting, and (c) to use the information to generate testable research questions and hypotheses for further analytic and intervention studies.

Significance of the Study

Little work has been performed to determine which health care workers use which safety devices and under what circumstances. There is also scant evidence from the literature exploring barriers to health care workers' use of available safety products and practices that could prevent acquisition of a bloodborne infection. These factors could be behavioral, environmental, educational, or others. Health care professionals involved in the prevention of needlestick injuries would benefit from data that identified and described such factors.

Safer needle use and practice can prevent a nurse or other health care worker from sustaining a needlestick or other blood exposure and from acquiring a serious bloodborne illness. Exploration of the barriers to and the facilitating conditions for nurses' use of safer needles and practices in home care is significant for several reasons.

First, the number of patients being cared for in the home and the complexity of their conditions is increasing. An increasingly elder population as well as numerous conditions including chronic obstructive pulmonary disease, cancer, HIV disease, diabetes, renal failure, and complicated wound conditions, are being cared for in this setting (Goldsmith & Rogers, 1997a, 1997b; Haiduven, 1998; NAHC, 1999). The numbers of the estimated eight million persons cared for in the home in 1998 (NAHC, 1999) who were infected with HIV, hepatitis B, and hepatitis C could number in the millions (CDC, 1997a, 1997b, 1998; Fry, 1998). Next, the procedures being performed in this setting are increasing in number and complexity, and include vascular access, tracheotomies, wound care, gastrostomy tube feedings, chemotherapy, and pain management, among others (Friedman et al., 1999; Goldsmith & Rogers, 1997a, 1997b; Haiduven, 1998).

Besides the number of patients cared for and procedures performed, the

number of nurses working in this setting has increased. In the Board of Registered Nursing Surveys conducted in 1990, 1993, and 1997, "the percent of RNs employed in home health care (in California) increased 78.9% (Sechrist et al., 1999, p. 26).

The consequences and costs of a needlestick are other significant reasons why further study in this area is needed. The cost of a needlestick or other percutaneous exposure ranges from $2,234 to $3,832 (Carlsen, 1998). These costs include immediate first aid, baseline serological testing of the source patient and exposed employee, post-exposure chemoprophylaxis, counseling, follow-up serological testing of the employee, clinician time to provide these activities, and lost time from work for the employee to participate in these activities (Fraser & Powderly, 1995). These costs do not include those from a resultant bloodborne infection. For example, should a health care worker acquire chronic hepatitis C, a six month course of alpha-interferon therapy is estimated to cost $200,000 (CDC, 1998), and this does not include time lost from work.

The devastating costs of exposure to hepatitis B, hepatitis C, or HIV from a needlestick are much more than financial. The employee must wait six months to a year to determine if he or she becomes infected. The emotional impact of waiting extends to partners and family members. There is time lost from work, increased workloads for co-workers in their absence, and liability issues for employers. If seroconversion occurs, there can be serious medical, professional and psychosocial consequences. These consequences may also have a psychosocial impact on family members, friends, and co-workers.

Therefore, of most critical import, is a decrease in blood exposures in health care workers. This could be accomplished by identifying factors which influence, or even predict the use of safe devices or practices in this setting.

Finally, the significance of this study can be summarized by examining its

two goals: (a) to use the information to provide a safer work setting for home health care nurses, and (b) to prevent exposures in home care nurses that result from unsafe needle use or practice.

In summary, the number of complex patients being cared for and procedures being performed have increased in the home care setting. This study aims to address a clinically and socially relevant problem for the greater number of nurses providing care in this setting.

Outline of Study

This study is divided into three parts: (a) a background preliminary study, (b) a phase one exploratory study, (c) and a phase two component. The preliminary study was a prevalence study of blood exposures from three home care agencies in the San Francisco Bay Area (SFBA), while phase one consisted of focus group sessions of registered nurses from these agencies. Phase two was a set of four focus groups of registered nurses from SFBA home care agencies.

In Chapter Two, the social context of home health care nursing is discussed. In Chapter Three, a literature review of research directly and peripherally related to the problem under study is provided. This review includes the epidemiology of percutaneous injuries, compliance with Universal Precautions in health care workers, regulatory and legal issues, and workplace self-protective behavior. Chapter Four includes a discussion of the theoretical framework, concepts used in the study, conceptual hypotheses and assumptions, the research questions, and a definition of terms. Chapter Five contains information on the background studies (preliminary study and phase one), including the methods, results, and limitations. The methodology for the third part of the study, or phase two, is described in Chapter Six. The analysis of phase two is provided in Chapter Seven. Finally, Chapter Eight contains the discussion, including the significance and critique of the study, implications and future research recommendations.

CHAPTER TWO: THE SOCIAL CONTEXT OF HOME HEALTH CARE NURSING

To explore the circumstances surrounding blood exposures and the use of needle safety devices and practices among home care nurses, it is necessary to understand the context within which these nurses work. Miles and Huberman define context as "immediately relevant aspects of the social system in which the person appears" (1994, p. 102). In this study, examples of immediately relevant aspects include the physical location of the nurse and the client, other persons present in the home at the time of the visit, and the recent history of the contact between nurse, client, and other persons. Examples of relevant aspects of the social system include the home care agency's policies and procedures, the family situation of the client, and the forces that have an impact on this situation. These forces may be economic, political, technological, etc. Understanding context is necessary for deriving meanings of events.

To understand the social context of home health care nursing, several areas must be included. These are home health care as an industry, the rapid growth of home care, and home care as a work environment. This chapter concludes with a summary of the status of home health care in the United States.

Home Health Care as an Industry

This discussion of home health care as an industry includes a brief history of home care in the United States, a description of the types of home care organizations, who receives care as well as who provides home health care services. The rapid growth of the home care industry, as well as technologic, economic, and regulatory issues driving this industry are also discussed.

History of Home Care Nursing in America

In the United States, home health care as an organized entity began in the late nineteenth century. In the 1880's, the Visiting Nurses Association established branches in Philadelphia, Buffalo, New York City, Boston, and Chicago. These services were available for both persons with the ability to pay and indigent persons (George, 1996). Thus, both public health and community health home care nurses have been making visits to the home for over a century (Kendra et al., 1996).

Types of Home Care Agencies

The nomenclature "home care organization" generally refers to three types: (a) home health agencies, (b) home care aide organizations, and (c) hospices. Home health agencies generally offer a variety of medical and rehabilitative services, such as intravenous therapy, respiratory therapy, occupational therapy, etc. Home care aide organizations generally provide non-medical services such as cooking, personal care, transportation, and home maintenance. Hospices usually provide palliative care for the terminally ill; services may be social, emotional, or spiritual in nature. However, home care organizations may also provide combinations of services, e.g., home health and hospice.

In addition, home care organizations may either be Medicare-certified or not. Finally, home care organizations are classified as free-standing or facility-based. Free-standing agencies include Visiting Nurse Associations, combined government and voluntary agencies, public government agencies operated by state, county, city or other unit of government, proprietary (free-standing, for-profit home care agencies), private not-for-profit agencies (free-standing and privately owned) or other (do not fit into these previously mentioned subdivisions). Facility-based agencies can be hospital-based (operating units or departments of a hospital), based in rehabilitation facilities, or based in skilled

nursing facilities. If an agency has a working arrangement with a hospital but is operated as a separate entity, then it is classified as a free-standing agency (NAHC, 1999).

Persons Receiving Home Health Care Services

The shifting age distribution of the population of the United States is a significant factor in the determination of persons requiring home health care. The population of the United States is growing older and living longer. It has been estimated that the proportion of the U. S. population that is aged 65 or older was 11% in 1970, 14% in 1990, and will reach 20% by the year 2010 (Ellenbecker, 1995; VanderMeer, 1993). This segment of the population may at some point benefit from home care services that provide assistance with activities of daily living. According to the Disability Statistics Rehabilitation Research Training Center (DSRRTC), "... as of 1994, approximately 16% of the U. S. population aged 65 and over and approximately 2.5% of the population aged 18-64 could benefit from home care services" (U. S. Department of Education, 1996).

The following data describe the demographics of persons who have received home care services. The National Center for Health Statistics (NCHS) reviewed discharge information from home health agencies from 1995-96, a sample of 7,775,700 home health patients. Sixty-six percent of home health discharges were aged 65 or older. Of these 66%, the breakdown was as follows: 10.8 % aged 65-69, 13.2% aged 70-74, 12.4% aged 75-79, 14.2 % aged 80-84, and 15.4% aged 85 years and older. Among this sample, 64% were female, 62.8% were White, 37% married and 24.6% widowed (Haupt, 1998). The National Medical Expenditure Survey (NMES) found that 5.9 million individuals, or approximately 2.5% of the U. S. population, were recipients of formal home care services in 1987. In addition, almost half were older than age 65, and the amount of home care services used tended to increase as age increased (Agency for Health Care Policy

and Research, [AHCPR], 1997). Another significant percentage of the population served by home care includes those under age 45. In the NCHS study, this segment comprised almost 20% of the population served between 1995-1996 (Haupt, 1998).

Goldsmith and Rogers characterized the following groups as recipients of home care in the United States:

1. Patients discharged from the hospital who have not fully recovered
2. Patients with chronic conditions who are no longer able to meet their own needs and require frequent monitoring.
3. Terminally ill patients (e.g. cancer, HIV disease) who require personal and emotional care, as well as pain management.
4. Patients who require assistance with activities of daily living as a result of limited mobility.
5. Families who are caregivers and need emotional support or a reprieve from caring for their loved ones.
6. Pediatric patients requiring life-sustaining equipment, who as a result of nursing support, can thrive at home and attend school. (Goldsmith & Rogers, 1997a).

It is important to describe the conditions for which clients receive home care services. The NCHS study (Haupt, 1998) characterized the 7,775,700 home health patients according to primary diagnoses as well as all-listed diagnoses. Twenty-two percent of the discharges had as their primary diagnosis diseases of the circulatory system, and 12.5% had heart disease. Injury and poisoning comprised 12.5% and diabetes 4.3% of the conditions respectively. Finally, infectious and parasitic diseases accounted for 1.9% of primary diagnoses and 1.7% of all-listed

diagnoses, or a range of approximately 132,186-147,738 individuals. This category includes HIV disease.

Persons Providing Home Health Care Services

The categories of personnel providing home care include informal and formal caregivers. Informal caregivers include family members, friends, or other types of unpaid assistance. The U. S. Bipartisan Commission on Comprehensive Health Care (USPCCHC) estimated that in 1989, 75% of elderly persons with some type of severe disability were receiving home care services from informal caregivers (USPCCHC, 1990).

Formal caregivers are defined as "professionals and paraprofessionals who provide in-home health care and personal care services, and are compensated for the services they provide" (NAHC, 1999, p. 11). Examples of professionals include registered nurses, social workers, licensed vocational nurses, physical therapists, and occupational therapists. Examples of paraprofessionals include home care aides, as well as physical and occupational therapy assistants.

There are two agencies that keep statistics on formal caregivers, the Bureau of Labor Statistics (BLS) and the Health Care Financing Administration (HCFA); however, their definitions and calculation methods differ. BLS excludes hospital-based and public agency workers from their home health care services workers and counts total number of employees. HCFA includes only certified agencies and full-time equivalents (FTEs) in its statistics. A comparison of the statistics from these two agencies yields the following representation:

Numbers of Home Health Care Workers (BLS, 1996) and Medicare-Certified Agency FTEs (HCFA, 1998)

Type of Employee	(BLS) # Employees	(HCFA) # FTEs*
RNs	134,443	132,796
LPNs	47,651	27,775
Physical Therapists	11,236	13,619
Home Care Aides	318,124	124,218
Occupational Therapists	4,344	3,574
Speech Pathologists	3,304	1,985
Social Workers	8,995	6,895
Other	137,303	61,591
TOTAL	**665,400**	**372,453**

*= Full-time equivalents (HCFA, 1998; BLS, 1996).

Regardless of the agency's statistics used, registered nurses and home care aides comprise the majority of home care employees. RNs make up 20% of full-time employees and 36% of FTEs in the two surveys. Home care aides comprise 48% and 33% of these statistics respectively.

From 1993 to 1997, the number of employees in home care grew from 510,000 to 713,000, which represented an almost 8% average annual growth (BLS, on-line, 1999).

The Rapid Growth of the Home Care Industry

Home health care has experienced a rapid growth in this century, and particularly in the past decade. In 1963, there were approximately 1,100 home care organizations. As of December 1996, the Health Care Financing Administration (HCFA) and the National Association of Home Care (NAHC) identified 20,215 home care organizations within the United States and U. S. territories (Munchus et al., 1999). Regarding this number, Munchus et al. add

"10,277 are Medicare-certified home health agencies, 2,154 are Medicare-certified hospices, and 8,034 are other home care agencies" (p. 21).

Between 1967 and 1985, the number of agencies that had been certified by Medicare went from 1,753 to 5,983. In the mid-1980's, the number leveled off to approximately 5,900. At their peak, Medicare-certified home health agencies numbered over 10,000 in 1997. The Health Care Financing Administration in 1998 listed 9,655 such agencies. The number of Medicare-certified hospices grew from 31 in 1984 to 2,287 in September 1998 (NAHC, 1999).

The number of hospital-based and freestanding proprietary agencies has grown faster than any of the certified agencies. Freestanding proprietary agencies numbered 0 in 1967 and 4,418 in 1998. Hospital-based agencies ranged from a low of 133 in 1967 to a high of 2,698 in 1997, and decreased to 2,631 in 1998. Thus, according to 1998 statistics, freestanding proprietary agencies and hospital-based agencies comprise 46% and 27% of the home care agencies respectively in the United States (NAHC, 1999).

Even though there has been a slight decrease in the total number of organizations providing home care services in the United States, the utilization of home care as a segment of the U. S. health care industry continues to increase. In 1987, approximately 5.9 million individuals, or 2.5 % of the population, received home health care (NAHC, 1999). The National Association of Home Care estimated that eight million people received home care services in 1998 (NAHC, 1999).

According to Goldsmith and Rogers (1997a), the following are reasons for the rapid growth rate of home health care in the United States: (a) patients often recover more quickly at home and prefer to be there, (b) the population of aging individuals is increasing the demand for home health care, (c) advances in technology facilitate the delivery of additional services in the home, (d) patients

with both acute and chronic conditions can benefit from home health care services, (e) lengths of stay in both hospital and skilled nursing facilities are declining, (f) admissions to acute care facilities in some health care institutions are avoided, and (g) home health care is more personalized. In addition, home health care costs are 30% to 50% less than the same services provided in a hospital (Munchus et al., 1999).

Technological, Economic and Legislative Issues Driving Home Health Care

Technological Advances

Technological advancements have resulted in sicker patients being discharged earlier from acute care facilities, requiring more services to be provided in the home. These services include perinatal care (e.g., uterine monitoring, tocolytic management, and nonstress testing); pediatric care (e.g., home phototherapy); apnea monitoring; enteral and parenteral care; respiratory care (e.g., compressed oxygen, liquid oxygen, ventilation); oncology (e.g., chemotherapy); general medical-surgical care; administration of anticoagulation therapy; regular infusion therapy; home blood and blood product infusion therapy; and pain management (Goldsmith & Rogers, 1997a, 1997b).

There has also been a recent proliferation in psychiatric home care services in this country. Such services have been found to prevent or shorten psychiatric hospitalizations for patients with conditions such as schizophrenia and acute depression (Carpenter-Mason, 1998).

The increase in services available to clients in the home as a result of technological advancement has several implications. First, this results in clients who range in age from infancy to older adulthood. Second, the types of procedures that are now performed in the home care setting range from simple to complex. Complex procedures require specialized training for home care providers as well as family caregivers. Some examples of complex procedures are

intravenous therapy, line and site care, enteral care, apnea monitoring and respiratory care. As a result, persons who work in home care are challenged with numerous types of clients and procedures in varied settings on a daily basis.

Economic and Legislative Forces

There have been several significant economic and legislative developments in the past few decades that have had an impact on the industry of home health care in the United States. Before Medicare and Medicaid were enacted, the home health care industry was unregulated, voluntary, and largely conducted by the Visiting Nurse Associations (Munchus et al., 1999). In 1965, Medicare's enactment enabled home care services to be made available to the elderly. In 1973, home health care services were extended to certain categories of disabled younger Americans. As previously mentioned, there was a resultant rapid increase in the number of Medicare-certified agencies during this time.

In 1974, "the appearance of Regional Health Systems Agencies...caused health care organizations to see home health as a valuable asset, and small VNAs were acquired and operated by larger hospital systems" (Munchus et al., 1999, p. 22). In 1980, the Omnibus Budget Reconciliation Act was passed. This reduced coverage restrictions on home health benefits, decreased eligibility requirements, and broadened the participation of proprietary agencies in this industry (Ellenbecker, 1995; NAHC, 1999).

The increased amount of documentation and paperwork, coupled with unreliable payment policies, led to a leveling off in the number of Medicare-certified home care agencies in the mid-1980s (NAHC, 1999). As a result of this problem, a lawsuit was brought against HCFA in 1987, by a group of U. S. Congressmen and the National Association of Home Care. This successful lawsuit enabled the NAHC to be involved in rewriting Medicare's home health care payment policies.

Another regulatory event not directed specifically toward the home health care industry nevertheless had a direct impact on this industry. In 1983, Medicare's Prospective Payment System went into effect. Under this system, hospitals were awarded predetermined rates of reimbursement for their patient care. It became more cost-effective for hospitals to discharge their patients early, thus having a major impact on the use of home health services. This was evident by the dramatic increase in this industry during this time.

The next major event affecting this industry was the passage of the Balanced Budget Act in 1997, created to control the rapid rise in Medicare spending (Joan Spicer, personal communication, December 1, 1999), and resulting in changes in home health care reimbursement. As part of this act, an interim payment system (IPS) was to be implemented and then replaced by the Prospective Payment System (PPS). The IPS used data collected from the years 1993 and 1994 for determining how much Medicare would reimburse for home care visits (Wilson, 1998). An additional aspect of this system was the establishment of cap on the amount Medicare would pay annually for any particular patient's care. A significant problem hampering the implementation of the IPS has been the difficulty in establishing a methodology for determining an appropriate case mix to make the IPS more effective (Wilson, 1998; Carpenter-Mason, 1998; Munchus et al., 1999). The IPS is scheduled to be replaced by the PPS. The Prospective Payment System came into effect October 1, 1999, with Medicare being affected first. It is estimated that Medicaid and other payors will follow (Wilson, 1998).

Meanwhile, the Health Care Financing Administration's Outcome Assessment and Information Set (OASIS), designed to influence the development of the essential case mix methodology required for the PPS, was mandated in 1998, for implementation in 1999. This set was developed from research conducted by the Center for Health Services Research and Center for Health

Policy Research, and was funded partly by HCFA and partly by the Robert Wood Johnson Foundation. This data set for assessment was developed to:

1. achieve broad-based, measurable improvement in the quality of care furnished through federal programs.

2. provide a fundamental component in the transition to a quality assessment and performance improvement approach based on measurable patient outcomes of care and satisfaction with the Medicare home health benefit.

3. Provide a common national core standard assessment data set of measures of outcomes and customer satisfaction. (Munchus et al., 1999, p. 28)

Home health care agencies were required to initiate this system in 1999, as part of the Conditions of Participation for Home Care (COP). The COP was formed in 1973, and revised in 1989, 1991, 1994. The COP outlined requirements for becoming a Medicare-certified agency. HCFA rewrote the COP in 1997 to include OASIS as a condition for Medicare-certification, and the OASIS mandate was finalized in 1999 (Carpenter-Mason, 1998; Munchus et al., 1999).

Home Care Expenditures and Utilization

To appreciate the impact of legislative and economic forces on home health care as an industry, a brief summary of home care expenditures and utilization is presented. Estimation of total home care spending is limited by different data sources and the fact that some spending for home care services is not included in national health accounts figures (NAHC, 1999).

Of the $907 billion estimated to be spent on personal health care spending in 1996, 40% was for hospital care, 9% for nursing home care, and 3% ($27 billion) for home care (Levit, Lazenby, & Braden,1998). According to HCFA (1998), the annual expenditure for home health care service was $40 billion in 1997 and was expected to total $42 billion in 1998. HCFA based its 1998 projection on the fact that freestanding home health expenditures from 1996-1998 grew by a 4.8%

annual average (NAHC, 1998).

According to the Agency for Health Care Policy and Research (AHCPR), Medicare is the largest payor source for home health care services, accounting for 40% of the total cost in 1996. Medicaid followed with 27%, and out-of-pocket sources accounted for almost 21% of the home health care expenditures. Private insurance contributed 12% (AHCPR, 1997).

Before enactment of the Balanced Budget Act in 1997, less than 9% of the total Medicare spending was paid toward home health benefits in 1997 (NAHC, 1999). However, in 1998, that percentage comprised only 6.2% of total Medicare benefits. It is also projected that the percentage of the total Medicare benefits for home health agencies will decrease to 3% in 1999, a 50% drop.

On the other hand, Medicare expenditures for home health care increased from $3.9 billion to 17.2 billion between 1990 and 1997. This rise in cost was attributed to increased numbers of home visits. Thus, increased utilization of home care services has not been coupled with increases in Medicare payments for these services.

Home Health Care as a Work Environment

In this section, the home health care setting as a work environment is described. First, an outline of guidelines and standards applicable to home health care is discussed. Next, characteristics of the home care work environment are described. Hazards to home health care workers are listed, with an emphasis on biological hazards.

National Guidelines, Federal Guidelines and Standards

As discussed in the previous section, there are numerous federal guidelines regulating home health care under the Health Care Financing Administration, as well as state and local guidelines that affect the type of care these agencies provide and the amount of reimbursement they receive. National organizations,

standards and guidelines that affect home health care as a work environment include the Joint Commission for the Accreditation of Health Care Organizations (JCAHO), the Occupational Safety and Health Administration's (OSHA) Bloodborne Pathogens (BBP) Standard and Tuberculosis Exposure Control Plan (TECP) Standard, the Centers for Disease Control and Prevention's Guidelines for Standard Precautions, and Recommendations for Post-exposure Testing and Prophylaxis for Occupational Exposures to HIV, hepatitis B, and hepatitis C.

Home healthcare agencies can receive accreditation by JCAHO if they develop and implement infection control policies and procedures, among many other criteria. By the end of 1998, JCAHO required all accredited home care agencies to select a minimum of two outcome indicators from an approved performance measurement system. Beginning in spring of the year 2000, data collected from the selected measurement systems must be submitted to the JCAHO in benchmark reports (Wilson, 1998; JCAHO, 1998). Many home care agencies have chosen clinical patient outcome indicators already required by the OASIS mandate, to comply with JCAHO standards (Pat Sparacino, personal communication, November 24, 1999).

Under OSHA's BBP Standard, all employers are required to prevent or reduce bloodborne pathogen exposures to employees. An Exposure Control Plan (ECP) must be developed, implemented and communicated to employees. Components of the ECP include engineering and work practice controls, the provision of personal protective equipment, education, hepatitis B vaccination, and post-exposure testing and treatment to all employees identified as having the potential to be in contact with bloodborne pathogens (OSHA, 1991).

OSHA's TBECP applies to home care settings concerning the provision of personal protective equipment to home care workers. Personal respirators approved by the National Institute for Occupational Safety and Health are to be

worn by home care workers if the patient is considered to be infectious and requires a home visit (CDC, 1994; Magruder & Hamilton, 1998). Use of personal respirators and regular skin testing are imperative in this setting, as the engineering controls available in the hospital to control transmission of tuberculosis cannot be implement in the home care setting. Such controls include negative air ventilation, adequate numbers of air exchanges per hour, exhausting of ventilated air to the outside, high efficiency particulate filtration, and ultraviolet radiation (Garofalo, 1996). Thus, established practice recommendations for this setting should include a program for purified protein derivative (PPD) skin testing of employees, the frequency of which should be based on specific risk assessments conducted by each agency (Bolyard et al. & HICPAC, 1998).

The Centers for Disease Control and Prevention's guidelines are not mandatory for health care facilities, as this agency does not carry enforcement power. However, according to Taylor and McNeil (1998a), "CDC recommendations and standards are recognized as the good standard of practice, assist HCFA in developing its safety and health policies, and influence the enforcement of OSHA standards" (p. 40). In addition, OSHA has historically taken the position that, with bloodborne pathogens, updates in CDC guidelines result in automatic updates in the OSHA BBP Standard (DeLaMare & Underwood, 1997). Thus, guidelines for management of health care workers exposed to hepatitis B, hepatitis C, and HIV are applicable to home health care (CDC, 1991, 1994, 1998).

California

California and several other states administer their own occupational safety and health programs according to the provisions of the Federal Occupational Safety and Health Act of 1970. In 1973, the California Occupational Safety and

Health Act was passed to ensure safe working conditions for persons working in California. The Division of Occupational Safety and Health (DOSH or Cal/OSHA) covers all workers in the state, with the exception of federal employees, maritime workers, or domestic service workers in private households. In California, every employer is required by Section 3203 of Title 8 in the California Code of Regulations to have an effective illness and injury prevention program (IIPP) in writing. The requirements of the IIPP are as follows:

1. Safety and health training for employees and supervisors.

2. A policy naming the person or persons responsible for the program.

3. A system for ensuring the compliance of employees with safe work practices.

4. A system for employees to communicate concerns regarding hazards in the workplace without fear of reprisal from employers.

5. A system for the identification and evaluation of workplace hazards.

6. A procedure for investigating occupational injuries and illnesses.

7. A procedure for correcting unsafe work practices.

8. A documentation system (for three year periods) for scheduled, periodic inspections, and employee training on safety and health. (Cal/DOSH, 1996, 1998)

Thus, California administers many of its own programs to provide for the safety of workers.

<u>Differences Between the Home Health and Hospital Settings</u>

Health care in the home is different from a traditional hospital, and the differences are social, organizational, and physical in nature. According to Smith (1995), "The social contract between worker and patient in home care work is one of guest and client, respectively" (p. 2).

Organizationally, although many home care agencies have policies and

procedures for infection control, patient care practices, use of equipment, and safety, it is difficult to monitor these when each home situation is unique. Even though home care agencies must comply with many of the same standards and are offered many of the same guidelines as hospitals, they are often challenged to comply due to limited resources for supplies, training, and monitoring of outcomes (Rose & Alexander, 1992).

The physical environment of the home setting is markedly different from that of the hospital. First, there are not other health care workers present to consult with or assist with procedures. The space for the patient as well as the work space for the employee is not standardized. Equipment in individual homes may differ from client to client and may vary on visits to the same client.

Kendra et al. list numerous examples of environmental issues in home care such as : "homes in disrepair, in known drug areas, and needed supplies not being in the home" (1996, p. 83) as well as that visits are now being made 24 hours a day. The unpredictability of the home care setting has been discussed in several reports (Smith, 1995; Kendra et al., 1996; Kendra, 1996). Smith and White (1993) stated that the home care work environment is "less standardized, predictable and controlled" (p. 180).

It is possible that the potential biological hazards in this setting are greater than those in the hospital, given the unpredictable and unstandardized nature of this workplace. A discussion of these biological hazards is essential in the context of this study.

Biological Hazards

Simmons, Trusler, Roccaforte, Smith, and Scott (1990) listed infections that can be transmitted in the home as: "tuberculosis, scabies, pediculosis, streptococcal pharyngitis, impetigo, and bacterial enteric infections" (p. 363) such as salmonella and shigella. Home health care personnel may be exposed to

vaccine preventable diseases from either their clients, or the family and acquaintances of clients. In their Guidelines for Infection Control in Health Care Personnel, the CDC's Hospital Infection Control Practices Advisory Committee (HICPAC), (Bolyard et al. & HICPAC, 1998) recommends that all health care workers without documented immunity to measles, mumps, rubella, varicella, and hepatitis B should be vaccinated against these diseases, unless medically contraindicated. All adults should have a booster dose for diphtheria and tetanus every ten years. Annual influenza vaccine is recommended for health care personnel who have contact with persons at high risk for influenza-related complications. This includes the elderly population of home care clients. Clients or their family members may be excreting wild polio virus (e.g., from an imported polio case). As a caution, home care workers should check that they have received the complete series of polio vaccination (Bolyard et al. & HICPAC, 1998).

In the context of this study, however, the diseases of most concern are the bloodborne pathogens, hepatitis B, hepatitis C, and HIV. Of the 140,000 new cases of hepatitis B reported to occur in the United States each year, approximately 5,100 cases have occurred in health care workers, with a 1% fatality rate (CDC, 1991). It is not known how many of these cases of hepatitis B have occurred in home care workers. Two thousand health care workers have died from hepatitis B in the past ten years (SEIU, 1997). Sequelae of this disease have included chronic hepatitis and cirrhosis of the liver (Heeg and Coleman, 1991). This disease is largely preventable with hepatitis B vaccine and there are post-exposure prophylaxis recommendations for this disease (CDC, 1991).

Hepatitis C virus infection (HCV) has emerged as a serious health problem in the United States, and is one of the most important causes of chronic liver disease in this country (NIAID & NIH, 1998). In addition, it poses a threat of

occupational acquisition by percutaneous or permucosal exposure to blood by workers in health care settings (Alter, 1994, 1997). Approximately 4 million Americans, or 1.8 percent of the U. S. population, are infected with HCV. Approximately 150,000 cases are estimated to occur annually in the United States. HCV causes approximately 8,000-10,000 deaths annually in the United States (NIAID & NIH, 1998). Most of these persons with hepatitis C are chronically infected and might not be aware of their infection because they are not clinically ill. In addition, the time from infection with this virus and appearance of infection can be as long as 20-30 years. "Infected persons serve as a source of transmission to others and are at risk for chronic liver disease or other HCV-related chronic diseases during the first two or more decades following initial infection" (CDC, 1998, p. 1). Employment in patient care or clinical laboratory work has been identified from case-control studies as an occupational risk factor associated with transmission of this disease (Alter, Coleman, and Alexander, 1989; Alter, Gerety, Smallwood, et al., 1982; CDC, 1998).

Thus, health care workers who provide care for patients in high risk categories and who perform procedures involving needles and blood, are at risk of occupational acquisition of hepatitis C infection. Limited studies have been conducted to detect seroprevalence of hepatitis C antibodies in health care workers; ranges of 1-4% have been reported. Recently released guidelines from the United States Public Health Service and the revision of the Cal/OSHA's BBP Standard provide a template for health-care institutions for post-exposure policies and procedures for hepatitis C infection (CDC, 1998; Cal/OSHA, 1998). The lack of a preventive vaccine, absence of post-exposure prophylaxis, and the large numbers of persons infected with HCV who are unaware of their infection, imply that adherence to Universal Precautions is the only method for prevention of occupational acquisition of this serious disease.

The cumulative number of diagnosed AIDS cases through December 1998 approached 700,000. In California, there have been over 100,000 cases (CDC, 1999). Patients with HIV disease are frequent recipients of home health care services, particularly hospice services. Eight cases of person-to-person HIV transmission occurring from an HIV-infected person to persons living in the same household or providing home care have been reported (CDC, 1994; Valenti, 1995). Five of these cases were associated with documented or probable blood contact, and in two cases blood exposures might have occurred but were not documented. The final case involved HIV infection in the brother of a patient with AIDS, though the specific mechanism of transmission was not able to be ascertained. Of these eight cases, the activities during which transmission may have occurred were as follows: four were persons living in the same household, three involved home nursing (two between a mother and son and one between an adult caring for another HIV-infected individual in the home), and one was between two siblings receiving home intravenous therapy for hemophilia.

Thus, the potential biological hazards for home health care workers include infections, vaccine preventable diseases, and bloodborne pathogen transmission. (Specific risks for infection from a blood exposure to hepatitis B, C, and HIV are discussed in Chapter Three.) These potential hazards underscore the need for home health care workers and family members to be thoroughly educated in the care of clients with these conditions and with infection control practices.

Summary: The Status of Home Health Care

Home health care is an integral part of the current U. S. health care industry. Recent legislative initiatives have directly affected this industry. After a period of rapid growth, this industry experienced several recent declines. The number of new home health care agencies in 1998 decreased by 789 from 1997 (NAHC, 1999). In 1998, total home care employment declined by 7.2% (BLS, 1999).

According to the NAHC, these recent declines are the "direct result of changes enacted as part of the Balanced Budget Act of 1997" (NAHC, 1999, p.1).

As a work environment, home care has been described as a setting that is unpredictable, not standardized, markedly different from the hospital setting, and posing numerous biological hazards to its workers. The importance of employers providing and employees following proper infection control policies and procedures, regulated by OSHA and recommended by the CDC, can not be overemphasized.

Another problem that home care agencies must contend with is the nursing shortage (Chapin, 1999). According to a survey reported by Mangan, enrollment in Bachelor's programs of nursing schools in the United States has declined by 17% in the last four years. This has occurred despite an estimated 21% growth rate for job opportunities for registered nurses in the United States by 2006 (Mangan, 1999). Since registered nurses comprise one of the two largest categories of home care workers, a decline in number of practicing RNs may affect future caseloads.

As a result of the numerous factors discussed in the previous sections of this chapter, home care agencies currently face many challenges. They must measure outcomes, provide a safe working environment for their workers, and recruit and retain the vital resource of home care nurses, all in an atmosphere of threatened reimbursement. Added to these challenges is the recent revision of the Cal/OSHA BBP Standard (see Chapter Three). Understanding the social context of home health care may lead to a better understanding of the circumstances surrounding blood exposures of home care nurses, as well as barriers to and facilitating conditions for their use of needle safety practices.

CHAPTER THREE: LITERATURE REVIEW

This review of the literature consists of several sections directly and peripherally related to the problem under study. There are several areas of the literature which require review in order to comprehend the complexity of both the circumstances surrounding blood exposures and use of needle safety devices and practices in health care workers in general and home care nurses in particular. The first area is the epidemiology of percutaneous exposures in health care workers. It is necessary to discuss the percutaneous injury problem in order to explore factors which inhibit or facilitate the ability to utilize safe needle practices and devices. The second area is compliance of health care workers with Universal Precautions, of which needle safety practices or precautions, are a subset. A discussion of regulatory issues directly related to compliance with Universal Precautions and peripherally related to the epidemiology of needlestick injuries is included. The third area is workplace self-protective behavior in the general safety field. Within each section, a critique of the research is included. At the conclusion of this chapter, a synthesis of all areas is presented.

Epidemiology of Percutaneous Exposures

The first section is a comprehensive review of the epidemiology of needlestick injuries (NSI). Included in this section are the frequency and description of NSI, NSI according to job classification and work location, reasons for NSI, interventions to decrease NSI, safety products to decrease or prevent NSI, biohazards of NSI, underreporting of NSI, and NSI in the home health care setting. In addition, a discussion of regulatory and legal issues surrounding needlestick injuries and safety product use in the health care setting is provided,

in order to understand the context surrounding needlestick injuries.

Frequency and Description of Needlestick Injuries

The Centers for Disease Control and Prevention (CDC) has estimated that approximately 800,000 occupational needlesticks occur each year in the United States, and this figure is the one that has most frequently been cited in the literature (Cardo et al., 1997; Gerberding et al., 1995; OSHA, 1995). More recently, using a standardized tracking system in a group of 77 U. S. hospitals, that number was estimated to be 972,000 (Tereskerz, Bentley, & Jagger, 1997).

There have been reports of percutaneous injuries according to the type of device used (Ippolito et al., 1994; Jagger et al., 1988; Lewis, Short, Howard, Jacobs, & Roche, 1995). These reports varied in terms of number of injuries per year but have been similar regarding the injury rates for specific devices such as injectable syringes, intravenous catheters and butterfly needles. In one report, device-specific sharps injury rates per 100,000 devices purchased, as well as usage rates of devices per full-time equivalent were calculated, both overall and by department. There were three epidemiological patterns which resulted as follows: (a) injury rates of butterfly needles were independent of usage, (b) injury rates of lancets varied directly with usage, and (c) injury rates of intravenous catheters, suture needles, and scalpels varied inversely with usage. In addition, several observations were noted. First, devices that were used relatively infrequently but under difficult conditions had high injury rates. Second, devices that required disassembly contributed to significant injury rates in areas such as the emergency department, where employees work under extreme time conditions. Finally, some departments with unconventional use of devices (e.g., scalpels in the laboratory) resulted in higher injury rates than might have been expected based on usage alone (Patel & Tignor, 1997).

The results of this study were similar to those of previous studies by Jagger

et al. (1988) and Ippolito et al. (1994), with regard to rates of hollow bore needle injuries. The study was successful in indicating several target areas for interventions to prevent future injuries in this facility, such as the use of intravenous (i.v.) catheters in pediatrics, and the problem of disassembling devices in busy areas such as an Emergency Department. This study had several limitations which should be noted when interpreting the results. First, using number of devices purchased in calculating rates of injury and usage has several disadvantages. Not all sharps devices purchased are actually used by the health care workers in contact with blood or body fluids. For example, some may be opened and discarded unused, some may be sent home with the patient, and some may be used in situations not utilizing blood and body fluids (e.g., in the pharmacy). Therefore, the number of purchased devices may differ significantly from the number of contaminated devices, and may underestimate the injury rate. Second, the numbers of reported injuries in this study were significantly lower than the other two studies to which it was compared. Finally, the rates of injury were calculated using reported injuries as the numerator; to what extent underreporting affects the actual rates was unable to be determined. A study such as this is useful in generating descriptive, institution specific data, as long as one exercises caution when comparing rates to other institutions.

Needlestick Injuries According to Job Classification

The job categories of healthcare personnel involved in percutaneous injuries have included nurses, physicians, surgeons (Lewis et al., 1995), anesthesiologists (Rosenberg et al., 1995), dentists (Gooch et al., 1995), medical and nursing students (Chia, Koh, & Jeyaratnam, 1993; Kirkpatrick, Ricketts, Reeves & MacGowan, 1993; Shalom, Ribak, & Froom, 1995), radiology technicians, environmental and housekeeping personnel (Williams, 1993), laboratory technicians (CDC, 1997b; Jagger & Bentley, 1995), respiratory therapists,

operating room personnel (D'Arco & Hargreaves, 1995; Gerberding, Littel, & Tarkington, 1990; Tokars et al., 1992; White & Lynch, 1993), and paramedics (O'Connor, Krall, Megargel, Tan, & Bouzoukis, 1996).

It is generally acknowledged that the job category most often involved in percutaneous injuries has been the nurse. Approximately 60-90% of needlestick injuries in medical centers have been incurred by nursing personnel (Aiken, Sloane, & Klocinski, 1997; English, 1992; Haiduven et al., 1992; McCormick, Meisch, Ircink, & Maki, 1991). A study by the Occupational Safety and Health Care Administration (OSHA, 1995) of needlestick data from 175 hospitals found that 47% of all needlesticks occurred among medical/surgical (29%), coronary care (10%), and emergency room (8%) nurses. This implies that such specific nursing areas should be further studied to identify factors which may contribute to needlestick injuries. Nurses comprise the majority of healthcare personnel in most institutions. In addition, it has been reported that needlestick injuries are the most common type of occupational injury experienced by nursing personnel (Williamson et al., 1988).

It is expected that absolute numbers of needlestick and other sharps injuries would be higher in nurses since nurses are the largest occupational group in health care. It is important to determine whether rates of injuries have been examined as well. A report by Robert and Bell (1994) stated that two prospective studies of percutaneous injuries on medical wards in the United States determined a rate of 1.8 injuries per year for physicians and 0.98 for nurses working on the same medical wards. However, the source of the rates were two different studies; the reader is unable to determine if the rates were similarly calculated. It is important to mention that the underreporting of exposures in health care workers may have contributed to the omission of important trends in needlestick injury data. This would be especially true for groups such as

physicians, whose underreporting rate has been estimated to be as high as 80% (Haiduven et al., 1999).

Needlestick Injuries According to Work Location

In addition to being included in institutional reports, there have also been reports in the literature regarding percutaneous injuries in specific work settings. There have been numerous reports on bloodborne exposures in the operating room setting (Ben-David & Gaitini, 1996; Lynch & White, 1993; White & Lynch, 1993). In one report, the operating room had the highest number of needlestick injuries for five straight years at a large medical center (Haiduven et al., 1995). Anesthesia department injuries have also been reported (Berry, 1995; Greene, Berry, Arnold, & Jagger, 1996), as well as needlesticks in radiology departments (Hansen, Miller, Redman, & McIntire, 1993), pediatric departments (Jackson et al., 1994), dialysis units (Ippolito, Petrosillo, Puro, Arici, & Jagger, 1995) and endoscopy units (Ragsdale, 1994; Shields, 1994).

Reasons for Needlestick Injuries

Several categories of percutaneous injuries have emerged consistently in the literature. These are injuries from recapping needles, while disposing of needles, and from sharp objects left improperly disposed (English, 1992; Haiduven et al., 1992; Haiduven et al., 1995; Jagger et al., 1988; McCormick et al., 1991).

Until recently, there was no standardized categorization system nor a nationally required reporting system for percutaneous injuries and blood exposures. However, a program entitled the "Exposure Prevention Information Network" or EPINet, has been developed and utilized by over 2000 institutions, both in the United States and internationally (Jagger, Cohen & Blackwell, 1994; Worthington, 1993). EPINet consists of uniform reports for collecting needlestick, other sharp object, blood and body fluid exposure information, as well as software for entering, accessing and analyzing the data from these forms. This

system uses the number of injuries per 100 occupied beds as the numerator and denominator, respectively (Tereskerz, Bentley, & Jagger, 1997). More widespread use of this or a similar program in the future may facilitate standardized categorization of needlestick injuries, may also enable the comparison of injury rates within and between institutions, and thus may enhance the epidemiological study of needlestick injuries in relation to the circumstances surrounding their occurrence.

It is important to note that the EPINet report form for the home care setting requires modification. The only selection for location where the exposure occurred is "home". This is not specific enough for targeting prevention efforts that may be related to the specific location in the home where the exposure occurred, e.g., bedroom, living room, etc.

A limitation of this system is that there are forced-choices on the data collection forms for the variables contributing to the needlestick injury. In addition, when requesting information on the preventability of an exposure, the responses may be a factor of who completes the forms. For example, a supervisor may have a different perspective on preventability of an exposure compared to the injured employee, who in turn might have a different opinion than the occupational health practitioner. It is also important for there to be inter-rater reliability with this method, so that the information is collected in a consistent manner. Finally, this software program does not have the ability to collect open-ended responses which may contribute to further description and understanding of circumstances surrounding the injuries.

Interventions to Decrease Needlesticks

Effects of various interventions on the numbers of percutaneous injuries have also been evaluated. Examples have included but have not been limited to the following: (a) number, placement, and design of needle disposal containers

(Anglim et al., 1995; Edmond, Khakoo, McTaggart, & Soloman, 1988; Haiduven et al., 1992; Linneman, Cannon, DeRonde, & Lanphear, 1991; Makofsky & Cone, 1993;); (b) educational programs (Haiduven et al., 1992; Seto, Ching, & Chu, 1990; Whitby, Stead, & Najman, 1991); (c) the practice of Universal Precautions (Beekman et al., 1994; Birnbaum, 1993; Linneman et al., 1991; Wong et al., 1991); (d) communication of needlestick injury data (Haiduven et al., 1992; Haiduven et al., 1995; Hanrahan & Reutter, 1997); (e) work practice changes such as not allowing needles to be recapped (Bailey, 1986; Haiduven et al., 1992; Haiduven et al., 1995; Huber & Summer, 1987; Seto et al., 1990); and (f) the use of specific safety products (Adams, Zehrer, & Thomas, 1993; Bebbington & Treissman, 1996; CDC 1997a, 1997b; Gartner, 1993; L'Ecuyer et al., 1996; Simpkins, Haiduven, & Stevens, 1995; Terrell & Williams, 1993; Yassi, McGill, & Khokhar, 1995). (The use of specific safety products is discussed in a later section of this chapter.)

The effectiveness of these other interventions has varied in these reports. This variation in results can be illustrated by examining the use of more convenient placement of needle disposal containers and education on recapping to decrease recapping practices. Edmond et al. (1988) found no significant differences in the number of needlestick injuries or in the frequency of recapping after the installation of bedside needle disposal units or educational programs. Linneman et al. (1991) showed that placement of sharps containers in all hospital rooms and educational programs failed to produce a major reduction in reported needlestick injuries, with the exception of a decrease in recapping injuries in other healthcare workers, but not nurses. Haiduven et al. (1992, 1995) illustrated a consistent, significant decline in both the total number of needlestick injuries as well as those from recapping, over a five year period, utilizing these two interventions as well as communication of needlestick injury information to all departments.

There were several limitations in these intervention studies which may have contributed to the varied results. The first was that educational interventions may have short-lived effects, and interventions may need to be repeated at certain intervals in order to maintain a sustained effect. The use of consistent educational programs, targeted to specific job classifications, and also included in general infection control presentations annually, were felt to be important qualities of the needlestick prevention programs used in one study and may have contributed to the success of such programs in decreasing needlestick injuries (Haiduven et al., 1992). The evaluation period of the studies may need to be longer to determine if results are sustained, improved, or decreased over time. Under-reporting of needlestick injuries, since it is known to occur, may affect determination of the effects of various interventions on needlestick injuries, as is discussed in another section of this chapter. The studies using placement of needle disposal containers in all patient rooms or treatment areas did not clearly indicate the distance between health care workers and the containers. Thus, if not within arms reach, this intervention would not be expected to decrease needlestick injuries. Use of observation of health care workers behaviors related to sharps use and disposal before the intervention might have helped in formulating and evaluating the intervention outcomes. Finally, the relatively low incidence rates from needlestick injuries require large sample sizes to adequately measure results of this outcome. Consideration may therefore need to be given for measurement of other outcomes, such as number of recapped needles or number of needles properly disposed versus those left outside of sharps containers, etc.

Safety Products and Needlestick Injuries

The past several years have brought with them improved personal protective equipment, a vast amount of new safety devices, and administrative controls for

health care workers, designed to reduce or prevent exposure to bloodborne pathogens in the workplace. New advances in personal protective equipment such as gloves, gowns and masks afford more protective barriers between patients' body fluids and the health care worker. The types of safety products, both re-engineered and substitution devices, that are available include needleless intravenous systems, safety devices for drawing blood and giving intramuscular injections, re-designed intravenous catheters, needle disposal containers, needle recapping devices, and many other examples.

There have been reports in the literature regarding the product evaluation process (Bonner, 1999; Chiarello, 1995; Jurf, 1994; Kroc & Pugliese, 1993; Larson & Maciorowski, 1986; Munz, 1993; Owens-Schwab & Fraser, 1993; Simpkins et al., 1995), the myriad numbers of safety products that have become available (Garvin, 1996; Wugofski, 1992), how to select needlestick prevention devices (Bonner, 1999; Finkelstein, Solomon, & Mendelson, 1996) and steps for implementing the use of safety devices (Vason, 1999). These articles have included editorials, practical guidelines, descriptions of products, catalogues of available safety products, and institutional experiences with specific products.

Recommendations that have consistently been reported include evaluation of devices by users before purchase, preference for passive versus active design features, the need for thorough training on use of new products, and the need to continue product evaluation after a device has been purchased, to uncover use problems or defects not discovered before purchase. Although this body of literature contains mainly case reports, it is mentioned because of the recommendations that have emerged, their implications for increasing user compliance, and the potential for including such factors in future studies that evaluate health care worker compliance with safety product use.

Cost-effectiveness of safety devices in preventing needlesticks has been

examined (Armstrong, 1991; Laufer & Chiarello, 1994). Some devices have been found to be cost-effective; others have not. It is important in cost-effectiveness studies to factor in the nursing time needed to use traditional versus safety-engineered devices as well as cost per needlestick prevented. These factors have not been consistently included in studies.

In the past several years, numerous reports on the effects of specific safety products on reducing needlesticks and blood exposures, comparing the effectiveness of standard versus safety equipment, or even comparing different brands of safety devices have yielded varying conclusions. These reports are summarized here.

In the operating room setting, studies evaluating several types of safety equipment and techniques have yielded significant results. The first is the use of blunt versus sharp needles, which has been shown to significantly decrease the number of needlestick injuries in surgical personnel, without adverse effects on patient's wound closure (CDC, 1997a; Dauleh, Irving, & Townell, 1994; Davis, 1994; Hartley et al., 1996; Mingoli et al., 1996; Rice, McCabe, & McManus, 1996; Wright, Moran, & Briggs, 1993). The effectiveness of gloves in reducing the innoculum of blood during percutaneous injury, and the added benefit of protection when double gloves are worn, have also been demonstrated in several studies (Bennett & Howard, 1994; Greco, Wheatley, & McKenna, 1993; Leslie et al., 1996; Mast, Woolwine, & Gerberding, 1993). Use of the "no touch" technique (contacting wound edges with instruments only during wound closure) resulted in a significantly lower incidence of glove perforations among surgeons using this technique versus traditional hand manipulation (Corlett, England, Kidner, Attard, & Fraser, 1993).

Use of a surgical suturing assist device, designed to perform one-handed suturing, has been found to contribute to decreased numbers of percutaneous

injuries and glove perforations among surgical personnel in gynecological and abdominal surgeries (Bebbington & Treissman, 1996; Haiduven & Allo, 1994). The study by Bebbington & Treissman (1996) was exemplary for several reasons. Those using the device were thoroughly trained before the study began so that inexperience with using the device would be eliminated as a confounder. Randomized allocation of device use was performed by using a random number table. Surgeons who agreed to participate did not know until the case began whether they would use the device or not. Thus, randomization occurred once consent to participate was received. Persons testing the gloves for perforations were blinded to whether the device had been used in the case. Since those using the device could obviously not be blinded to the interventions, the use of independent assistants measuring the outcome of glove perforations afforded a component of control in this study (Hulley & Cummings, 1988). Finally, the authors presented a comprehensive discussion of potential limitations of their study, with proposed areas for future research.

There are several areas requiring further effectiveness studies in the operating room setting. These include use of puncture-proof gloves, passing surgical instruments with a "no touch technique," and use of safety scalpels designed with one-handed blade removal.

Use of a needle cover that allowed one-handed recapping of used needles was evaluated for its effect on the number of "cover preventable" needlestick injuries, defined as "injuries that might occur after a needle could have been made safe by being contained" (Wright & Farrer, 1993, p. 154). The use of these covers resulted in a significant reduction in needlestick injuries to nurses. It is important to note, however, that four needlestick injuries were assessed to be directly related to the use of these new covers. Strengths of this study included the pre and post-intervention design and the injury determination method that

allowed exclusion of injuries not related to the needle being covered. A major limitation of the study was the inability to control for other factors (e.g., new policy not allowing cleaning personnel to pick up used needles, a new impervious disposal container, better practices by physicians and nursing, and a new program for reporting injuries).

Safety syringes, which vary in design from active to passive, have been compared, evaluated, and tested. One institution evaluated a device with a spring loaded design that was to be engaged with one hand after use. Emergency Department workers were instructed on the correct use of the safety syringe. For a one month period after this instruction, sharps containers were emptied to determine whether the safety feature had been activated. It was determined that 40% of the 390 devices had not been properly activated. A user satisfaction survey was distributed after one month of use and satisfaction was unfavorable overall. The data suggested that the extra step required to activate such devices may be have been an impediment to the correct use (Mulherin, Rickman, & Jackson, 1996). A strength of this study was that a survey soliciting feedback on the device from the users was used. However, only 17 surveys were completed and the number distributed was not reported.

In a similar recent report, a second generation design of this one-handed retractable device was evaluated. Of the 1794 syringes evaluated, 99% had been activated (Charney, 1999). A strength of both studies was the creative approach of using the number of activated safety syringes as the outcome measure, rather than reported use of the device by the health care workers. Conversely, a limitation of both studies was the inability to determine at what point the safety device had been activated, for example, had the safety device been activated prematurely or just before disposal. It is not clear from the second report specifically how the device had been modified or whether the re-design or the

larger sample of syringes evaluated accounted for the marked differences in activation rates.

In an eight year study of reported needlestick injuries, one institution developed nine needlestick injury categories to use a consistent method for analyzing these injuries. There was an increase in the number of percutaneous injuries in the categories of "during /after injection" and "during needle disposal" in the year following purchase of a new safety syringe. Upon further examination of the injury report forms, it was determined that incorrect use of the device contributed to the injuries (Haiduven et al., 1995). In this instance, it was fortunate that the information was available on the injury report forms to make this determination. However, a limitation of retrospective surveillance is the inability to obtain further information once the data have been collected. Institution-specific analyses such as these are effective for determining injury trends, identifying problem areas, and evaluating specific interventions.

There have been reports on needleless intravenous access devices, tubing connectors, heparin locks, and access ports (Adams, Zehrer, & Thomas, 1993; Berry, 1993; Fassel, Coyner, & Jagger, 1994; Terrell & Williams, 1993). Gartner examined the impact of a needleless intravenous system on needlestick injuries and whether the cost could be justified. In this study, IV-related, needle-related, and trash-related injuries decreased, but disposal-related injuries increased. The cost for the needleless system was justified (Gartner, 1993). Another evaluation of a needleless IV system resulted in a 72% decrease in IV-related injuries and a cost savings of $1.85 for each administration set-up (Skolnick, LaRocca, Barba, & Paicius, 1993). The effectiveness and cost-benefit of using a needleless intravenous access, after their hospital experienced its highest number of needlestick injuries in this category, were evaluated in another report. There was a 43% overall reduction in needlestick injuries and a 78% reduction in

intravenous access-related injuries, without increased costs (Yassi et al., 1995). In a study comparing 3 needleless intravenous systems to traditional devices with needles, needlestick injury rates were slightly lower in one of the product groups but not the other two; problems with device use, staff satisfaction, and low rates of needlestick injuries in control and intervention groups made it difficult to make definitive conclusions regarding effectiveness and cost savings (L'Ecuyer et al., 1996).

One study examined the effectiveness of a shielded safety syringe and a needleless i.v. system on needlestick injury rates before and after their introduction to the facility. Even though there was an overall reduction in the number of injuries, it was not statistically significant. In addition, there was a significant increase in cost for these devices (Orenstein et al., 1995).

Safety phlebotomy devices and intravenous catheters have also been examined in several studies. A large prospective study by six hospitals in conjunction with the CDC (1997b) found a significant reduction in phlebotomy-related percutaneous injuries. Use of a safety i.v. catheter, with self-sheathing capabilities, decreased both blood splashes and needlestick injuries, and did not require a change to routine techniques of its users (Watters, MacCallum, Maurice, & Robertson, 1995).

Even though safety products are rapidly being developed, produced, marketed, evaluated and purchased, there is no guarantee that they will be used by health care workers. Not using safety products in institutions where they have been made available has recently reported as a reason contributing to percutaneous injuries (Haiduven et al., 1992). In this retrospective surveillance study, the number of needlestick injuries in the category of "manipulating intravenous line or access ports" as well as those in the "miscellaneous" category that involved use of a needle when the procedures could have been conducted

without a needle, were used to estimate the percentage of needlesticks from unnecessary needles. Approximately 15-23% of the needlestick injuries were potentially preventable if unnecessary needles had not been used (Haiduven et al., 1992). In this study as well as in a subsequent report, a calculation was made each year of the number and percentage of total needlesticks that could be prevented by proper use of available safety products. Often this information was obtained from the incidence reports; when it was not, the person analyzing the needlesticks contacted the supervisor, the employee who was injured, or both, to obtain the information necessary for this determination to be made (Haiduven et al., 1992; Haiduven et al., 1995).

There are several issues regarding the problem of studying the use of safety products to prevent needlestick injuries in health care workers. First, as these two previously mentioned studies illustrate, retrospective surveillance of needlestick injury reports may not be effective in determining that an injury could be prevented by use of a safety device. Interview data may need to supplement such reports. With these two methods, social desirability and recall are threats to their validity. Observational studies of safety product use may be severely threatened by the Hawthorne effect, as health care workers may use a product more when they know they are being observed. Use of self-report surveys on frequency of safety product use may need to be supplemented by studies of outcome measures other than number of needlestick injuries, as has been previously mentioned.

Needlestick Injuries in Home Care

The literature regarding needlestick and blood exposures in the home care setting is scant. In one study, a survey of home health care agencies in northern California was conducted to evaluate the nature of work performed in home care and the presence and type of educational programs in occupational health (Smith

& White, 1993). Needlestick injuries and infections or exposures other than needlesticks accounted for 14% and 6% of the injuries respectively. However, the response rate for this survey was only 34%, and the authors caution that the results may not be representative of all home care agencies. Nevertheless, the survey results did indicate that needlestick injuries were a risk for home care workers, of which nurses comprised the majority of workers.

Another survey was conducted among a random sample of 600 home health care agency directors to determine the frequency of needlestick injuries to employees working in the home care setting (Backinger & Koustenis, 1994). Two-hundred seventy-eight directors participated, with a 46% response rate. Of the 226 (81%) agencies reporting needlestick injuries, 102 (45%) reported that there had been none in the previous year and 124 (55%) reported that there had been injuries. The frequency of needlestick injuries reported ranged from one to 134, for a cumulative total of 475; 25% of agencies reported one injury and 13% reported two injuries during the previous year. The highest number of needlestick injuries reported by one agency was 134; the next highest numbers were 22, 21, and 19, but only one agency each experienced this frequency of needlesticks. Limitations of the study were an inability to determine which category of worker sustained the needlestick injuries, and the lack of descriptive information on the needlesticks.

Biological Hazards of Needlestick Injuries

There are numerous diseases that have been reported to be transmitted by needlestick injuries to healthcare personnel. These have included more commonly recognized hazards, as well as those which may not have been readily associated with needlestick injuries. Examples of the latter include tuberculosis (Kramer, Sasse, Simms, & Leedom, 1993), malaria (Haworth & Cook, 1995), typhus (Jee, Chung, Lee, Kim, & Chang, 1996), Cryptococcus neoformans

(Casadevall, Mukherjee, Yuan, & Perfect, 1994), cytomegalovirus (Hibberd, 1995), syphilis, Rocky Mountain Spotted Fever, herpes simplex, tetanus (Stephany, 1992), and Ebola virus (CDC, 1995b and 1995c). It is generally recognized, however, that the three bloodborne pathogens, hepatitis B, hepatitis C, and HIV, are of greatest concern for occupational transmission (Cockroft, Oakley, Gooch, & Mastin, 1994; Crowe & Tilton, 1994; Hibberd, 1995; Stephany, 1992).

The risk of acquiring hepatitis B after a needlestick injury from a positive source can be dramatically reduced if a healthcare worker has received the hepatitis B vaccine. However, in the unvaccinated person, the risk of acquiring this disease has been reported to range from 6-30% (CDC, 1997c; NIOSH, 1999; Owens & Nease, 1992). There are effective post-exposure prophylaxis (PEP) regimens available, consisting of the vaccine series and hepatitis B immune globulin, depending upon the vaccination status of the exposed health care worker (CDC, 1991).

Unlike hepatitis B, there is currently no vaccine available for prevention of hepatitis C virus (HCV) infection. In health care workers who have sustained needlestick exposures, HCV seroconversion has been documented in the range of 2% to 10% (Arai et al., 1996; Dana, Becherer, & Bacon, 1994; Heintges & Wands, 1997; Lanphear et al., 1994; MacDonald, Crofts, & Kaldor, 1996). In a recent report (Williams, 1999), the average incidence of seroconversion from a percutaneous injury reported to be 1.8%, with a range of 0 to 7% (Alter, 1997; CDC, 1998). Thus, health care workers who provide care for patients in high risk categories and who perform procedures involving needles and blood, are at risk of occupational acquisition of hepatitis C infection.

Unlike hepatitis B and HIV, there is no effective post-exposure drug regimen recommended for hepatitis C. The only FDA-approved drug for the treatment of chronic hepatitis C is interferon; combination therapy with interferon and

ribavirin is FDA-approved for patients who have relapsed following interferon therapy (CDC, 1998). This therapy is effective is only 15-25% of patients, is fraught with numerous side effects, and has a 50% relapse rate when therapy is stopped (Fried & Hoofnagle, 1995; CDC, 1998).

The risk of acquiring an HIV infection from a substantial needlestick has been reported to be 0.3-0.4% (Kopfer & McGovern, 1993; Stringer, 1993). This risk estimate is based on reported needlestick injuries in healthcare workers who have seroconverted (CDC, 1995a; Cheng, Ford, Cheng, Weber, & Kerndt, 1995; Tokars et al., 1993). As of June 30, 1999, 55 documented seroconversions and 136 possibly occupationally acquired cases of HIV infection have been recorded. In addition, 4.8% of AIDS cases in adults have been health care workers (CDC, 1999). Hollow-bore needlestick injuries have been the most common object of exposure. These numbers do not account for the unknown number of health care workers who have seroconverted to HIV positivity post-needlestick but who have chosen to not report this information to the CDC. Results of a case control study examining factors associated with seroconversion to HIV after a needlestick or blood exposure reported that injection of blood, depth of penetration, and a hollow bore needle injury were significantly associated with seroconversion (CDC, 1995a). These patients were followed to determine if they seroconverted their HIV status after the exposure. In this report, numbers of persons who have not reported injuries and whether they have seroconverted, are not accounted for. Thus, the incidence of HIV seroconversion from an HIV-contaminated exposure may be higher or lower than 0.3-0.4 %.

Unlike HCV, there is a CDC-recommended post-exposure prophylaxis (PEP) for occupational exposures to HIV. These guidelines were revised in 1998 by the U. S. Public Health Service (USPHS). Both a basic (zidovudine and lamivudine) and an expanded regimen (basic regimen plus either indinavir or nelfinavir) are

recommended, based on the exposure circumstances. In a retrospective case-control study of health care workers, the risk for developing HIV infections among workers who used zidovudine for post-exposure prophylaxis (PEP), was reduced by approximately 81% (USPHS, 1998). This PEP is most likely to be effective when implemented as soon as possible after the exposure (USPHS, 1998).

There have been several health care workers who have acquired HIV occupationally and who have made their stories public. Their declared goals have been to promote the need for safer devices to be purchased by institutions and for health care workers to make self-protection and prevention of needlesticks a priority in the workplace (Arnold, 1996; Arnold, 1997). There has been a recent case report of a health care worker who died after acquiring both HIV and hepatitis C infections following an occupational needlestick exposure (Ridzon et al., 1997). The effectiveness of using such examples in educational or motivational efforts to decrease needlestick injuries is unknown at this time.

Underreporting of Exposures

Underreporting of exposures makes it difficult to ascertain the total number of needlesticks, rates of injury, and the risk of acquiring a bloodborne infection (Cato & Mulhall, 1994; Tandberg, Stewart, & Doezema, 1991). As early as 1983, Hamory found that 40% of needlestick injuries in a hospital within the past three months and 75% in the past year had not been reported. He also found that those employees who did not report injuries were more likely to have been employed for less than two years (Hamory, 1983). More recently, a study in five Canadian hospitals compared the number of needlestick injuries reported to the health service versus those reported to a research team. In addition, the research team distributed an anonymous survey to employees in one of the five hospitals to estimate the degree of underreporting that had occurred in the past year. The

range of underreporting in the five hospitals was 29-61% from the comparative study, and 70% from the single hospital survey (Roy & Robillard, 1995). These authors used three methods, prospective surveillance, prospective voluntary visits to the research team, and a retrospective survey, to determine underreporting rates, and all were found to be high.

Underreporting of needlestick injuries among medical students has been examined in several surveys. Choudbury and Cleator (1992) found that only 15% of such injuries had been reported and Kirkpatrick et al. (1993) found a similar rate of 17% (both used anonymous surveys). In another survey also using an anonymous questionnaire, this problem was examined in third and fourth year medical students, and found that 75% underreporting occurred in both groups (Waterman, Jankowski, & Madan, 1994).

Another study examined reporting of percutaneous and mucocutaneous exposures among all categories of health care personnel in a large county teaching hospital, by using confidential surveys distributed during mandated educational programs. In 549 respondents, 163 (30%) had been injured and had reported the injuries, and 141 (26%) had not reported all injuries. To determine the underreporting rate, the number of injuries not reported was divided by the total number of injuries reported. Overall, 46% underreporting occurred, 45% among nurses and 80% among physicians (Haiduven et al., 1999). The findings for overall underreporting were similar to those of Hamory (1983) and Roy and Robillard (1995). The high percentage of underreporting by physicians, supported studies by Choudbury and Cleator (1992), Kirkpatrick et al. (1993), and Waterman et al. (1994). A limitation of the study was the inability to determine a response rate to the survey.

In the studies by Beekman et al. (1993) and Roy and Robillard (1995), data from surveys were combined with other methods to determine underreporting

rates. This use of more than one method may be an effective way to validate research results (Burns & Grove, 1993).

It appears from these reports that underreporting has been more likely to occur among physicians. With the exception of Hamory's report, however, there has not been much information on whether those who have reported injuries are different from those who have not; this is an area that may benefit from further study. One such study might be a survey on reporting practices of different classifications of health care workers, with inclusion of demographic and work-related characteristics. Characteristics of those who do versus those who do not report may be compared, and might yield valuable information for future studies. The limitation of this type of design would be low response rate to the survey, and the question of whether those who respond differ from those who do not. The institutional safety climate may influence the reporting practices of the health care workers and should be examined as well.

There have been several reasons for underreporting identified in various reports. The first is health care worker assessment that an exposure did not come from a contaminated source. The second is that belief that an exposure did not require reporting according to existing institutional policies. There have been statements by health care workers that indicated little or no perception of risk to themselves from an exposure. Time constraints that precluded reporting have also been mentioned frequently. Dissatisfaction with follow-up procedures for needlesticks and lack of knowledge of the need to report such injuries have also been found to contribute to underreporting (Haiduven et al., 1999; Hamory, 1983; Waterman et al., 1994).

Other important barriers to reporting of needlestick injuries may be related to the workers' compensation system and lack of confidentiality associated with this system. Workers' compensation laws rarely provide full restitution for an

illness or injury so it may not be in the best interest of the health care worker to report an exposure (Tereskerz & Jagger, 1997). In addition, the workers may jeopardize their confidentiality and job security by filing a claim after a needlestick that results in seroconversion.

When health care workers report their needlesticks and blood exposures, testing of the source patient and the injured health care worker for hepatitis B, hepatitis C and HIV (with consent) is done. In addition, post-exposure prophylaxis for HIV and hepatitis B can be given. Finally, when such mechanisms are in place, the health care worker is eligible to receive workers' compensation benefits for adverse events, such as subsequent infection with a bloodborne disease. These mechanisms do not take place when an injury is not reported. Thus there are several implications of underreporting in relation to needlestick injuries. First, underreporting may result in omission of valuable information on needlestick injury trends. Second, it results in an underestimation of the number of health care workers who contract hepatitis B, C or HIV infection post-exposure and who thus might receive prophylactic treatment. Underreporting may also indirectly benefit the institution, by providing a false sense of security regarding its safety record. Finally, underreporting illustrates a need for increased education on the risks of needlestick injuries for those health care workers who do not appreciate such risks. It is therefore important that reasons for underreporting be elicited and interventions targeted to increase reporting.

Compliance with Universal Precautions in Health Care Workers

Compliance with Universal Precautions among health care workers has been examined in numerous studies, many of which are discussed in this section. Because use of needle safety devices and practices is a subset of Universal Precautions policies, review of Universal Precautions compliance literature is

warranted. The findings that have been consistently and significantly reported regarding health care worker compliance with these precautions are presented in this section.

Universal Precautions: Background and Definition

As a direct response to the emergence of HIV disease in the early 1980s, the Centers for Disease Control (CDC) published guidelines, in 1985, introducing the concept of "Universal Precautions" (CDC, 1985). This concept incorporated the notion that health care workers should use care in handling the blood and body fluids of all patients regardless of their diagnosis. These guidelines have been revised and updated over the past decade (CDC, 1987; CDC, 1989). Included in these guidelines were recommendations to use personal protective barriers such as gowns, gloves, and masks when handling patients' bloody body fluids, immediate disposal of used needles, and not recapping used needles. These guidelines were adopted by most health care facilities in the United States.

Definition of Compliance

According to Webster's New World Dictionary, "compliance" is defined as "acting in accordance with a request, order, rule, etc." (Neufeldt & Guralnik, 1991, p. 285). In Taber's Medical Dictionary, it is defined as "the extent to which a patient's behavior coincides with medical advice" (Thomas, 1993, p. 430). It is not the intent of this section to engage in a philosophical discussion of compliance. However, it is important to mention that such definitions infer that the gold standard of compliance is 100%. Therefore, studies of compliance by either patients or health care workers most often strive to describe some portion of 100% of compliance that is achieved or to explain why 100% compliance is not achieved. It is important to keep this in mind when reviewing the methodologies that have been utilized to study the phenomenon of compliance with Universal Precautions by health care workers.

Level of Compliance Among Health Care Workers

It has been a consistent finding in the study of this phenomenon that Universal Precautions are not always followed by all health care workers. In one review article, 28 studies on compliance with Universal Precautions were listed and non-compliance rates. If omitting the highest and lowest rates as possible outliers, the non-compliance rates ranged from 9-57%, 5-76%, 6-98%, 35-81%, 13-48%, and 56-84% for handwashing, glove use, mask wearing, use of eye wear, not recapping needles, and general Universal precautions, respectively (Gershon, Karkashian, & Felknor, 1994). In another review article of over 32 studies, failure to comply with glove use alone ranged from 4-68% (Levin, 1995).

Compliance According to Job Category or Work Area

Another consistent finding in the study of UP compliance is that several job classifications and work units have poorer compliance than others. Compliance among physicians (Baraff and Talan, 1989; Becker et al., 1990; Courington, Patterson, & Howard, 1991; Gershon, Vlahov, Felknor, Vesley, Johnson, Declos, & Murphy, 1995; Hammond, Eckes, Gomez, & Cunningham, 1990; Kelen et al., 1990; Michalsen et al., 1997; Stotka, Wong, Williams, Stuart, & Markowitz, 1991), emergency department personnel (Henry, Campbell, & Maki, 1992; Smyser, Bryce, & Joseph, 1990; Williams, Campbell, Henry & Collier, 1994), and emergency medical responders (DiGiacomo et al., 1997; Eustis, Wright, Wrenn, Fowlie, & Slovis, 1994) appears to be poorer than among other classes of personnel, such as nurses, phlebotomists, and laboratory staff.

Reasons for Non-compliance

Larson and Kretzer (1995), in their review of the literature on Universal Precautions (UP) compliance for the years 1984-1994, summarized reasons given by health care workers for non-compliance. These included the following: "inadequate or inaccessible supplies, contact with few high risk patients,

interference with technical procedures, concerns that clients might be offended, and time constraints" (Larson & Kretzer, 1995, p. 94). Another report reviewed thirteen studies in which compliance with UP was the dependent variable and a health care organization intervention was the independent variable. Reasons given for non-compliance in these studies were "inconvenience, being unaware of requirements, not perceived to be at personal risk, unavailability, and barriers' ineffectiveness" (Levin, 1995, p. 368). In one article that utilized a work systems analysis to evaluate compliance with Universal Precautions, the most frequently cited reasons for non-compliance in the eight articles reviewed were "lack of time and interference with skillful task performance" (DeJoy, Gershon, Murphy, & Wilson, 1996, p. 164). Additional frequently reported reasons were "forgetting about UP, lack of knowledge of UP protocols, discomfort, and lack of access to protective equipment" (DeJoy et al., p. 164).

Factors Associated with Non-compliance

In a survey that involved over 1700 hospital-based health care workers, lack of compliance was significantly correlated with male gender, perceived patients' needs, risk-taking personality, and safety climate of the institution (Gershon, Felknor, & Delclos, 1993). Other factors noted to be significantly associated with compliance included high levels of knowledge about HIV infection risk and routes of transmission, low work stress levels, tolerance in attitudes toward patients with HIV/AIDS, and " belief in the efficacy of preventive compliance behaviors" (Gershon et al., 1994, p. 356). One study used the theoretical framework of the Health Belief Model to identify variables which influenced compliance with Universal Precautions in the emergency department. Health care workers with more than three perceived obstacles were significantly less likely to use gloves if contact with blood was anticipated; those with a greater number of training experiences were significantly more likely to use gloves, and

significantly less likely to recap a used needle after an intramuscular injection, phlebotomy, or injection of a medication into an intravascular line (Williams et al., 1994). One study of UP in trauma resuscitation attempts demonstrated a significant correlation between both the factors of pre-notification of an incoming patient and presence of the trauma team before the arrival of the patient and compliance with UP (DiGiacomo et al., 1997). In a study of physicians' compliance with Universal Precautions, both general compliance (sharps safety activities, handwashing, cleaning up of blood spills, not eating or drinking in the work place) and personal protective equipment (PPE) compliance were measured. Factors significantly and negatively associated with general compliance were age of the physician and conflict of interests between patient care and safety of the employee. Factors significantly and positively associated with PPE compliance were safety climate and UP training hours. Safety climate was measured by use of Likert scales to respond to six statements related to safe work practices of co-workers and supervisors, the priority of safe practices in the workplace, and the minimization of unsafe conditions. Work stress was significantly and negatively associated with PPE compliance (Michalsen et al., 1997).

Universal Precautions Compliance in the Home Care Setting

Only one published paper reported on compliance with Universal Precautions in home healthcare (Rose & Alexander, 1992). In this study, nursing directors or supervisors from 20 home health care agencies in the southeastern United States were surveyed about their perception of compliance by home care workers to Universal Precautions. Of these 20 agencies, 11 (55%) reported monitoring compliance by having supervisors make planned visits to the home, five (25%) used some type of quality assurance measures, and four (20%) conducted random inspections in the home, which included interviews with the

employee, patient, and family. Examples of quality assurance measures were the number of supplies used, including sharps containers, the number of infectious waste bags properly labeled and disposed, attendance at orientation programs, and documentation of glove use in the medical record. Two agencies had evaluated UP compliance in recent months and reported levels of 95% among nurses and home health aides and 76% among home health aides. (Rose & Alexander, 1992).

There were several strengths of the study. The first was the use of outcome measures other than needlestick injuries for monitoring compliance. The second was the use of an additional measure of compliance. The authors asked 35 student nurses who observed home care nurses during their rotation into this setting to estimate glove use by nurses. In a total of 179 visits, only 16% were noted to use gloves during blood-glucose testing, and of these, 64% washed their hands after removing gloves. Thus, this additional measure of compliance could be used to supplement that of the nursing directors.

There were several limitations of the study including the small sample size, lack of information regarding the specific questions asked of the participants, and the potential threat of social desirability. In addition, only two agencies actively kept records documenting actual compliance figures. The high percentage of compliance seems unrealistic, particularly given the subjective nature in which these rates were reported. There was no information on the observation study regarding whether subjects knew they were being observed or how many agencies were involved.

Methods Utilized to Study Universal Precautions Compliance

Research methodologies that have been used to study compliance with Universal Precautions have employed both quantitative and qualitative techniques, and have included self-report surveys, direct observation studies,

combinations of both methodologies, intervention studies, and focus groups. Three key review articles (Gershon et al., 1994; Larson & Kretzer, 1995; Levin, 1995) as well as numerous study examples are cited in this discussion.

Self-report Surveys

Self-report surveys of behaviors, attitudes, and knowledge to measure compliance with Universal Precautions among health care workers have been the most frequently utilized method to date (Larson & Kretzer, 1995; Levin, 1995; Gershon et al., 1994). In a review of 32 articles studying compliance with glove use during contact with blood, 20 (63%) used self-report surveys (Levin, 1995). One review of all studies of UP compliance in acute and community health care settings and dental settings between 1984-94 identified 41 such studies. Of these, 36 (88%) employed surveys of behavior, knowledge or attitude (Larson & Kretzer, 1995).

There are several advantages to the use of self-report surveys as a research methodology. First, when structured to preserve confidentiality, this method can encourage honest responses to sensitive issues, such as attitudes toward HIV and self-reports on behavior in the health care setting (Hulley & Cummings, 1988). When respondents are able to answer honestly, this adds to the validity of the study results (Waltz, Strickland, & Lenz, 1991). Another advantage of the survey is the ability to standardize the questions, so that information is elicited in a uniform manner (Waltz et al., 1991). Use of surveys is well suited to studies of knowledge, attitudes, and behaviors, which contribute to the complex problem of compliance with Universal Precautions (Hulley & Cummings, 1988).

There are several disadvantages to the use of self-report survey as a research methodology. These include low response rate, social desirability, interaction of selection and treatment, overconfidence, history and interaction of selection and history. Health care workers may self-report higher than actual compliance levels

with Universal Precautions because they believe that is what is expected of them (Waltz et al., 1991). If only health care workers who comply to some degree with Universal Precautions agree to respond to surveys, interaction of selection and treatment may result (Burns & Grove, 1993). The "overconfidence heuristic" has been defined as "the tendency for persons to be overconfident in their judgments" (Slovic, Fischoff, & Lichenstein, 1977, p. 6). As has been previously mentioned, one of the most commonly reported reasons that health care workers give for lack of compliance with UP is minimal perception of risk to themselves for not doing so. Therefore, compliance rates in self-report surveys may be affected by this "overconfidence heuristic" (DeJoy et al., 1996, p. 166), particularly with regard to questions related to personal risk. (Further discussion of risk perception can be found in Chapter Five.) History could constitute a threat if, on a particular unit, a health care worker had been splashed with blood or if a manager of a unit imposed disciplinary action on an employee for not following UP. Respondents working on this unit could be influenced either positively or negatively by these events. History could interact with selection by the use of cluster sampling that would inadvertently result in whole units being sampled. Different units may have different histories of employee exposures, which might subsequently influence self-reported UP compliance rates of respondents.

Observation Studies

The direct observation of glove use alone, handwashing, single or combined use of personal protective equipment, and needle recapping have been utilized to study UP compliance among health care workers. In a review article examining 57 such studies, observed behavior was used in 13 (23%) articles (Larson & Kretzer, 1995). In a review of 32 articles on failure of health care workers to wear gloves during potential blood contact, 16 (50%) used observation (Levin, 1995). Several methods of observation have been employed in this type of study and

can be categorized by organization, job category, and work setting.

The first area, type of observation, has involved a variety of strategies. In some studies, persons being observed have had knowledge of the observation. This type has consisted of observation by research investigators (Larson et al., 1991) or by staff members (Bowman & Nicholas, 1990; DeVries, Burnette, & Redmon, 1991). In other studies, observation has been conducted by research assistants when those being observed were told that investigators were present for some other purpose (Baraff & Talan, 1989; Eustis et al., 1995; Henry et al., 1992; Kelen et al., 1991; Roane, 1993). A third strategy has been observation by staff members (Friedland, Joffe, Wiley, Schapire, & Moore, 1992; Hammond, Eckes, Gomez, & Cunningham, 1990) or research investigators (Schwartz, Jacobs, & Juda, 1992) when subjects were not informed that they were being observed. A fourth and more recent strategy has consisted of continuous observation by video camera of persons who knew they were being video-taped (DiGiacomo et al., 1997).

Numerous studies (n= 8) have been conducted where employees in single job categories have been observed for Universal Precautions compliance. These studies have included hospital laboratory workers (Albrecht & Miller, 1989; Gauch, Feeney, & Brown, 1990), anesthesia personnel (McKay, 1992; Stevens, Mentis, & Downs, 1991), nurse midwives (Loewen et al., 1989), nursing personnel (Bowman & Nicholas, 1990; Schillo & Reischl, 1993), and emergency department physicians (Hammond et al., 1990). Work setting has also been used as the unit of analysis. Examples include emergency departments (Henry et al., 1992; Henry, Campbell, Collier, & Williams, 1994; Marcus et al., 1993; Talan & Baraff, 1990), operating rooms (Panlilio et al., 1991; Ronk & Girard, 1994), maternity and obstetrics departments (Bauer & Kenney, 1993), intensive care units (Deobbeling & Wenzel, 1990) and a physician office setting (Miller, Krol, & Losh, 1992).

Finally, groups of health care workers have been studied for overall compliance rates, and then often subdivided into individual job categories (Hersey & Martin, 1994; Kaczmarek et al., 1991).

Various components of UP have been observed including handwashing, glove use, barrier equipment use, needle recapping and disposal policies, during specific procedures or for all procedures, and combinations of one or more of these (Gershon et al., 1994; Larson & Kretzer, 1995; Levin, 1995). These studies have mainly been conducted by direct observation of health care workers' practices though one study used videotaped observations (DiGiacomo et al., 1997). It is important to mention that indirect observations, such as the number of needles found recapped or the number of glove perforations among surgical personnel after operative procedures, have been used in different reports on needlestick injuries (see section in this chapter "Epidemiology of Needlestick Injuries") and may offer potential as an additional method of observation for studying Universal Precautions compliance. An area of future study may involve comparing levels of compliance and whether this differs according to observation methods used.

Combinations of Self-report and Observation Studies

Studies of UP compliance which have employed both self-report surveys of behaviors, attitudes, or knowledge and observation are far less in number than either of the two methodologies alone. In Levin's review, only four of 32 (12.5%) studies evaluating glove use utilized both self-reported and observed glove use (Levin, 1995). None of 57 studies evaluating either individual item use (e.g., gloves, eye wear) or Universal Precautions as a whole utilized a combination of these methods (Larson & Kretzer, 1995).

Given the numerous disadvantages of either method alone, it seems logical to utilize this combination for monitoring UP compliance among health care

workers. This "across-method triangulation" is "the combined use of two methods in the study of the same phenomenon" (Burns & Grove, 1993, p. 277). The benefit of method triangulation is the potential to "produce richer and more insightful analyses of complex phenomena than can be achieved by either method separately" (Duffy, 1987, p. 133). In addition, validity can be enhanced when two methods are used (Waltz et al., 1991). For example, one study utilized pre- and post-test surveys of knowledge of UP and self-reported compliance as well as observation of emergency department personnel (Henry et al., 1992). Self-reported barrier equipment use and needle recapping rates were among the variables measured. Observed compliance with barrier equipment was significantly lower than self-reported compliance, with the exceptions of glove use, and recapping rates, which were nearly identical. The authors imply that self-reporting is "likely to result in overestimation of UP compliance" (Henry et al., p. 944). On the other hand, for those needles which were observed to be recapped, 78% were recapped with a two-handed technique, whereas the mean self-reported rate of two-handed recapping was only 44%. This finding implies that health care workers may not be aware of the frequency with which they engage in a high-risk procedure, a finding that would not be evident by use of self-report alone. Combining these two methodologies may increase validity and underscore the need for more studies that describe the relationship between observed and self-reported compliance with UP.

Comparison of Compliance Rates Between Self-report and Observation Methods

Because there has not been a standardized measurement method of compliance across the numerous studies cited, it is difficult to make a determination of whether compliance rates between the two methods of survey and observation vary. It is possible to make such a determination in studies which utilized both self-report survey and observation. In a study of 24

anesthetists, observed glove use during various procedures ranged from 22-58%; self- reported glove use for routine care was 50%, yet for high risk situations was reported to be only 4% (Stevens et al., 1991).

Using a one-group before and after design, a study of medical office staff (n=34) was conducted. Initial single-blinded observations during medical procedures were made over a three week period. At the end of this period, questionnaires about attitudes and perceptions of staff behaviors and knowledge of universal precautions were distributed to all office staff. A didactic lecture (emphasizing the importance of universal precautions and relating the most current figures from the CDC regarding HIV seroconversion post-occupational exposure) was then presented. Single-blinded observations were repeated for another three week period, after which identical questionnaires were distributed. Attending and resident physicians estimated that they wore gloves for handling blood 61-80% of the time, whereas students, nurses, and technicians estimated their own use to range from 81-99% (Freeman & Chambers, 1992). Observations indicated that before the intervention, overall compliance with glove use was 44%, compared to a 49% after the intervention. This difference was not significant.

In another study of emergency department staff at two community hospitals, self-reported versus observed compliance rates for each category of barrier equipment use respectively were as follows: gowns, 55% versus 15%; masks, 35% versus 15%; gloves, 80% versus 65%; and goggles, 45% versus 55% (Henry et al., 1994). Thus, self-reported rates of compliance for all cases except goggle use were significantly higher than observed rates.

There are several implications from findings of studies where the compliance rates differ between methods. First, as discussed earlier in this chapter, persons may overestimate their compliance rates in self-report surveys. Second,

observations are subject to bias from the Hawthorne effect. In addition, observations in field settings may not be able to capture specific circumstances that either hinder or promote compliance if the observation period is not long enough, does not cover all shifts, does not cover periods with adequate staffing, or other factors that may influence compliance. Finally, the perspective from which the method is based (e.g., health care worker, manager, researcher) may influence the measurement of compliance rates.

Studies to Evaluate Interventions

Larson and Kretzer (1995) analyzed studies of fifteen interventions to improve knowledge, attitudes, or use of barrier precautions between 1984-1994. Five tested an educational intervention, three utilized feedback, four used a combination of the two interventions, one utilized an administrative mandate, and two made changes in either equipment (e.g., automated sink), or clothing (e.g., cover gowns). The authors concluded that educational interventions are "useful for improving knowledge, but have had little effect on attitudes or behaviors" and that "the effect of feedback on sustained behavior change was equivocal" (Larson & Kretzer, 1995, p. 101). Levin (1995) discussed 13 studies of interventions to increase UP compliance from 1983-1994. Five utilized education alone, one used feedback alone, three utilized education and feedback, and four used three of four interventions (education, feedback, equipment purchases, or reminder posters) to improve UP compliance. Four studies demonstrated significant positive effect on some or all barrier precaution use. It is interesting to note that these two review articles of virtually the same time period only overlapped in the analysis of three studies (Courington et al., 1991; DeVries et al., 1991; Friedland et al., 1992).

Of the 13 studies reviewed by Levin, two utilized a cross-sectional design and 11 used non-experimental pretest/posttest of the same group (Levin, 1995).

Limitations in the studies evaluating interventions were listed as lack of a theoretical framework on which to base the intervention, lack of power analyses, inconsistent definition of compliance across the studies, small sample sizes, generalization of findings beyond the boundaries of the studies, and lack of discussion of threats to validity other than the Hawthorne effect (Larson and Kretzer, 1995; Levin, 1995).

Use of a Theoretical Framework to Study Compliance with Universal Precautions

The atheoretical nature of many of the studies on UP compliance has been a major limitation of the designs. There have been few studies which utilized theoretical frameworks to study universal precautions, attitudes towards blood exposures, and follow-up testing after blood exposures. The following models have been used to study UP compliance in health care workers: the Health Belief Model (Williams et al., 1994; Henry et al. 1992), DeJoy's (1996) Stage or Sequential Model of Workplace Self-protective Behavior (Gershon et al., 1995), Prochaska's Stages of Change Model (Prochaska & DiClemente, 1984), and the PRECEDE/PROCEED Model (Larson et al., 1991). The Health Belief Model has also been utilized to study health care workers' attitudes towards blood exposures (Hainey & Krantz, 1999; McFarren-Grady, Shortbridge, Davis & Klinger, 1993) and attitudes towards follow-up testing after a blood exposure (Sass, Bertolene, Denton, & Logsdon, 1995). Larson (1995) stated:

> Despite the fact that there are a number of theories which have been used to explain behavioral change, very few have been discussed in the context of practices related to the prevention of infection, and none, to our knowledge, have been used as a basis for planning an intervention. (p. 103)

The implication from this statement is that interventions utilized to date to improve compliance with UP will continue to meet with limited success unless they are "theoretically sound and multi-dimensional" (Larson & Kretzer, 1995, p.

103).

Regulatory and Legal Issues

Nationally, the development of the Occupational Safety and Health Administration's (OSHA) Bloodborne Pathogens Standard in 1991 brought with it important issues with regard to prevention of bloodborne exposures in health care workers. This standard regulated practices which include but are not limited to the following: (a) that needles be disposed of in suitable containers as close to the area of use as possible, (b) that needles not be recapped by hand, (c) that health care workers who have contact with blood/body fluids follow universal precautions (including wearing personal protective equipment) and either accept hepatitis B vaccination or sign a declination form refusing it, and (d) that health care facilities supply engineering controls and require that health care workers use them (OSHA, 1991). In this standard, engineering controls were defined as "controls (e.g. sharps disposal containers, self-sheathing needles) that isolate or remove the bloodborne pathogens hazard from the workplace" (OSHA, 1991, p. 64175).

It was not a requirement of this original standard to keep a separate log of percutaneous injuries. In fact, reporting of needlestick injuries in health care facilities had not been mandated by any regulatory agency. OSHA required only reporting of "significant needlesticks" in the OSHA 200 log (OSHA ,1991; OSHA, 1995).

Most recently, California has been in the forefront of these issues. On September 30, 1998, landmark legislation in the form of Assembly Bill 1208 was approved by Governor Pete Wilson. This bill was introduced by Assembly Member Carole Migden in 1997. This bill required that the Division of Occupational Safety and Health develop an emergency revision of the Bloodborne Pathogens (BBP) Standard to include the following:

1. A revised definition of "engineering controls" that includes sharps prevention technology including, but not limited to, needleless systems and needles with engineered sharps injury protection, to be defined in the standard.

2. A requirement that sharps prevention technology specified be included as engineering or work practice controls, except in cases where the employer or other appropriate party can demonstrate circumstances in which the technology does not promote employee or patient safety or interferes with a medical procedure. Those circumstances shall be defined in the standard, and shall include, but not be limited to, circumstances where the technology is medically contraindicated or not more effective than alternative measures used by the employer to prevent exposure incidents.

3. A requirement that a written exposure control plan be updated when necessary to reflect progress in implementing sharps prevention technology as specified.

4. A requirement that information concerning exposures be recorded in a sharps injury log, including, but not limited to, the type and brand of device involved in the incident. (Cal-OSHA, 1998)

As a result, the Proposed State Standard, Title 8, Chapter 4, of section 5193-Bloodborne Pathogens was amended, effective January 22, 1999. It required that the emergency revision be adopted until the final regulation become operative or by July 1, 1999. In the emergency standard, the definition of engineering control has been modified to "controls" (sharps disposal containers, needleless systems and sharps with engineered sharps injury protection) (Cal/OSHA, 1998, p. 2). The definition of engineered sharps injury protection is:

> Either (1) a physical attribute built into a needle device used for withdrawing body fluids, accessing a vein or artery, or administering medications or other body fluids, which effectively reduces the risk of an exposure incident by a

mechanism such as barrier creation, blunting, encapsulation, withdrawal, or other effective mechanisms; or (2) a physical attribute built into any other type of needle device, or into a non-needle sharp, which effectively reduces the risk of an exposure incident" (Cal/OSHA, 1998, pp. 2-3).

There are defined exceptions to the use of engineering controls in the standard: (a) lack of availability of a device in the marketplace, (b) documentation by a licensed healthcare professional (directly involved in the care of a patient) that use of a particular engineering control would jeopardize either patient safety or the success of a medical, dental, or nursing procedure, (c) demonstration by the employer that an engineering control is not more effective in preventing exposures than the alternative device in use by the employer, and (d) demonstration by the employer that information on the safety performance of the engineering control is not available, and that this is being determined by objective product evaluation (Cal/OSHA, 1998).

Regulations such as the OSHA standards raise legal issues as well. These issues center around liability of the institution versus the individual in bloodborne pathogen exposures. For example, students or health care workers who have acquired bloodborne diseases from needlesticks or blood exposures have filed lawsuits against their institutions or instituted third party claims against manufacturers, claiming that injuries could have been prevented if safety products or safer policies were available. On the other hand, institutions may not stand behind a health care worker who has sustained adverse effects from a needlestick injury if there is evidence that a health care worker did not follow the institution's policies and procedures (Jenner & Bourke, 1993; Tammelleo, 1994). Workers' compensation for an adverse event post-exposure may not be given if baseline information was not collected at the time of the exposure. With the emergency standard regarding safer products now in effect in California, will

hospitals readily comply by purchasing safety products in all available categories, or will there be misuse of exceptions as stated in the standard? If hospitals attempt to maintain a sharps injury log but are unable to collect accurate information on type and brand of device involved in an exposure incident, what are the legal ramifications?

It would seem to follow, as a result of these standards and legal issues, that hospitals should supply safe products and policies, employees should use safe products and follow procedures, and compensation for morbidity and mortality should be received when it can be documented that occupational exposures occurred. However, problems such as underreporting of needlesticks, failure to follow policies or use safe products, and the social stigma that may be attached to reporting HIV acquisition of an employee illustrate the complexity of these issues. The very recent amendment to the Cal/OSHA BBP Standard may be a major step toward assuring healthcare worker protection from workplace exposures. However, the complexity of the percutaneous injury problem still exists. In order to ensure that nurses and health care workers use safe practices and devices, barriers and facilitating conditions must be explored. For those in home health care, complying with this standard may be further compromised by conditions and factors unique to this setting.

Workplace Self-Protective Behavior

The topic of workplace self-protective behavior is discussed in this section. It begins with background on occupational health controls designed to protect workers from hazards in their workplace environments. Compliance with use of personal protective equipment, both in the health care setting and in the general safety field, are discussed. Theoretical models used to study this phenomenon are outlined. This section concludes with a discussion of organizational safety climate as an important component of worker self-protective behavior.

Background

In the occupational health field, the safety of the worker is paramount. It is generally well established that a hierarchy of controls in the workplace setting should be used to assure that workers operate in as safe an environment as possible. These include engineering controls, work practice controls, and use of personal protective equipment. The rationale for delineating these controls and principles into a hierarchy relates to their effectiveness. In order of preference, these controls and principles are as follows: (a) substitution of the hazard with a less toxic or non-toxic substance, (b) engineering controls, (c) work practices, (d) administrative controls, and (e) personal protective equipment (Rogers, 1994).

Engineering controls are defined as "methods of controlling employee exposures by modifying the source or reducing the quantity of contaminants released into the work environment" (Plog, Niland, & Quinlan, 1996, p. 947). Engineering controls, by design, should engineer out the hazard, utilizing the principles of substitution, isolation, enclosure, or ventilation (Plog et al., 1996). In the health-care setting, engineering controls include handwashing sinks, sharps disposal containers, and re-engineered or substitution devices for accessing patients' blood and body fluids. (Levy & Wegman, 1995; Plog et al., 1996; Rogers, 1994).

Administrative controls are defined as "methods of controlling employee exposure by job rotation, work assignment, time periods away from the assignment or training in specific work practices designed to reduce the exposure" (Plog et al., 1996, p. 931). Administrative controls incorporate work practices (e.g., use of safe practices and good hygiene measures) as another component of control (Plog et al., 1996; Rogers, 1994). In the health care setting, examples of administrative controls include policies prohibiting recapping of used needles, and requiring immediate disposal of used needles; as well as

education on bloodborne pathogens and ways to prevent or reduce occupational exposures. Work practice examples are immediate and proper disposal of used sharps and handwashing.

Personal protective equipment (PPE) consists of "devices worn by the worker to protect against hazards in the environment" (Plog et al., 1996, p. 967). Examples of PPE used in the health care setting to reduce exposures to biological hazards include gloves, gowns, protective eye wear (e.g., safety glasses, face shields, goggles), and masks.

Use of PPE is considered to be the least effective control method for several reasons. First, workers must be provided with effective equipment. Next, workers must know that such equipment is available. Third, workers must use the equipment consistently (Levy & Wegman, 1993; Rogers, 1994). According to Plog et al. (1996),

> The primary disadvantage[s] of personal protective equipment is that they do not eliminate the hazard from the workplace, and their failure results in immediate exposure to the hazard. A protective device may become ineffective without the wearer's knowledge, resulting in serious harm. The integrity and fit of a personal protective device is vital to its effectiveness. (p. 546)

Given these limitations, it is understandable that controls which require less action on the part of the worker are considered more effective. Unfortunately, particularly in the health care setting, it may not be possible to provide higher order controls in some instances, and workers must rely on personal protective equipment.

Compliance with Wearing Personal Protective Equipment in the Health Care Setting

As previously and extensively discussed, compliance with wearing personal

protective equipment by health care workers in the practice of Universal Precautions has been inconsistent and less than optimal. The range of non-compliance was reported to be the greatest with mask wearing and use of protective eye wear (Gershon et al., 1994). (Barriers to use of personal protective equipment were discussed in the second section of this chapter.) It should be emphasized that when health care workers believe the equipment to be cumbersome and ineffective, that this equipment is not used consistently.

Compliance with Wearing Personal Protective Equipment in the General Safety Field

Compliance with use of personal protective equipment in other occupational settings is also seldom 100%. There are several types of personal protective equipment (PPE) analogous to the use of PPE, safe needle practices and devices in the health care setting. These include use of hearing protection to prevent noise-induced hearing loss in noisy work environments and use of PPE (e.g., hard hats, steel-toed shoes, and fall safety devices) in construction workers. Several reports regarding use of these kinds of personal protective equipment are discussed here.

In a study of non-fatal falls in the construction industry in West Virginia, 63% of 182 injured workers all working from elevated surfaces, had received some type of fall protection, yet these devices were not commonly used. Of note, one third of the injured workers in this study had been employed in this occupation for less than two years (Cattledge et al., 1996).

In a survey of construction sites in the Baltimore area, (Dedobbeleer & German, 1987), construction workers and foremen were given self-administered questionnaires eliciting information on safety practices. There were two objectives in this study: (a) to identify both individual and situational factors that were associated with safety practices of the construction workers, and (b) to

determine both the individual and combined impact of the identified factors. The survey was supplemented by non-participant observation of workers' safety practices. This study utilized the PRECEDE Model as an organizing framework, specifically to determine what influence individual predisposing, reinforcing, and enabling factors had on workers' safety performances.

On a five point rating scale with "5" being the highest, the mean level of compliance with safety regulations of wearing hard hats and steel-toed shoes was 3.1 (range 1.3- 4.0). Of the nine selected sites where workers were observed, 65% of all employees were wearing a hard hat at the time of the observations; 59% reported always wearing a hard hat. The authors contend that because correlation between self-reported and observed wearing of hard hats was high, this indicated high reliability of the data, even though no correlation values were reported. Factors demonstrated to affect a worker's compliance with safety practices were age, attitude toward safety performance, perceived control over personal safety, not having had a serious injury, and exposure to some type of training. The positive relationship between age and safety performance was contrary to two previous studies in 1967 in the mining industry, Cheradame's study (as cited in Dedobbeleer & German, 1987) and Kuyer's study (as cited in Dedobbeleer & German, 1987).

Predisposing factors alone explained most (r = .48) of the 51% variance in worker safety performance. Of the predisposing factors, attitude toward safety performance (r= .43) and age (r= .46) were the most powerful predictors and contributed the most and approximately equally to the variance (P<.001). There were no significant relationships between workers' attitude and exposure to training or safety meetings, nor between knowledge of safety performance and safety interventions.

There were several important implications from this study. First, there may

be a need for mandatory safety training for younger workers before the start of employment. Second, the ineffectiveness of current training methods imply that there need to be more effective training interventions. Third, holding safety meetings at the site may positively impact safety performance. Finally, the relationship between the predisposing factor of attitude towards safety and safety performance requires further exploration.

Strengths of this study include the use of two data collection methods, self-report survey and observation, the use of correlation analysis to determine relationships between variables, and the use of a theoretical model to frame the study. There were several limitations to this study. First, the possibility of selection bias exists as it was not possible to compare participants to non-participants. This selection bias might have weakened the validity of the study, as well as the ability to generalize the results. The design of the study limits the ability to use the model generated as a causal model; longitudinal design in the future might enable testing of a causal model. Finally, in six of the nine sites, the surveys were filled out while the researchers were present, thus it is not known how much the threat of social desirability influenced the survey results.

A program of research on use of hearing protection has been conducted by Lusk and associates from the University of Michigan (Lusk & Keleman, 1993; Lusk, Ronis, Kerr, & Atwood, 1994; Lusk, Ronis, & Kerr, 1995; Lusk, Ronis, & Hogan, 1997; Lusk, Kerr, Ronis, & Eakin, 1999). The conceptual framework used was Pender's Health Promotion Model (HPM) (Pender, 1987). According to the HPM, there are seven cognitive-perceptual factors which influence health promoting behaviors: importance of health, perceived control of health, perceived self-efficacy, definition of health, perceived health status, perceived benefits of health-promoting behavior, and perceived barriers of health-promoting behavior. The HPM uses the concepts of perceived barriers and

perceived benefits from the Health Belief Model.

In a preliminary study testing the use of the HPM for use in a larger study (Lusk & Kelemen, 1993), selected components of the HPM to determine their relationships with worker's use of hearing protection were used. Perceived barriers and benefits, definition of health, perceived health status, and demographic characteristics were measured in metal shop workers in the automobile manufacturing industry. Frequencies and correlations for each of the measured variables, as well as multiple regression analysis, were used to identify predictors of hearing protection use. Results indicated that perceived benefits of hearing protection use were positively and significantly related to its use ($r=.29$, $P<.01$), whereas perceived barriers were negatively and significantly related to its use ($r= -.23$; $P<.05$). In the regression analysis, the authors were surprised to find that only one cognitive-perceptual factor, benefits, approached significance as a predictor for use of hearing protection ($R^2= .16$; $P<.06$). However, the authors caution that barriers to use in this sample may have not been viewed as a distinct concept, but rather the opposite end of benefits. Fifty-four percent of workers at this site had a moderate hearing loss and 52% had a severe loss. Limitations of the study were inability to generalize results due to the small sample and only one site used, and the inability to adequately determine whether subjects had received advice on use of hearing protection. The findings imply that there is a need to assess what serves as a basis for worker's motivation to use hearing protection.

Another study was used to test the HPM as a causal model to explain workers use of hearing protection (Lusk et al., 1994). The study was conducted in an automobile transmission plant, and used written questionnaires to measure cognitive-perceptual factors (see above for list of these factors), and modifying factors (e.g., demographic characteristics, situational factors). Structural equation

modeling was performed on three models (one theoretical and two exploratory path models). In all three models, three variables had significant direct effects on use of hearing protection: value of use, self-efficacy, and barriers, with the first two variables having the strongest effect. The three models (theoretical, exploratory path model #1 and #2) accounted for 49.3, 52.7 and 50.7% of the variance in the use of hearing protection respectively. An unexpected variable, negative effect of health competence (workers who felt they could control their health as well as workers who reported the ready availability of hearing protection devices) had a significantly negative effect on use. The authors propose that this latter finding may equate with "feelings of invincibility, causing hearing protection to be viewed as unnecessary" (Lusk et al., 1994, p. 156). This study was effective in determining a causal model for future testing of use of hearing protection. A limitation of the study was the limited generalizability of results due to the singular setting used. However, the authors presented a comprehensive discussion comparing their results with those of previous tests of the model, and recommend future tests of this model in other worker populations.

In a study of predictors of hearing protection use among blue collar workers, items in the barriers scale both were most strongly correlated with use and had the greatest potential for change. As a result of this study, the authors propose that the barrier items be used to develop training intervention programs (Lusk et al., 1995). In a 1999 study, (Lusk et al.) identified the following barriers to use of hearing protection: (a) wearing hearing protection kept the wearer from hearing what he or she wanted to hear, (b) use of protection resulted in the wearer's voice sounding very loud, and (c) use interfered with the ability to communicate in the job setting.

Another study compared three methods of measuring workers' use of

hearing protection: observation, supervisor reports, and self-report. The results demonstrated that self-report and observations were highly correlated with minimal discrepancies between these two methods; supervisor report was highly discrepant between both self-report and observation (Lusk, Ronis, & Baer, 1995). The authors concluded that since self-report and observation were so highly correlated, that self-report may be acceptable measure of workers' use of hearing protection in situations where budgetary and time constraints exist.

A study with a very similar design to that of the Lusk et al., 1994 study was conducted among a different population-construction workers (Lusk, Ronis, & Hogan, 1997). In the theoretical model, three cognitive-perceptual factors (value of use, benefits, and barriers), and two modifying factors (interpersonal modeling and noise exposure) were significant predictors of hearing protection use. In the exploratory model, among these five variables, interpersonal modeling accounted for more of the variance (45% of the total 50.6% variance) than the other four, which accounted for equal amounts (<1.6-1.7% each). Interpersonal modeling was measured using two questions: how much time the participants believed the co-worker with whom they spent most of their time used hearing protection when exposed to noise and how much time the supervisor used hearing protection. The direct influence of modifying factors (demographic, interpersonal, and situational influences) on worker behavior related to hearing protection use was an important finding of this study.

In summary, it appears that self-report of workers on use of personal protective equipment is a reliable measure. Second, the use of a theoretical model, in this case the Health Promotion Model, strengthens the findings of the studies and facilitates the ability of others to replicate the study in other worker populations. Third, consistent findings that barriers negatively affect use of PPE emphasize that such barriers must be decreased or eliminated to improve use.

Finally, the importance of exploring and clarifying the relationships between different factors in influencing use of personal protective equipment and other safety-related behaviors needs to be emphasized.

Theoretical Models to Study Worker Self-Protective Behaviors

In the previous sections in this chapter, the importance of using a theoretical framework to study compliance with UP in health care workers as well as compliance with use of personal protective equipment has been illustrated. Several theoretical models have also been suggested for use. In this section, theoretical models used to study general behavior are reviewed for their applicability to studying workplace self-protective behavior (DeJoy, 1996; Salazar, 1991; Zimmerman & Vernberg, 1994).

DeJoy (1996) proposes that the theories used to study general safety behavior can be used to study workplace safety behavior. He divides the applicable studies into three distinct groups: (a) value expectancy models (e.g., Health Belief Model, Theory of Reasoned Action, and Protection Motivation Theory); (b) contextual or environmental models (PRECEDE/ PROCEED Model); and (c) behavior change models (e.g., Transtheoretical Model and Precaution-Adoption Model).

Variables included in the value-expectancy models that are proposed to be relevant to worker self protective behavior include threat-related beliefs, self-efficacy, response efficacy, barriers, and normative expectations. Research has shown that barriers and costs are the single best predictors of health behavior (Janz & Becker, 1984). DeJoy (1996) states, "research on the use of personal protective equipment shows that job-related barriers are often a major factor in non-compliance" (p. 64). Salazar (1991) proposes that between the HBM, TRA, and self-efficacy theories, that the incorporation of the self-efficacy concept in to the HBM may facilitate a complete explanation and prediction of certain

behaviors.

The applicability of the use of a contextual model, e.g., the PRECEDE/ PROCEED Model can best be illustrated by DeJoy (1996) with the following statements:

> It is the interactive nature of the three diagnostic factors [predisposing, reinforcing, and enabling] that is probably of greatest potential importance to understanding worker behavior. In particular, efforts to influence the beliefs and attitudes of workers and, thus, motivate them to follow safe practices may fail if the environment is non-supportive. This calls attention to the importance of job-related barriers, the ready availability of safety equipment and devices, and the importance of skill-based training in facilitating self-protective behavior. (p. 66)

Results from research using behavior change models imply that types of information and interventions will have different importance depending on where individuals are in the change process. A concept that has emerged from use of this model, "collective control" is defined as "a norm or shared belief about the way the group works, what it is that the group can and cannot accomplish by what actions" (Peterson & Stunkard, 1989, p. 822). DeJoy (1996) contends that collective control closely resembles the concept of "safety climate" and that safety climate should be an important frame of reference to guide adherence to safe work practices.

As a final comment to the use of behavior change theories to influence behavior, Zimmerman & Vernberg (1994) emphasize that theories of preventive health behavior change should incorporate behavioral beliefs and intentions. The next section specifically discusses the concept of safety climate and the importance of its influence on worker self-protective behavior.

Safety Climate

In this section, the definition of safety climate and a brief historical perspective are provided. This is followed by a discussion of the research on safety climate in the general safety field, and concludes with a more specific discussion of the importance of safety climate as a factor influencing health care workers' safety behaviors.

Definition and Background

"Safety climate" refers to the perceptions that workers share about safety in their organization (Zohar, 1980). Zohar developed the first measure of safety climate, producing a six-factor dimension of the concept that was not replicated in further studies (Brown & Holmes, 1986). Further study resulted in a two-factor dimension for the concept, "management commitment to safety" and "workers' involvement to safety" specific to the construction industry (Dedobbeleer & Beland, 1991). According to Williamson, Feyer, Cairns, & Biancotti (1997),

> There is clearly little agreement amongst these previous studies on the dimensions that should be incorporated into a safety climate model. Across all studies, two areas seem to be reflected consistently, views about management attitudes to safety and about workers' involvement or attitudes to safety. The interpretation of these two factors is however very broad and has been generated from quite different types of questions....Clearly, further work is needed to gain a better understanding of the concept of safety climate and to develop an appropriate measure of the concept. (p. 17)

Coyle, Sleeman, and Adams (1995) attempted to assess whether factor analysis of a safety questionnaire administered to two highly similar organizations would result in the identification of the same sets of similar factors. Results indicated that safety climate factors were not stable across organizations, creating challenges for research regarding this concept. It is not the intent of this

paper nor within its scope to conduct an exhaustive review of the literature on safety climate. However, two specific objectives are to outline its importance as a contributing factor to general workplace self-protective behaviors and to present findings relating to the importance of safety climate to health care safe work behaviors.

Safety Climate in the General Safety Field

Williamson et al. (1997) attempted to develop a measure of perception and attitudes about safety to serve as an indicator of safety culture to be used with working populations. The products from this study were two scales with acceptable levels of internal consistency, one long scale (32 items; alpha = 0.75) and one short scale (17 items; alpha = 0.61), to measure workplace attitudes and safety. The importance of this study was that the scales were used on 1570 workers from seven workplaces, including heavy and light manufacturing, and outdoor workers. According to the authors, "so many of the items in the original item pool reflected a high level of consensus among respondents no matter what company they came from" (Williamson et al., p. 25). The authors conclude that the scale covers both general safety beliefs as well as perceived workplace problems, and imply that this broader representation is more likely to "be much more informative in comparing individuals, work groups, and companies and in looking at any changes in safety climate" (Williamson et al., p. 26).

Given that there has been little agreement about the exact measurement of the concept, it is does not follow that such comparisons are meaningless. According to Coyle et al. (1995), "In fact, the converse applies. The simple identification of different sets of safety climate factors immediately informs the safety professional of where attention might be most usefully focused" (p. 253). The implications from this statement are that any information received regarding the safety climate of a workplace will be valuable if it identifies what areas could

be targeted for safety interventions.

According to DeJoy (1996), "Studies of safety program effectiveness in non-health-care settings suggest that a positive or supportive safety climate is an important contributing factor to good safety performance" (p. 168). As it is evident at this point that safety climate is an important contributing factor to workplace safety behavior, it is appropriate to identify factors that have been consistently identified as associated with successful safety programs and safety performance in industry. Cohen (1977) reviewed studies using a variety of approaches to identify the following distinguishing characteristics of successful safety programs:

1. Strong management commitment to safety.

2. Close contact and integration between workers, supervisors, and management enabling open communications on safety as well as other job-related matters.

3. A stable work force subject to less turnover.

4. Good housekeeping practices and effective environmental quality control.

5. Well-developed selection, job placement, and advancement procedures.

6. Early training and follow-up instruction in job safety procedures.

7. Evidence of added features or variations in conventional safety practices serving to enhance their effectiveness. (p. 177)

Finally, it is important to outline the benefits of a positive safety climate. According to Gershon et al. (1995), potential outcomes of workplaces with positive safety climate include "improved employee-employer relations, decreased worker injuries, decreased compensation costs, decreased liability, improved performance, and improved quality of life" (p. 234). In short, it appears that regardless of the exact label given to the individual components, that safety climate encompasses salient factors which influence workplace safety behaviors.

Safety Climate in Health Care Settings

The influence of organizational safety climate on worker self-protective behavior has emerged from the health care literature as well (Cox & Leiter, 1992; White & Berger, 1992; Gershon et al., 1994; Gershon, Vlahov, & Felknor, et al., 1995). Safety climate has been found to be associated with UP compliance in several studies (Gershon, Felknor, & Delclos, 1993; Gershon et al., 1995; Gershon et al., 1999; Michalsen et al., 1997; White & Berger, 1992).

In a review of 28 studies of UP compliance (Gershon et al. 1994), characteristics of a safety climate were listed to include elements such as top management commitment, presence of a visible safety program, introduction of safer anti-needlestick devices, accessibility of personal protective equipment, no punitive measures for "whistle blowers", and supportive supervisors who modeled safety behaviors for co-workers.

In a study of UP compliance at three medical centers, (Gershon et al., 1995), a newly developed scale was used to assess participants' perceptions of the extent of hospital management's commitment to general safety and to UP. Two organizational factors, safety climate and safety training, were correlated with UP compliance. Compliance rates for workers who perceived that the hospital had a strong commitment to safety (26%) were higher than those who did not perceive a strong safety climate (9%; $P < .001$). Likewise, compliance rates in persons receiving at least one hour of training (26%) were higher than those who had not received any training (15%; $p < 0.001$). Results from multiple regression indicated that participants who perceived a strong institutional safety commitment had a compliance rate almost three times higher than those who did not perceive a strong safety climate (odds ratio [O.R.] 2.60; 95% Confidence interval [CI 95], 1.61-4.19).

In a recent study of UP compliance in correctional health care facilities, the

strongest work related factor associated with compliance was safety climate. Workers who perceived their facility to have a strong safety climate were seven times more likely to be compliant (Gershon et al., 1999).

The implication from these few studies is that safety climate can be an important contributing factor to healthcare worker compliance with following Universal Precautions. Perception of a poor safety climate may serve as a barrier to safety product use where a positive perception of organizational safety may facilitate safer practices. Exploring the perspectives of both managers and employees regarding safety climate is an important area for future study.

Synthesis

In the area of epidemiology of needlesticks, the nurse is most often the recipient of a needlestick injury. Potential sequelae of such an exposure include hepatitis B, hepatitis C, and HIV, of which the degree of risk varies for each. Recent attempts to standardize reporting of percutaneous injuries using the EPINet system show promise for this purpose in the hospital setting. However, the denominator most frequently used has been number of injuries per occupied beds, making this an ineffective measure in alternative health care settings, particularly the home care setting.

It is evident from research findings that non-compliance with Universal Precautions among health care workers is a multi-factorial problem. This problem involves real-life settings where situations may be stressful and unpredictable; human behavior with its resistance to change; environmental conditions such as crowded settings, where accessibility to safety devices and personal protective equipment may be compromised; and organizational components, such as policies on safety and management's support of safety. The use of self-report for measuring UP compliance has been favorable. However, this method is limited by use of forced-choice questions to identify barriers to

compliance. The challenge for research is the design of methodologies with a more comprehensive approach for identifying factors that contribute to or impede the ability of health care workers to comply with Universal Precautions.

The importance of safety climate as an influencing factor on workplace safety behavior has been demonstrated. The need for use of a theoretical model for studying worker self-protective behavior has been emphasized. The PPM, because it is an interactive model, is well suited for studying this phenomenon.

Regulations, if followed, have the potential for changing work practices. However, as previously mentioned, earlier studies on decreasing recapping injuries and convenient placement of sharps containers have varied in their effectiveness. The effectiveness of newer safety products in decreasing needlestick injuries has varied as well. The use of unnecessary needles and failure of health care workers to use existing safety devices and practices, despite their availability, raises concerns for health care professionals interested in decreasing "preventable" exposures. It is therefore imperative that both barriers to and facilitators for safe health care practice be explored. Use of focus groups to identify barriers and facilitators to safe behaviors is one methodology that can be used to elicit this information.

In the home care setting, baseline information on circumstances surrounding blood exposures is necessary, as well as the determination of an appropriate denominator for determining needlestick injury rates. With the revised BBP Standard now in effect in California, it is important to explore the barriers and facilitators to use of safe devices and practices. It is essential that the rapidly growing home health care setting be included in strategies to ensure a safer work environment for its many workers.

CHAPTER FOUR: THEORETICAL FRAMEWORK AND RELATED CONCEPTS

This chapter presents a discussion of the theoretical framework used in this study. The concepts of perceived barriers, perceived facilitating conditions, and risk perception are included as they are an integral component of the target safety behavior in this study- use of needle safety devices and practices. The conceptual hypotheses, assumptions, and research questions for the study are outlined. This section concludes with a definition of terms as used within the context of the PRECEDE/PROCEED Model and this study.

Theoretical Framework of the PRECEDE/PROCEED Model

A theoretical framework applicable to the particular problem under study is the PRECEDE/PROCEED Model (PPM). This model was originally developed to evaluate health education programs and guide their development. PRECEDE stands for predisposing, reinforcing, and enabling constructs in educational/ environmental diagnosis and evaluation. PROCEED stands for policy, regulatory, and organizational constructs in educational and environmental development (Cole & Slocumb, 1995; Green, 1984; Green & Kreuter, 1991). The PPM is based on epidemiological, social, behavioral, and educational sciences, as well as health administration principles. There are two propositions emphasized throughout this model: (a) health actions and health risks are caused by multiple factors, and (b), because they are, efforts to affect behavioral, environmental, and social change must be multi-dimensional.

The PRECEDE model component contains predisposing, reinforcing, and enabling factors that influence a given health behavior or decision. Predisposing factors are an individual's or group's knowledge, attitudes, beliefs, values, and perceptions that positively or negatively influence motivation for a behavioral

change. Enabling factors include skills, resources, or barriers that can affect behavioral and environmental changes. Reinforcing factors consist of feedback from others or rewards that are received following adoption of a behavior (see Figures 1 and 2). These factors may hinder or facilitate continuation of such behavior. The PRECEDE portion is the diagnostic or assessment component of the model (Green and Kreuter, 1991). The PRECEDE portion incorporates concepts from behavioral theories such as the Health Belief Model (HBM), Bandura's Social Learning Theory (Bandura, 1977, 1982), Fishbein's Behavioral Intention Theory (Fishbein, 1980) and Lewin's Force-field Analysis.

The PROCEED component incorporates policy, regulatory, and organizational constructs with the purpose of designing interventions to overcome barriers that may be identified in the PRECEDE component. Policy is the set of objectives and rules guiding activities in an organization, which also provides authority for resource allocation. Regulatory refers to the process of enforcing policies, rules or laws. Organization refers to the act of implementing a program, including coordination of necessary resources (Green & Kreuter, 1991).

There are six basic phases involved in the complete PPM; however, evaluation of the interventions in the PROCEED portion can extend the model to as many as nine phases. The six basic phases are as follows: (a) social diagnoses, (b) epidemiological diagnoses, (c) behavioral and environmental diagnoses, (d) educational and organizational diagnoses, (e) administrative and policy diagnoses, and (f) implementation (Green & Kreuter, 1991).

In the health education and promotion literature, the PPM has been used to analyze bulimic tendencies among elite women swimmers (Benson & Taub, 1993); compliance with diabetic regimens (Tamez & Vacalis, 1989); AIDS knowledge, STD prevention, drug, and alcohol abuse among adolescents (Alteneder, 1992; Lipnickey, 1986; Lohrmann & Fors, 1986; Rubinson & Baillie,

Figure 1. Diagram of PRECEDE Component of PRECEDE-PROCEED Model (Greene & Kreuter, 1991, p. 30)

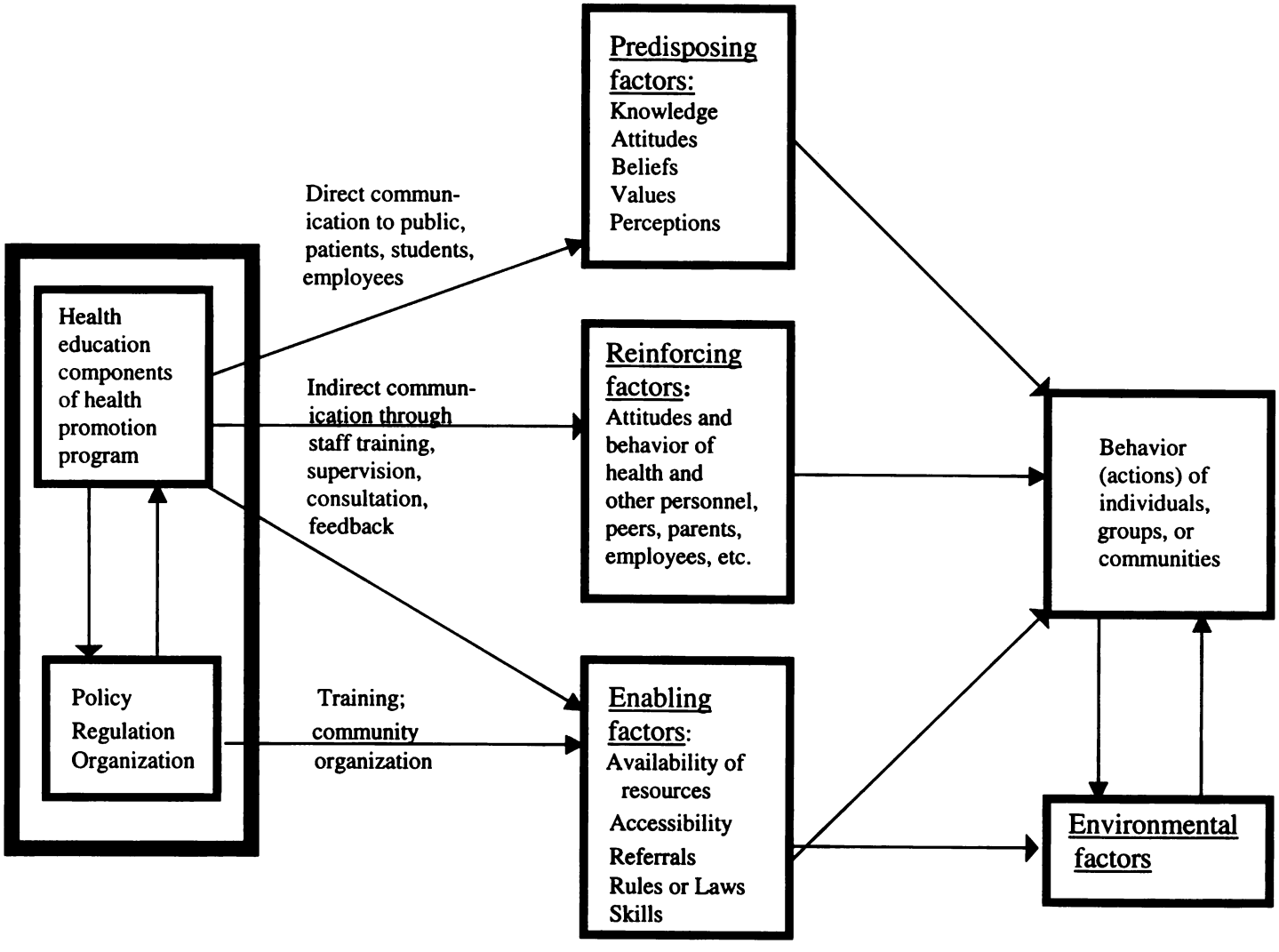
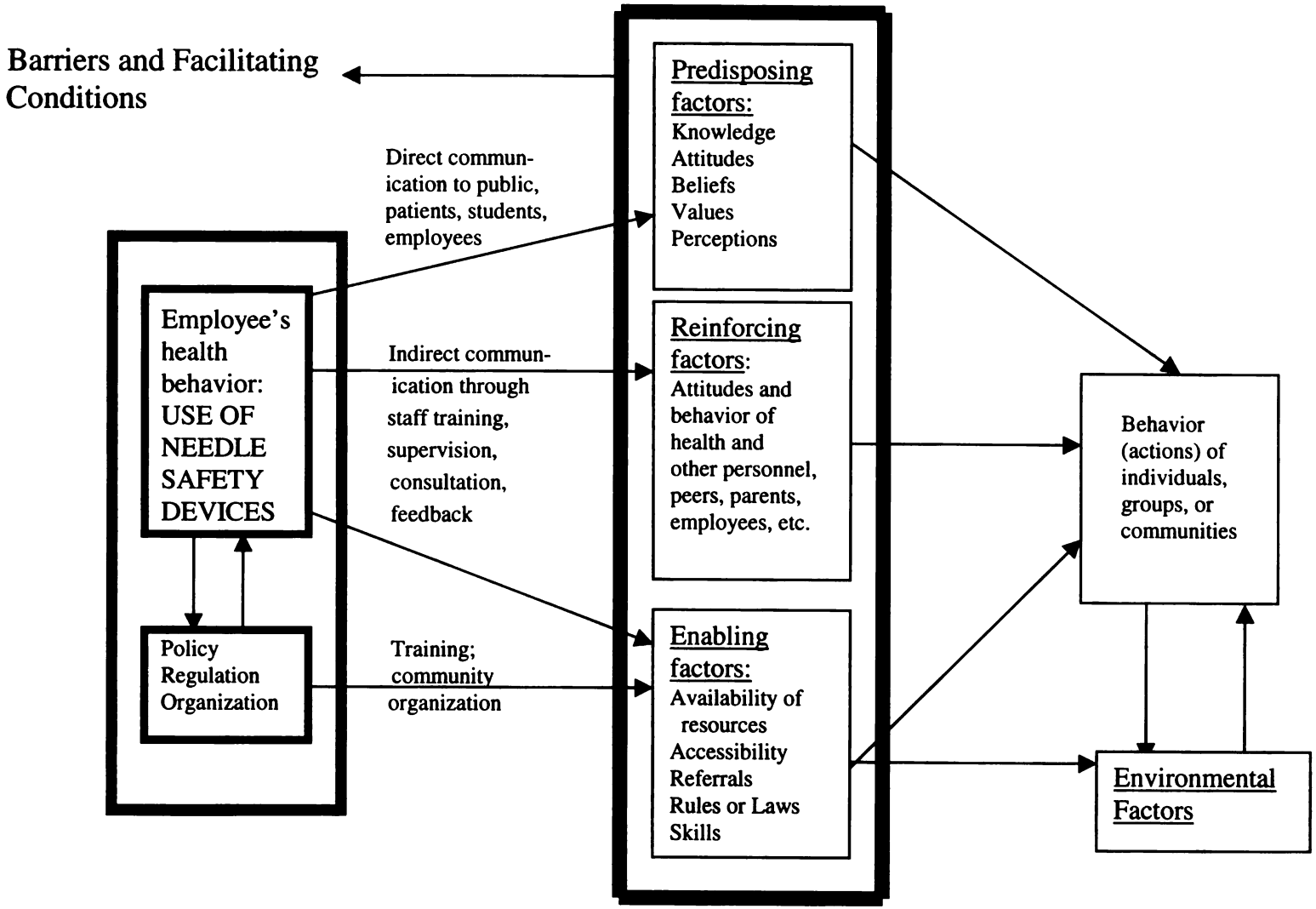


Figure 2. Diagram of PRECEDE Component Applied to Study Problem: Exploring Barriers to and Facilitating Conditions for Needle Safety Use and Practices in Home Care Nurses



1981); and community involvement in breast cancer screening (Taylor, Taplin, Urban, Mahloch, & Majer, 1994).

The PPM also has been used more recently to study health-related behaviors. One study compared the ability of the HBM, Theory of Reasoned Action, and PRECEDE models to predict changes in behavior during an 8-month period in the areas of smoking, exercise, and both sweet and fried food consumption (Mullen, Hersey, & Iverson, 1987). The variables operationalizing the PRECEDE model accounted for more variance in behavior than the other two models. Thus, the PRECEDE model was found to be more effective in explaining these health behaviors. The PRECEDE Model has been studied more extensively than the PROCEED portion (Green & Kreuter, 1991).

In this study, the PRECEDE component (assessment and diagnosis) of the model is used as an organizing and theoretical framework. The purpose is the identification of perceived barriers and facilitating conditions to home care nurses' use of safe practice, using the predisposing, enabling, and reinforcing factors to guide the focus group questions.

Along with the definitions of predisposing, reinforcing, and enabling factors and their subdivisions provided in the definition of terms, it is necessary to define other constructs in this component. These include environmental factors, rewards, punishment, and both positive and negative reinforcements. Definitions and examples are presented here to gain a better understanding of the use and applicability of this model for the problem under study.

According to Green and Kreuter (1991) "Environmental factors are those external to an individual, often beyond his or her control, that can be modified to support the behavior, health, or quality of life of that person or other's affected by that person's actions" (p. 28). Environmental conditions can either positively or negatively influence behavioral risk factors for a disease, condition, or health-

related behavior. Using the desired behavior of smoking cessation as a target, positive environmental conditions might include advertisements and media coverage of adverse health outcomes from smoking, restriction of selling cigarettes to teen-agers, and no-smoking policies. Negative environmental conditions might be easy access to cigarette machines, and targeted advertisements to increase teen smokers, such as using popular public figures who smoke, movie stars who smoke, etc.

The concepts of reward, punishment, and reinforcement are central to understanding the reinforcing factors in this model. These concepts are defined and examples given using a diet and exercise program as the target safety behavior. Rewards are positive consequences of behavior. An example of a reward received from a diet and exercise program would be weight loss and resultant ability to fit into smaller sized-clothes. Punishment, on the other hand, is a negative consequence of behavior. An example of a punishment would be sore muscles or consistent hunger resulting from such a program. Positive reinforcement is the reward for the target behavior. An example of positive reinforcement from a diet and exercise program might be receipt of praise from family members or friends as a result of weight loss. Such praise may serve as a reinforcing factor in continuing the program. Negative reinforcement, on the other hand, is the reward received for undesirable behavior. An example would be the satisfaction received from eating "comfort" foods that may be high in calories. Such negative reinforcement may influence continuation of the undesirable behavior. Thus, rewards, punishment, positive and negative reinforcements are consequences that interact to reinforce an individual's behavior, which may be desirable or undesirable, towards continuance or extinction. Throughout this report, terms that are interchanged with "punishment" include "adverse consequences" and "disincentives".

Identification of the predisposing, reinforcing, enabling, and environmental factors that are perceived to be barriers or facilitating conditions for home care nurses' use of needle safety devices and practices is the focus of phase two of this study. (A diagram of the components of the original model is presented in Figure 1.) In the original model, several relationships between factors are represented. Predisposing, reinforcing, and enabling factors are represented to influence behavior. In addition, enabling factors influence environmental factors. Environmental factors both influence behavior or are influenced by behavior.

Applicability of PPM to Study Workplace Self-Protective Behavior

The PPM has been described as an interactionist approach to studying behavior, where there is attention to the context in which individuals or groups operate (Dejoy, 1996). The interactionist approach considers the person and the situation, thus including both social and environmental factors. DeJoy (1996) gives the following rationale for the applicability of the PPM for studying workplace safety behavior:

> The PRECEDE model increases the saliency of environmental or contextual variables in two important ways: (a) by directing attention to the skills and resources that are prerequisite to the achievement of behavioral goals, and (b) by viewing the environment as an important source of support and reinforcement for behavior change and maintenance. The revised version proposes that an environmental diagnosis should occur along with the behavioral diagnosis, and that special attention should be given to the interaction of behavioral and environmental factors. (p. 66)

The PPM has been used as a framework for studying worker self-protective behaviors in the construction industry (Dedobbeleer & German, 1987), as well as to test an intervention to improve handwashing in the health care setting (Larson et al., 1991). In addition, there have been reports examining the use of this

framework for studying worker self-protective behaviors (DeJoy, 1986; Peters, 1991).

In studying the circumstances surrounding safe needle use and practices in health care workers, it is necessary to utilize a theoretical framework that accounts for all the factors that interact in influencing these behaviors. Therefore, the PPM as an interactionist and contextual model, is appropriate for this purpose.

Importance of Including Risk Perception in the Theoretical Framework

A theory describing or exploring safety behavior should include the concept of perceived risk. Perception of risk should encompass what the individual or group perceives to be the chance of an untoward event occurring should the safety behavior not be used, e.g., injury from a car crash if seat belts are not worn, acquisition of a bloodborne disease if a needle safety product is not used, hearing loss when not wearing hearing protection, and falls when not using fall protection equipment.

The concept of risk perception originated in empirical studies of probability assessment, utility assessment, and decision-making processes. Proponents of this work were Fischoff, Bostrom, and Quadrel (1993) and Slovic (1987). "Risk perception" is defined by Slovic (1987) as "intuitive risk judgments of individuals made when asked to characterize and evaluate hazardous activities and technologies" (p. 280). "Risk assessment is the process utilized by technologically sophisticated analysts to evaluate hazardous activities and technologies" (Slovic, p. 280). The "psychometric paradigm" referred to in numerous risk perception studies are a group of "psycho-physical scaling and multivariate techniques to produce quantitative representations of risk attitudes and perceptions" (p. 281) and have been used to quantify and predict perceived risk.

It is obvious that these two risk definitions are of the same entity; the

difference is in the perspective of the identifier. Professional risk analysts use the term "risk assessment," whereas lay people use "risk perception." This is due, in part, to the use of mortality rates by analysts to quantify risks, as opposed to subjective measurement by lay people, and can result in vast differences. Lay people feel that they currently face more health risks and that risks will be greater in the future; risk assessors do not (Slovic, 1987).

There have been several important research findings from this body of work. The first finding is that there appears to be a strong inverse interdependence between risks and benefit judgments, i.e., the higher the perceived benefit, the lower the risk, and vice versa (Alhakami & Slovic, 1994). Another point is that disagreements about risks between lay and expert persons should not be expected to evaporate in the presence of evidence. This is because, when new evidence is presented to an individual, it has been found to be perceived as reliable if it is consistent with strong initial beliefs and dismissed as unreliable if it is contrary to such beliefs. When an individual does not hold strong prior opinions, the opposite is true. It has been suggested that to merge lay and expert perceptions, a unidimensional index of death or disability for particular illnesses or hazards should be developed. Because "riskiness" means more to people than "expected number of fatalities," attempts to characterize, compare, and regulate risk must be sensitive to this broader perception. Risk communication and management efforts must be structured as a two-way process. Finally, it may be possible to change perceptions of risk by changing perceptions of benefits, and vice-versa (Alhakami & Slovic, 1994; Fischoff et al., 1993; Slovic, 1987).

It is evident from this discussion that risk perception is a complex concept. However, there are several reasons for the perception of risk to be included in theoretical models that study safety behavior. The perspective of individuals regarding risk may affect their actions. Thus, if a person does not perceive a risk

of acquiring a bloodborne disease from a needlestick injury, for example, that person may not use safe practices or products. The investigator or "expert" must be able to communicate risk from a personal perspective, yet be able to ascertain how the individual's perspective affects their action. Incorporation of the individual's, as well as the expert's, perceptions of risk need to be represented in further behavioral models examining safety behaviors. The relationships between perceived risk and benefit may also influence behavior. Such relationships need to be studied further to determine the most effective interventions for changing the individual's perceptions to increase the likelihood that safety behaviors are followed. If there is potential for an individual's perception of risk to be influenced by benefit perception, there are opportunities for education or risk communication of health care providers to influence such perceptions by the individual.

A health care worker 's perception of risk also may influence needle safety behaviors, as illustrated in the studies on Universal Precautions compliance. One example of the influence of risk perception is illustrated in a report on recapping of used needles by physicians and nurses. The study found that recapping was related to the perception by a health care worker that recapping was a way to avoid needlestick injury to themselves and co-workers (Becker et al., 1990). Health care workers who recap may not perceive recapping as a risk and in fact, perceive a benefit of preventing infection in themselves and co-workers. In such persons, re-education regarding the risk of infection from recapping and the benefits of immediate needle disposal may be required to change this long established behavior.

There are opportunities to apply the concept of risk perception to the PRECEDE/PROCEED Model. In the PRECEDE component, in terms of the individual's risk perception, this concept can be applied to the "predisposing

factors" under the perceptions sub-category. Perceptions of peers and family may be incorporated into "reinforcing factors" under attitudes. The organizational or "expert" perception of risk can influence the framework for training and policies, and may be incorporated under the "enabling factors." In the PROCEED component, it is important to include the organization's perception of risk, as it can influence the policy and administrative components of interventions to increase a particular behavior.

Perceived Barriers and Facilitating Conditions

The term "perceived barrier" is a concept from the Health Belief Model (HBM), and the PRECEDE/PROCEED Model, as previously mentioned, incorporates concepts from the HBM into its framework. "Perceived barriers" are an individual's perception of potential negative aspects of a particular health action that may act as an impediment to the recommended behavior. The individual weighs the action's effectiveness against negative perceptions (Rosenstock, 1974). A facilitating condition is considered the opposite of a barrier, thus, they are an individual's perception of conditions or factors that act to make it easier for the individual to perform the recommended behavior. According to Salazar (1991),

> Barriers are those things that arouse negative feelings toward a given action. Even though an action may be seen as reducing the threat of a disease, if it is also seen as inconvenient, expensive, unpleasant, painful, or upsetting, the individual may be reluctant to take action. (pp. 129-130)

The concepts of perceived barriers and facilitating conditions are included in this discussion of theoretical framework for several reasons. First, within the context of the PRECEDE component of the PPM, predisposing, reinforcing, enabling, and environmental factors influence a target behavior. It is therefore important when exploring factors influencing a specific behavior, to determine

whether these factors are perceived as barriers or facilitators. In studies using the HBM, perceived barriers have been consistently identified as the most powerful of the HBM variables in explaining and predicting health behaviors (Pender, 1996). Janz and Becker, two proponents of the HBM, examined 29 HBM studies conducted between 1974 and 1984, as well as tallied findings from 17 pre-1974 studies. Perceived barriers were the most powerful single predictor of the HBM dimensions across all the studies (Janz & Becker, 1984). Finally, as was illustrated in Chapter Three, several studies on UP compliance found that perceived barriers influence the ability of health care workers to consistently practice UP. Thus, the concepts of perceived barriers and facilitating conditions for nurses' use of needle safety devices and practices are central to the questions under study in this dissertation.

Operationalization of Concepts of Perceived Barriers and Facilitating Conditions

It is important when measuring perceived barriers and facilitating conditions to safe practice that there is opportunity in the measurement for the subjects' own perceptions to be included. Subjects can be asked to agree or disagree with statements regarding their perceptions of particular safety behaviors (closed-ended questions) or can be asked to identify barriers or facilitators to particular behaviors. An example of the former was used by Hainey and Krantz (1999) when health care workers were asked to use a Likert scale to respond to the statements regarding barriers to follow-up procedures after occupational blood exposure.

Identification of barriers can be accomplished by forced-choice questions (closed-ended) or by open-ended questions. In a study of UP compliance in the emergency department by Williams et al. (1994), perceived obstacles were measured by requesting the participants to select any of ten factors they believed contributed to their non-compliance. Examples of the ten factors were: "needles

and syringes are poorly designed, I forgot to take precautions, and disposal containers not readily available" (Williams et al., p. 141). In 1991, a theorists' workshop was held among proponents of several behavioral theories (TRA, HBM, Self-efficacy), to develop recommendations for studying variables identified as factors influencing behavior. In the discussion of barriers and facilitators, the theorists recommended use of interviews with open-ended questions with wording such as "what makes it difficult or impossible for you?" and "what makes it easier for you?" to perform a particular health-related behavior (Fishbein, Bandura, Triandis, Kanfer, Becker, & Middlestadt, 1991). These theorists proposed use of focus group interviews with open-ended questions to identify barriers and facilitating conditions to behavioral performance.

In summary, whatever method is used to measure barriers and facilitating conditions for a particular safety behavior must incorporate the perception of the subject and wording that allows identification of factors making it easy and difficult to perform the behavior. It has been suggested by leading behavioral theorists that the focus group interview be used for this purpose.

Conceptual Hypothesis and Assumptions

The conceptual hypothesis for this proposal is that there are barriers that impede home health care nurses from using existing safety needles or practices as well as facilitating conditions that enable them to use such practices and devices. The first assumption is that identification and exploration of these barriers and facilitating conditions is necessary in order gain a richer understanding of the setting in and circumstances under which these nurses work. The second assumption is that identification of these barriers and facilitating conditions is necessary before interventions can be designed to increase use of such practices. The third assumption is that use of such practices

can prevent further needlestick injuries and blood exposures. The fourth assumption is that registered nurses who participate in the focus group sessions might share their feelings and thoughts freely. The fifth assumption is that the participants are providing truthful responses to the questions.

It is also important to consider that which cannot be assumed in this study. Assumptions that can not be made in this study are that all registered nurses use the same definition of needle safety devices and needle safety practices. Therefore, these terms will be defined in each focus group before asking questions related to these terms. It also cannot be assumed that all nurses use the same level of precautions, that all participants have equal perceptions of personal risk for acquiring a bloodborne pathogen infection from a needlestick, and that all nurses share equal knowledge and educational levels regarding their nursing practice. Finally, it can not be assumed that the different agencies in this study have identical types and availability of the different safety devices or organizational support.

Research Questions

The two research questions for this proposal are: (a) what are the perceived circumstances surrounding needle use and disposal that contribute to blood exposures of registered nurses in the home care setting?, and (b) what are the perceived barriers to and facilitating conditions for nurses' use of needle safety devices and practices in the home care setting?

Definition of Terms

The following is a definition of terms, given within the contexts of the PPM and the area of study for this dissertation whenever possible. When appropriate, examples of the terms are provided.

Auditability- The qualitative counterpart to "reliability," also termed "dependability." Refers to the "process of the study" being "consistent,

reasonably stable over time, and across researchers and methods" (Miles and Huberman, 1994, p. 278).

Attitudes- In the context of the PPM, a feeling that is characterized by constancy and directed toward a particular object, person, or social institution, with an evaluative component (Green and Kreuter, 1991; Waltz, Strickland, and Lenz, 1991). In the context of this study, it refers to attitudes towards safety, recapping of needles, particular devices, etc.

Beliefs- In the context of the PPM, "a conviction that a phenomenon or object is true or real" (Green and Kreuter, 1991, p. 156). In the context of this study, it refers to beliefs that consequences of a needlestick or blood exposure are true or real, including but not limited to bloodborne diseases (e.g., hepatitis B, hepatitis C, or HIV), loss of work, loss of income, etc.

Blood access procedures- Any procedure that involves entering a patient's blood or body fluid or any devices containing such fluids. Examples include but are not limited to drawing blood, starting an intravenous line, administering an injection, entering an intravenous line to administer of withdraw fluids.

Blood exposures- Percutaneous or mucocutaneous exposures. A specific eye, mouth, other mucous membrane, non-intact skin, or parenteral contact with blood or other potentially infectious materials that results from the performance of an employee's duties.

Compliance- In the context of this paper, it is defined as acting in accordance with the principles of Universal Precautions and the Occupational Safety and Health Administration's Bloodborne Pathogen Standard.

Confirmability- defined as "relative neutrality and reasonable freedom from unacknowledged researcher biases" (Lincoln and Guba, 1985, p. 278). Also known as "objectivity".

Credibility- The qualitative counterpart to "internal validity," also termed

"trustworthiness." Defined as the truth value, or the ability of the findings to represent reality (Lincoln and Guba, 1985).

Dependability- See "auditability"; qualitative counterpart to "reliability".

Enabling factors- A concept of the PRECEDE/PROCEED Model (PPM). Skills, resources or barriers that can affect behavioral and environmental changes (Green and Kreuter, 1991). Examples include availability of resources, accessibility of resources, referrals, rules or laws, and skills.

Home health care agency- A facility that provides health care services to persons in the home. Includes Medicare-certified agencies, Medicare-certified hospices, and non-Medicare certified agencies.

Knowledge- In the PPM, this is synonymous with awareness. In this study, includes awareness of specific practices, personal experiences, or experiences of others that might predispose the home care nurse toward or against the target safety behavior.

Needle safety devices- Re-engineered or substitution devices designed to reduce or eliminate percutaneous exposures. These include but are not limited to sharps disposal containers, needleless intravenous systems, devices with engineered sharps injury protection used for withdrawing body fluids, accessing a vein or artery, and administering medications or other fluids. These devices are designed to "isolate or remove the bloodborne pathogens hazard from the workplace" (OSHA, 1998, p. 1).

Needle safety practices- Not recapping a needle that has been used to access a patient or a patient's device, not placing a used needle in anything but an approved sharps container, and immediate disposal of a used needle into a sharps container. Will be referred to as a subset of Universal Precautions, moreover termed "Needle Safety Precautions."

Perceived barriers- Any factors, conditions or circumstances that the home care

nurse perceives to impede or hinder the ability to use safe needle practices and devices in the home health care setting.

Perceived facilitating conditions- Any factors, conditions or circumstances that the home care nurse perceives to conciliate, propitiate, or simply to make it easier to use safe needle practices and devices in the home health care setting.

Perceptions- In the context of the Health Belief Model, can include perceived severity of consequences, and perceived susceptibility to such consequences, of not following a target health plan or behavior. In this study, it is defined as perceived risk of acquiring a bloodborne infection post-needlestick or blood exposure.

Percutaneous exposures- Blood or bloody body fluid contact through a break in the skin caused by a contaminated needle, instrument, other sharp object, or human bite. Synonyms include needlestick, sharps injury, and puncture wound.

Personal protective equipment- Specialized clothing or equipment worn or used by an employee for protection against a hazard (OSHA, 1998, p.4).

Predisposing factors- A concept of the PPM. An individual's or group's knowledge, attitudes, beliefs, values, and perceptions that positively or negatively influence motivation for a behavior change, which in the context of this paper is the use of needle safety practices and devices (Green and Kreuter, 1991).

Probes- A technique for questioning designed to elicit additional information. Examples of probes include "please describe what you mean, is there anything else, and please give me an example" (Kreuger, 1998, pp. 45-46).

Reinforcing Factors- A concept of the PPM. Feedback from others or rewards that are received following the adoption of a behavior, e.g., prevention of a needlestick by use of a safety product. These factors may hinder or facilitate the continuation of such behavior (Green and Kreuter, 1991).

Transferability- The qualitative counterpart to "external validity" and "generalizability," also termed "fittingness." Refers to "the relevance or applicability of our findings to other similar settings" (Miles and Huberman, 1994, p. 173).

Universal Precautions- An infection control approach, originally formulated by the Centers for Disease Control and Prevention, whereby the blood and certain body fluids are treated by health care workers and other care-givers as if known to be infectious for hepatitis B virus, hepatitis C virus, and other bloodborne pathogens (OSHA, 1998).

Values- A preference for life goals or ways of life that are often shared within a culture or community (Green and Kreuter, 1991; Waltz et al., 1991). Are broader in range than attitudes. In this study, examples are values placed on safety and comfort of patients and values placed on personal safety of nurses.

CHAPTER FIVE: BACKGROUND STUDIES

This study consisted of three parts: two background studies (consisting of a preliminary study and phase one) and phase two. The purpose of this chapter is to outline the methods employed for each of the background studies. First, the design of the entire study is described. Next, for each of the background studies, an overview, setting, sample, data collection methods, procedures, data analysis, results, and limitations are described. The chapter concludes with a discussion of the meaning of the findings in relation to research question #1.

Research Design

This study uses an exploratory and descriptive design with a quantitative and qualitative data collection method. A preliminary study was conducted to analyze the blood exposure information from three home care agencies in the San Francisco Bay Area. This analysis of blood exposures in the three home care agencies was conducted before phase one and used, in part, to formulate questions for phase one focus group questions. The first and second phases used a qualitative data collection method- focus group interviews. The three parts of the study were designed to answer the research questions and to meet the specific aims of the study.

Overview of Background Studies: Preliminary Study and Phase One

Donna Haiduven (DH) served as a graduate assistant on a three-year project entitled, "Product Design for the Home Care Setting." This three- year project of the Training for the Development of Innovative Control Technologies (TDICT) project and Trauma Foundation, was funded by the National Institute for Occupational Safety and Health. The Principal Investigator (PI) for the project was June Fisher, M. D. Dr. Fisher subcontracted with the University of California,

Berkeley-affiliated Labor Occupational Health Program (LOHP) to assist with this project. (The LOHP is a program of the Center for Occupational and Environmental Health with which the University of California, San Francisco, is affiliated.) The principal investigator of this LOHP subcontract was Robert Spear, MD. Additional personnel involved in this subcontract from LOHP included Robin Baker, Project Director, and Elaine Askari, Project Coordinator.

The overall purpose of this three-year project was to identify home health care worker needs for better control technology to prevent health care worker exposures to blood. The TDICT Project brings together industrial hygienists, product designers, and health care workers to address these issues. Along with identifying needs, the project's goals were to develop safety criteria for sharps disposal boxes for home care, and to design, with health care worker involvement, a box to meet these criteria.

The specific activities of the graduate assistant (DH) on this three-year project related to this dissertation are as follows: (a) analysis of the three home care agencies' blood exposure data (preliminary study for this dissertation), (b) participation in formulation of focus group questions and served as research assistant during the three focus groups, and (c) thematic content analysis of transcripts from the three focus groups (phase one of this dissertation).

Preliminary Study

Overview

The purpose of this preliminary study was to gain an understanding of the types of blood exposures among nurses who work in the home care setting. It was theorized that this information might be useful for the overall project, in formulating the focus group questions and in designing safety products for nurses in this setting. Three agencies, part of the Project Advisory Committee, were requested to submit needlestick and blood exposure reports for the years

1993 through 1996. Data from these agencies were analyzed and combined into one report.

Rationale for Inclusion of Preliminary Study

The rationale for including the analysis of blood exposures from the agencies as a preliminary study in this dissertation study is as follows. First, it served as an initial basis for information on blood exposures in the home health care setting. Second, the information obtained was used to formulate questions for the subsequent focus group sessions in phase one, including probes. Third, it informed the researchers about specific procedures, devices, or circumstances contributing to blood exposures in this setting which required further exploration and validation to answer the research questions in this study. Finally, it provided an alternative data collection method to strengthen the validity of the findings from phase one and phase two.

Research Design

The design of the preliminary study was a cross-sectional prevalence study. The period studied was 1993-1996.

Research Setting

In this section, the characteristics of the three participating agencies, designated as Agencies A, B, & C, are described. The participating agencies were located in the San Francisco Bay area. Agency A was a combined home care and hospice organization, not-for-profit, which employed 476 registered nurses. The average daily census was 2180 clients. Services offered included home care, hospice, home infusion therapy, well mother and baby, rehabilitation, social services, aid services, dietitian and nutrition, psychiatric, geriatric (e.g., incontinence program), and general medical-surgical (including wound care and ostomy). This agency had numerous branches, serving approximately 15 cities and covering five counties.

Agency B was a combined home care and hospice, not-for-profit organization that employed 53 registered nurses. Services included pre-natal, maternal child health, obstetrics, pediatrics, adults, geriatrics, orthopedics, and rehabilitation. It covered only one metropolitan area within one county. The average daily census was 350 clients, and the average number of monthly visits was 1500.

Agency C was part of a national, for-profit chain of medical services. It employed 99 registered nurses and covered one county. The average client census was 850; 90,000 visits were made annually. Services offered included hospice, pediatrics, psychiatric, mother-baby, and medical-surgical.

The agencies represented both for-profit and not-for-profit organizations, with a wide variety of services, and a range of sizes. In addition, Agency A made visits to urban and suburban locations, whereas Agency B was primarily urban, and Agency C included urban, suburban, and a small number of rural locations.

Sample

Criteria for Sample Selection

The agencies that participated in the preliminary study were required to be represented on the Project Advisory Committee for the length of the project. There were no other specific criteria for sample selection.

Nature and Size of Sample

These agencies were composed of a total of 648 practicing home health care RNs.

Confidentiality and Human Subjects Assurance

The directors from the three home care agencies submitted blood exposure information for 1993-1996. All identifying information was removed before being submitted by the home care agencies, so that it was not possible to determine the identities of any employees. The three agencies were assigned a group letter of A,

B, or C. Only the project team had knowledge of which agency belonged to which group. Agencies were assured that any future publications of this information would not contain identifying information for either the agencies or the employees.

Data Collection Methods

An audit of existing blood exposure information from the three agencies was conducted. The blood exposure information for the three agencies varied in format and content.

Agency A submitted information from January 1995 through June 1996. The data were divided into six month periods and included date and time of exposure; place where exposure occurred; type of exposure (e.g., needlestick, body fluid splash to eye); a description of how the exposure occurred; and assessment of preventability (e.g., preventable or questionably preventable). Agency A also calculated exposure rates (number of exposures per 100,000 visits) for each six month period.

Agency B submitted a document entitled "Blood/Body Fluid Exposure Log" for August 1993 through June 1996. Names and phone numbers of exposed personnel had been removed. Data were collected for title of the exposed employee and department location; whether the employee had received the hepatitis B vaccine and whether he or she had antibody to hepatitis B virus; date of exposure; site (e.g., hand, eye); type (e.g., percutaneous, mucocutaneous); how the injury occurred (e.g., while suturing, while trying to flush an intravenous catheter, etc.); post-exposure treatment administered (e.g., hepatitis B immune globulin, hepatitis B antibody test, tetanus-diphtheria booster); and the name and status of source patient (e.g., hepatitis B, hepatitis C, and HIV antibody status).

Agency C submitted information from November 1994 through August 1996. The only data included were job classification of the exposed person and a

description of how the exposure occurred.

For the participating agencies, there was no information on who collected these data. Agency A's information was in typed format, Agency B's in handwritten form, and Agency C submitted both handwritten and typed data.

Each exposure incident was reviewed and categorized according to a categorization system developed by Donna Haiduven in 1987 (Haiduven, DeMaio, & Stevens, 1992). The system was designed for categorizing reasons for hospital-based blood exposures. There are nine possible choices for categorizing the blood exposures:

1. During/After Injection
2. During/After Blood Draw
3. Before/During/After Needle Disposal
4. While Manipulating Intravenous Lines/Heparin Locks
5. Improper Disposal
6. Recapping
7. Patient Moved Abruptly During Procedure
8. During/After Starting I.V.
9. Miscellaneous

For this study, one category, "While Manipulating I.V. Lines" was changed to "While Manipulating I.V. Lines/Access Ports." This change was made to include subcutaneously implanted ports for infusing intravenous fluids and medications and which are in wide use in home care.

This categorization system has been discussed in several published papers (Haiduven et al., 1992, 1995). The system has been used consistently to categorize over 2000 blood exposures since 1987. The categories have not been formally tested for validity or inter-rater reliability. However, consistent results have been achieved when others in the same institution have used the system. Advantages

of the system are its ease of use and ability to capture most reasons for exposures. It also facilitates targets for interventions to decrease exposures. The disadvantages of the system are that it may not have mutually exclusive categories and may not be exhaustive. The use of the "Miscellaneous" category was designed to decrease these limitations.

A separate data collection form entitled "Blood Exposure Worksheet" was utilized to categorize the exposures from each agency (see Appendix A), as well as to produce one composite report for the three agencies. This worksheet included the time period studied, the number of exposures for each year, the total number of exposures for the three year period, job classifications, department or unit where the injury occurred, and the category of exposure. Additional comments were listed for each group, including examples such as whether the source patient was HIV, hepatitis B or hepatitis C antibody positive, the device being used at the time of the exposure, and the procedure being performed at the time of the exposure.

Procedure

Blood exposure data from each agency were reviewed and categorized. A composite report of the data from the three agencies was produced for use in the analysis.

Data Analysis

Descriptive statistics were used for the categorical nominal data that were elicited (Hulley and Cummings, 1988; Shott, 1990). Frequencies and proportions of the categories of blood exposures, job classifications of the exposed employees, and devices used at the time of the exposure were determined from the composite report.

Results

The total number of exposures for the three agencies from 1993-1996 was 52;

four blood exposures and 48 needlesticks. Nurses were involved in 48 (92%) of the injuries. Twelve (23%) of exposures occurred before/during/after needle disposal. Nine (17.3%) were from manipulating i.v.s/access ports. Eight (15%) were due to improper disposal (caused by the patient in two cases) and seven (13.5%) occurred during/after blood draw. (The results of all categories are in Table 1.) Of those exposures where the source patient status was recorded, 20 of 39, or 51% were from HIV positive patients. In those exposures where hepatitis B and C source patient status were recorded (n=23), 1(4%) was from a hepatitis B and 1(4%) was from a hepatitis C positive source.

In the 12 exposures that occurred before/during/after disposal, the sharps container was overfilled at the time of disposal in two instances, and the container fell from the trunk, opened, and a used sharp struck the nurse in one instance. Of the 20 exposures that occurred before/during/after needle disposal and from improper disposal, 6(25%) were related to the unavailability of a sharps container at the time of disposal.

Five needlesticks (9.6%) occurred when Huber needles were being withdrawn from implantable ports. Six needlesticks (11.5%) involved manipulation of a blood glucose device. In 4 (7.7%) needlestick accidents, it was reported that the protective guard or sheath on the syringe had malfunctioned.

Implications

There are several implications that can be made from these data. If increasing numbers of HIV positive patients are being cared for in the home setting, home care nurses may be at higher risk of HIV exposure from needlesticks and blood splashes in areas where HIV disease is prevalent. In addition, the number of hepatitis C antibody positive persons in the United States (estimated to be four million) who may not be aware of their infections and are being care for in the home setting also pose a risk to home care nurses. Since the largest number of

Table 1. Results of Preliminary Study of 52 Blood Exposures in Three Home Care Agencies

Category of Exposure	#	%
Before/During/After Disposal	12	23
Manipulating IVs/Access Ports	9	17
Improper Disposal	8	15
During/After Blood Draw	7	14
Miscellaneous	6	12
During/After Injection	3	6
Patient Moved Abruptly	3	6
During/After Starting IV	2	4
Recapping Needle	1	2
Unknown	1	2
TOTAL	52	

exposures fell into the category of "Before/During/After Needle Disposal," the need for exploring existing systems and developing safer systems of needle disposal in this setting are reinforced. For needlesticks in the category "Improper Disposal" that were due to the design of existing containers for use in home care or the lack of availability of these containers, interventions should be designed to improve both the design and availability of safer needle disposal containers. There was also a cluster of needlesticks while withdrawing needles from implantable ports, indicating a potential need for a safer device to be developed for this procedure.

Limitations

There were several limitations to this preliminary study. First, this was a retrospective study of data previously collected by these agencies. Therefore, there was no mechanism to obtain further information on the individual exposures. Second, the three agencies submitted exposure information for varying time intervals between 1993 and 1996. Next, the anonymous nature of the data prevented determination of whether certain employees were exposed more than once or if certain patients were involved in more than one exposure. Finally, the absence of denominator data (e.g., the number of procedures performed by RNs, the number of RN visits, the number of devices used) limits the ability to determine exposure rates. DH attempted contacting the agencies several times to determine the number of RN visits for each of the three years to use as denominator data, but was unable to obtain these data. Safer devices for performing blood glucose testing and manipulating intravenous systems were available on the market at the time of this study; whether these devices were available and not used, not available, or used incorrectly and therefore contributed to the exposures cannot be determined since that data had already been collected on these exposures.

Phase One

Overview

The first phase was a set of three focus groups, one from each of three home care agencies in the San Francisco Bay Area, to identify themes regarding blood exposures in this setting. The three focus groups were conducted in 1996 and participants were from the same agencies used in the preliminary study.

Research Setting

The three focus group interviews were conducted at the individual home care agencies, in their conference rooms. Two were conducted after work hours and subjects were compensated individually. A third focus group interview was conducted during regular working hours, and the agency was compensated with a lump sum to be used for educational purposes at the agency.

Sample

Criteria for Sample Selection

A convenience sample of registered nurses working in home care was used in phase one. Inclusion criteria were occupation as a registered nurse and current employment at one of the three home care agencies. Subjects were recruited by the Project Manager by placing flyers at the three home care agencies. The Project Manager used a contact person in each of the three agencies to hand out flyers, serve as the contact persons for interested participants, maintain a list of potential subjects, and schedule a date and time for the focus group session with the Project Manager. The contact persons were requested to attempt to recruit up to eight persons for the session. No limit was set on the minimum number of participants that were required to hold a session.

Nature and Size of Sample

A total of 16 nurses participated, including two males. Age was determined by choice of four-year age range categories. The range of categories was from 28-

32 to 58-62, with a mode of 48-52. A range of ethnic backgrounds was represented including Euro-Americans and Asian Americans. Nine received Baccalaureate nursing degrees, five had nursing diplomas, and two had Associate Degrees in nursing. One diploma graduate had two other degrees (B. S. and M. H. S.) and a participant with an Associate nursing degree also had a B. A. in Health Services. The mean number of years of nursing experience was 14.8; with a range from one to 30 years. The number of years of home healthcare experience ranged from one to 20, with a mean of 7 years. The number of hours worked per week ranged from 32-50. The range of number of hours worked per shift was 8-15; the mode was eight hours.

Confidentiality and Human Subjects Assurance

Participants were asked to fill out a consent form before the focus group interview was held. Participants were informed of the purpose of the focus group interview, that it would be audio tape-recorded, that information would be kept as confidential as possible, and that all identifying information would be removed from the transcripts. In addition, employers would only have access to a summary report and future potential publications would have no identifying information. Participants were also informed that participation was voluntary, could cease at any time and that refusal to participate would not affect future employment. One potential risk presented to participants was loss of privacy, either inside the group, or outside of the group should participants divulge the contents of the session outside of the session. However, another potential risk was unpleasant feelings that might arise when discussing exposure situations of themselves or co-workers. Potential benefits included gaining information that might be used to develop safer devices for nurses and that participants might find sharing experiences with their co-workers enjoyable and productive. (A copy of the consent form used for phase one is located in Appendix B.)

The study received approval from the Committee for the Protection of Human Subjects at the University of California, Berkeley. (A copy of this approval is located in Appendix B.)

Data Collection Methods

Instruments

The following demographic data were collected: age range, sex, number of years of experience as a nurse and in home care, average number of hours worked per week, and educational level. (A copy of the demographic data sheet is located in Appendix B.) In phase one, DH as assistant moderator took notes during each focus group and utilized these when conducting the data cleaning and analysis. No formal form was used for this purpose.

The focus group questions comprised the data collection instrument in this part of the study. (A list of the 12 focus group questions for phase one is located in Appendix B.) The focus group questions were developed by the research team and were designed to determine what types of blood exposures occur in this setting; knowledge of, training received, communication about and problems with devices designed for safety in this setting; and what devices nurses would like to see developed or modified for use in this setting. The questions were built upon, in part, the previous work of Lipscomb and Askari, 1995). An additional question regarding perceived influences on nurses' decisions to use safety devices was included.

The style of the questions were open-ended and the order was based on Morgan's (1988) recommendations. Thus, the opening question was general in nature, designed to allow participants to become comfortable by introducing themselves, stating their specialty and number of years of home care experience. Questioning then proceeded from more general types of questions (exposure situations and types of safety devices) to more specific questions on individual

devices. The last question was used to summarize the session by asking for a decision on a particular product. A final opportunity was presented by asking for any additional comments, designed to decrease the risk that important information might have been missed.

Use of Preliminary Study Data in Formulation of Focus Group Questions

As previously mentioned, information from the circumstances on blood exposures in the preliminary study was utilized to formulate focus group questions for phase one. More specific examples of how this was done are presented. Since the greatest number and percentage of exposures in the preliminary study were related to the process of needle disposal, questions in phase one were included to elicit information on particular devices nurses would like to see modified or developed for use in this setting, theorizing that sharps containers might be a concern for the participants. The cluster of blood exposures in the preliminary study, where it was reported that the safety device malfunctioned, led to the inclusion of a focus group question in phase one to describe difficulties nurses had with existing devices as well as a question to explore how well nurses described training received on these devices. To further explore the possibility that some of the exposures in the preliminary study might have been prevented by use of existing safety devices, respondents were asked if they had experienced any exposures that they believed could have been prevented with a safety device. In addition, respondents were asked to list safety devices that their agencies made available to them.

Procedure

The Project Manager held individual meetings with the educational coordinators or infection control coordinators of the four agencies prior to the formation of the Project Advisory Committee for the 3-year project. Flyers were developed by the Project Manager and mailed to the Advisory Committee

members with a cover letter explaining the purpose of the focus groups. Potential subjects recruited by the agency contact persons were notified by way of this flyer of the date, time, and location of the focus group sessions.

DH 's duties as assistant moderator included making a sketch of the seating arrangements of the participants, taking field notes, and participating in the de-briefing sessions immediately following the focus group sessions.

Participants were greeted by the research team as they entered the meeting room and asked to fill out a consent form and demographic data form. The focus group session was led by the moderator. Two research assistants from the research team were present, DH and RG. Sessions were audio-taped and lasted one and one half hours. At the completion of the session, participants were asked to fill out a payment request form so that they could be reimbursed by mail. The research team then participated in an audio taped debriefing session immediately after each session. The audio tapes of the focus group and de-briefing sessions were transcribed verbatim. Written transcripts were then sent to DH for data cleaning, removal of identifying information, and thematic content analysis. The final report was written by DH, reviewed by the research staff and presented to the Project Advisory Committee.

Data Analysis

Descriptive statistics were used to represent the demographic and work-related variables from the demographic data sheets to describe the study sample. A specific method of qualitative data analysis, or thematic content analysis, was used to analyze the transcripts of the three focus groups. The procedure used for the thematic content analysis was modeled by Zemke and Kramlinger (1985). This procedure consisted of the following steps:

1. Reading transcripts and coding them with key ideas, words, and phrases and marking notable quotes that illustrated this coding.

2. Formulating categories, examining each category to search for subtopics and to select the most useful quotes, and clustering the categories containing the various ideas and quotations into themes.

3. Completing a written report for the project team in which the themes served as major headings. (as cited in Basch, 1987, p. 417)

The relative salience of each theme was determined by two factors: (a) each theme had to be related to the first research question- "What are the circumstances surrounding blood exposures to home care nurses?", and (b) each theme had to be present in all three focus group interviews.

Results

Responses to Focus Group Questions

A summary of responses to ten of the focus group questions is presented in Appendix B. In addition, a description of the responses to the question, "What influences your decision to use or not use a needle safety device?" is included here, due to the salience of this question to this study.

Participants voiced numerous responses to what they perceived to influence their decisions to use a needle safety device. These responses are further described and grouped into categories of factors. The first factor was concern that a safety device may pose an infection risk to the patient. If the nurse believed this to be true, he/she might hesitate to use a particular safety device. The second factor comprised several components that could be characterized as perceived or actual risks to the nurse: (a) fear or perceived threat (of contracting a disease from a needlestick), (b) perceived invulnerability to injury, and (c) past needlestick injury. The third factor involved personal characteristics of the nurse, (e.g., overall nursing experience, inexperience with a particular device, and learning from past mistakes). Another factor could be labeled as characteristics of the device itself, and included hassle factor to use the device, convenience of use

of the device, time needed to use the device, and availability of the device. A fifth factor, termed organizational factors, included the particular agencies' policies regarding use of the device and communication back to the nurses about needlestick injury statistics. Finally, the last factor is termed "weighing relationship between existing factors" and is represented by the relationship between fear from contracting a disease and the hassle from using the device, implying that some amount of personal calculation of risk occurs in the decision making. In summary, the six categories of factors resulting from that question are as follows: (a) perception of infection risk to the patient from the device, (b) perceived or actual risks to nurses from use or non-use of the device, (c) personal characteristics of the nurse, (d) characteristics of the device, (e) organizational factors, and (f) weighing of relationships between factors.

Thematic Content Analysis

There were four themes that emerged from the content analysis in phase one. The four themes, including a description of the theme and data examples to illustrate these themes, are presented here.

Conditions unique to the home healthcare setting.

The home health care setting contains unique conditions that pose challenges for healthcare workers and can contribute to potential for bloodborne exposures. These include low or inadequate lighting which hinders the ability to perform procedures; pets which may knock over equipment or get in the way of nurses; areas such as carpets being more difficult to clean than hospital floors if soiled with blood or body fluids; difficulty maneuvering around beds and rooms; beds that don't move up and down; lack of assistance from other medical personnel; lack of adequate numbers of electrical outlets and lack of three-pronged outlets; leaving equipment such as a sharps container in the home which is filled with other items upon the nurses' return or gone; and the unknown nature of the

home setting, the patient situation, and the environmental situation. An additional aspect of this theme is nurses having to improvise, and acceptance that these conditions are a given in the home care setting. Several data examples are presented to illustrate this theme as follows:

> "So the circumstances of how you even approach the patient in the home setting, is, I mean, vastly different from what I've seen in hospitals."
>
> "It's not like you have an extra pair of hands, you know, where in the hospital you can get a colleague to come and help."
>
> "And we don't have the advantage on nights--we have no idea if they [patients] have a sharps bucket, or if they have an i.v., or if they have blood, or even what disease they have most of the time when we go see them. We don't even know whether they're dying of AIDS, or whether they're just recovering from a heart attack."
>
> "And the stuff like light, and room, and safety in the home, and where you are you going to put your stuff, it's just part of home care."
>
> "I feel like we just kind of, I mean it's like, you make do."
>
> "You just do it, and figure out how to do it, and figure [you improvise] it's part of the job--."

Risks posed by use of medical devices in the home care setting.

This theme was represented by concerns regarding the risk of some devices to patients, the risk of injury or exposure to healthcare workers in the home setting from particular devices, and both nurses' and patients' unfamiliarity with either safety devices or equipment in the patient's home.

The risk of infection to patients from the one of the new needleless intravenous systems was described as follows:

> "I think, too, like there's, there's a kind of, cap they put on lines sometimes that has some sort of clay on the end of it. I don't like them. I mean I know they're safe, and everything, but the idea of not cleaning that thing off, and just, I mean it seems like it's an infection risk to me, so I'd much rather do it another way. As soon as I know somebody's got one of those, I get one of our other ones. But, so I think infection risks for patients is a big one."

Regarding a large opening on current sharps containers that may be left in patients' home between visits by nurse,

> "You know, with these large openings, unless somebody has a refrigerator to put it on top of if there are children around, I feel like we're just setting them up for problems. Just setting them up."

Regarding the sharps disposal containers,

> "Without a doubt I think the sharps box have to be changed, because they are not user friendly at all in home care, and I don't think they're safe. I never feel safe putting my needle in the long tubing or syringe into that box."

Regarding the safety needleless systems,

> "Well the needleless systems are much more complicated, of course, than if you're using a needle... And so you've got lots of steps. And then in all those steps you've got all these infection risks."

Regarding the correct use of equipment designed for safety,

> "But you have to use them right. That's the other thing, with all like with this, you have to use the equipment correctly to get the results."

> "We have these devices that are used for the blood-drawing tubes-- it just doesn't feel like it's a real safe method.... I just go ever so slowly and concentrate to the point where I break out in a sweat almost."

Regarding patients' difficulty in learning to use a device,

> "There's one [device] that we use [a syringe with a shield to slide over the needle]. And it became unbearable for the clients to learn, it was just a real, a learning issue. And they were more likely to get stuck than to prevent a stick....it was unwieldy and uncomfortable, and we got rid of them."

Regarding nurses' unfamiliarity with patients' blood glucose monitoring machines,

> "There's a, when people have their own blood glucose-monitoring machines, and they don't have the tips that retract...there's no incident that I know of that has ever happened, but there's bound to be, there's going to, something is going to happen soon, because to pull it off, it's very hard to maneuver.... But I can see that's a big potential for something happening."

> "And of course what does happen sometimes, is if you have a patient that has a different kind of insurance, and they have to use a different insurance

company than we normally use, then you go out there and they got all this different equipment, and you may not...know how to use it. And sometimes there aren't explanations. So that can be a problem."

Variation in nurses' knowledge of safety products and training on use of safety devices.

Even within agencies, there was variation in knowledge regarding the existence, availability, and methods of use for safety devices, as well as a range of responses for both the amount of training received on equipment and devices and attitudes regarding the quality of such training.

Regarding training on safety devices:

"I don't recall ever having any kind of in-service or class on how to use any of the equipment."

"Well, no, I don't think I've gotten trained on any of the devices except for that needleless thing."

"Occasionally you'll see a rep [sales representative]. But you know, not often enough."

"We weren't in a class. We were given a thing of paper-- here read this, take the test, and sign it....That was ineffective for me."

"The only effective safety teaching that I have ever had done was that one with the needle-less system, and it was by the reps [company sales representative]."

"We had a class and the discussion. It was, I thought, informative."

"It's a few times a year, I would say it's at least every six months or more frequently....I mean it could be as frequent as once every couple of months that we'll try something new."

"I think it's [training methods] fine."

"Now as far as ours is concerned, like the needleless system, we had thorough orientation, really in-services on how they were used in the i.v. team. And then whenever we--that's part of any nurses that are hired on that are going to be seeing our patients get oriented also, and get in-serviced also on every aspect of what we do."

Communication.

This theme represents examples of ways that nurses communicate within their agencies and their opinions regarding such communication.

Regarding communication about difficulties with safety devices,

"I don't know that we do" AND"We don't really coordinate" AND "We don't have time" AND"And when you don't have time that's low on the list."

"And we on nights don't get anything anymore."

"So we communicate poorly. It doesn't get dispersed to everybody."

"We're only getting half the information anyway, so it just is all this big huge hodge-podge, mumbo-jumbo that doesn't make any sense."

"But they don't always get the information about equipment and products in a structured way."

"But part of that [communication] is just the information to the individual nurses. How often accidents or sticks can happen. Because you, as just the individual practitioner, you may never have gotten stuck, so you don't realize how frequent it can be. So just getting this information, you know, 'the reason why this is in place is because we've had "x" number of incidents in the last so many months."

"And with the i.v. patients we meet regularly with the pharmacy who provides our supplies, and so we have great communication between the companies, and we do discuss supplies and what needs to be changed, and what we want and what we don't want."

"They [i.v. companies] regularly get our input, and they're often--they are always willing to listen--."

"We have a form that we can fill out and turn in to put in a complaint about something, or you know, if we have a problem with equipment or something. I don't know that anybody ever uses them, but they're available."

"I think if we had more of these kinds of opportunities [focus groups] to share information with each other, which this organization does not lend itself to giving us that time to meet and to share how we do things and what we find works...giving really good suggestions about how

> we can help each other...and one way that we could really learn a lot of information."

Other Findings

There were several other findings which emerged from one or more of the focus groups in phase one. The first was the fact that home healthcare nurses have to deal with safety and security issues when walking to and from their cars at all hours and in often unsafe neighborhoods. Concern for such conditions may take precedence over concerns of bloodborne exposures.

> "My chances of living after getting stuck are better than my chances of living rifling through my trunk in [an unsafe neighborhood] at 2:00 in the morning."

> "But let me tell you that at midnight in [an unsafe neighborhood]...in that instance when I know I'm going to those places, I'll try to stop before I go, pull my bag out of the trunk, put it into the car with me.... But I will not go into the trunk of my car in that neighborhood-- you know, where you're just standing there [after dark] and you're a sitting duck."

Another finding was that many nurses consider personal protective equipment such as gloves, gowns, and goggles to be safety devices or safety products, whereas the investigators were specifically thinking of devices such as sharps containers, safety syringes, and needleless systems. Because gloves came up in the focus groups, another finding should be mentioned. Two groups had concerns regarding the quality of regular exam gloves versus sterile gloves, were aware that sterile gloves cost more, and felt more protected with sterile gloves.

> "If I need to charge an extra 5 bucks so my gloves fit and I can get it in [the needle], in one stick, I'm going to charge an extra 5 bucks so my gloves fit. But that's not what my agency wants me to do."

> "But I think costs will influence that as well, because I can see them [the agency] saying, because we do blood draws every day like you guys, and they would say they're going through four pairs of sterile gloves a day."

There was concern voiced regarding the amount of waste generated by home

care nurses that then becomes an increased amount of waste for the patient to dispose of as well as items that are not biodegradable which add to the increase in the waste stream. In addition, there were misconceptions regarding what constitutes medical waste.

> "And then if it's disposable, how do you dispose of this in the patient's home? ....There's a lot of packages. Man, you're opening up tubings, and needles, and, you know, bags and all, and the i.v. bags are in a plastic bag, and everything. And I always feel like I'm just, like, adding to this person's garbage, and you know, I'm conscious of how much garbage I make at home, and then if somebody came into my house and started bringing me all this more garbage, I don't know. I mean I think if I have a hard time, how do they get it out of their house? I mean some of these old people can't be taking the garbage out, and we're making all this garbage for them."

In summary, the four themes surrounding blood exposures to home care nurses are: (a) conditions unique to the home healthcare setting, (b) risks posed by use of devices in this setting, (c) variation in nurses' knowledge of safety products and training on use of safety devices, and (d) communication. The three themes emerging as other findings included: (a) safety and security issues, (b) concern with quality of clean versus sterile gloves, and (c) concerns with amount and type of waste generated from the home healthcare setting.

Limitations

In phase one, there were several limitations regarding the sample. First, the Project Manager was not in control of the subjects recruited. Next, the number of participants in the three groups was six, four, and six respectively; thus, none of the groups contained the target number of eight. Because the control of the subjects was with the agency contact persons, the research team did not know until the time the focus group was scheduled how many persons would show up. There was no information on the number of initial refusals. Therefore, the ability to determine how representative the sample from each group was for their

agency was limited.

In two of the groups, subjects were compensated individually and sessions were held after work hours. In a third group, the agency was given a monetary donation to be used for educational purposes by the agency and the group was held during work hours. It is possible that subjects individually compensated differed in some way from those who were not. It is also possible that holding the session during work hours discouraged or encouraged participation; this was not able to be determined.

Meaning of Findings in Relation to Research Question #1

The first research question in this study was "What are the perceived circumstances surrounding needle use and disposal that contribute to blood exposures of registered nurses in the home care setting?" As a result of the preliminary study and phase one, designed to answer the first research question, the themes extracted from the answers to the focus group questions illustrated the numerous factors interacting in this setting that may result in an unfortunate needlestick or blood exposure: (a) conditions unique to the home healthcare setting, (b) risks posed by use of medical devices in the home care setting, (c) variation in nurses' knowledge of safety products and training on use of safety devices, and (d) communication. The conditions of the home care setting emerged from the data even without being specifically asked in the focus group questions in phase one. Poor lighting, presence of pets, difficulty moving around beds and chairs, and the numerous other characteristics of the home as a work setting challenge the nurses' ability to perform procedures and contribute to a needlestick injury or other type of blood exposure.

The second theme illustrates the complex nature of the concept of perceived risk. These risks identified by the nurses in phase one include actual risk to the patient, actual risk to the home care nurse, and potential risks to nurses, patients,

and family members from the medical devices used in this setting. In addition, both the devices used to perform the procedures and the procedures themselves are perceived by nurses to contribute to their potential for exposures in this setting.

This theme is further complicated by the wide range in variability of the nurses' knowledge of safety products and in the training on use of these devices that emerged as the third theme. It results in several possible scenarios in this setting. First, there may be nurses who are knowledgeable of the safety products and how to use them, but if they perceive these devices to be risky to their patients, may continue to use conventional devices. There may be nurses who perceive safety products to be a risk to their own safety and who also continue to use conventional devices. On the other hand, nurses who are not knowledgeable of safety practices may not perceive themselves to be at risk from conventional devices. Others may perceive certain devices as safe and do consistently use them. Even if nurses are aware of certain devices, if they have not received adequate training, there is potential to sustain a needlestick. However, continued use of conventional devices not designed with safety in mind also presents potential exposure situations.

The fourth theme of communication illustrates the wide range of ways that nurses communicate within their home care agencies and in their opinions about these communications. How communication contributes to blood exposures in this setting can be illustrated with several examples. In agencies where there are regular meetings and forums in which to discuss problems with specific devices, nurses may be able to specify problems with a particular device or hints on using that device. In such situations, it is feasible that some exposures may be prevented as a result of this communication opportunity. In agencies in which there is not communication regarding devices, if a nurse has been stuck with a

particular device or during a specific procedure and there is not a forum for communicating these problems, there is the potential for other nurses to get stuck in future situations. Thus, the importance of communication as a forum for preventing blood exposures as well as the lack of communication as a potential contributing factor to blood exposures in this setting can be appreciated.

The three additional findings from this phase included safety and security issues, concerns with glove quality of clean versus sterile gloves, and concerns with medical waste generation in this setting. Nurses described safety and security issues such as walking to and from their cars in unsafe neighborhoods and during nighttime hours, as well as having to drive to and from their visits to homes. How this may contribute to blood exposures may be explained when relating it to perceived risk. Concerns for such situations as going to and from the car or driving may take precedence over the potential for a bloodborne exposure. This was illustrated by the nurses who described their risks from going out to the car in an unsafe neighborhood or at night to retrieve a sharps container as higher than the potential of getting stuck by a needle they had to recap because they may have failed to bring the sharps container into the home. Such perceptions of risk may contribute to a nurse's personal calculation of a situation and her resultant choice of which action to take, e.g., recapping the needle for later disposal versus going out to the car to get the sharps container.

That nurses described gloves, goggles, and gowns as specific safety products was not anticipated when formulating the focus group questions. However, this finding helped illuminate additional circumstances that contribute to blood exposures in this setting. In particular, gloves that tear easily and fit loosely may result in blood exposures to nurses' hands. This was such a concern that in two of the groups, nurses stated that they would choose tighter fitting sterile gloves for procedures requiring manual dexterity (e.g., blood draws, starting i.v. lines).

They stated that they would do this knowing that it cost the agency more because they were concerned with their own safety. Thus, poor fitting and easily tearing exam gloves are an additional factor contributing to blood exposures in home care nurses.

The misinformation regarding what constitutes medical waste in home care was a disturbing finding with potential to contribute to exposures in this setting. If nurses believe that bloody dressings can not go in regular trash, as many in this study did, this may result in them taking it in their cars and possibly getting spills or splashes to themselves. In addition, concern with generating such waste was found. How this might contribute to blood exposures in this setting would be if nurses took sharps from the home not in approved containers because they did not want them to end up in the patient's trash. They might sustain a needlestick in such cases.

In summary, the conditions unique to the home care setting as a work environment, the perceived risks of medical devices used in this setting, the variation in knowledge and training on use of safety devices, and communication within agencies may all contribute to needlesticks and blood exposures in home heatlhcare nurses. In addition, safety and security issues, the quality of gloves used in the home, and concern for generating waste may directly or indirectly influence the potential for needlesticks or blood exposures. Finally, the complex relationships between these factors have been illustrated.

Relevance of Background Studies to Phase Two

Information from the background studies contributed to the design of the focus group questions in phase two. Results from phase one were used to inform questions in phase two. Results from the background studies contributed to designing the first research question, "What are the circumstances surrounding blood exposures in home care nurses?" Findings from the background studies

were also validated in phase two. In Chapter Eight, data collected by both the preliminary study and the two phases of focus groups are included to describe the context of barriers and facilitators to safety practice in this setting and their relationship to blood exposures.

CHAPTER SIX: METHODOLOGY OF PHASE TWO

Phase two in this study consisted of a second set of four focus groups among home care agencies in the San Francisco Bay Area. The purposes were to validate the themes extracted from the preliminary study and the first set of focus groups and to answer the second research question, "What are perceived barriers to and facilitating conditions for nurses' use of needle safety devices and practices in the home health care setting?" This phase was conducted independently by DH as part of the dissertation.

Description of Research Setting

Descriptions of both the types of setting in which home care nurses work and the settings where the focus groups were held are described.

The Home Health Care Setting

The home health care nurses who served as participants in this study work in three different environments. First, there is the home of the patient. Homes consist of a variety of types in the San Francisco Bay Area, from hotels in the city to country homes in the south part of this area. The types of locations in this geographical area included urban, suburban, and rural. Patients may be alone, have family members or friends present, and may have pets. The second environment is the nurse's car, which is used to transport the supply bags, carry specimens and take the nurse to and from the home. The third environment is the home care agency itself. Here supplies are stocked, office space is used, staff meetings are held, and assignments and charts are picked up.

The Focus Group Setting

The primary requirements for the physical location of the focus group sessions are an environment that is accessible to the participants and one that is

comfortable (Asbury, 1995). The rationale for these requirements is that they facilitate participation in the focus group sessions. Thus, the groups were advertised to be held at each of the agencies and these agencies allowed use of their meeting rooms for this purpose. In phase two, DH as moderator planned the physical set-up of each focus group. The sizes of the rooms varied, therefore so did the location of the refreshments. However, seating arrangements at the meeting table were uniform for the four sessions in phase two. The moderator was seated at the end of the table facing the door and farthest from the door. The assistant moderator was seated at the end of the table closest to the door. This set-up allowed the moderator to always see the whole group and for the assistant moderator to be able to guide latecomers to the table if necessary, so that the moderator could continue running the group (Krueger, 1998). Snacks were placed on the center of the meeting table so that participants would not disrupt the group by getting up to get food during the session. The microphone was placed in the center and the tape recorder at the end of the table where the assistant moderator sat, for easy access to the tapes.

Sample

Target Population and Sampling Plan

The accessible population for this study consisted of registered nurses who work in home care agencies in the San Francisco Bay Area. The intended sample size for this phase of the study was 25 registered nurses who would participate in the focus groups. In a qualitative study, it is appropriate to work with small samples of people. "Qualitative researchers usually work with small samples of people, nested in their context and studied in depth" (Miles and Huberman, 1994, p. 27). Since the purpose of this phase was to explore and describe in detail the perceived barriers and facilitating conditions for safe practice, a small sample size was appropriate.

Purposive sampling, was used to select the sample. Purposive sampling is often used in qualitative studies, as it is a way to elicit beginning ideas about an area of research that may not be possible to elicit using other sampling techniques (Burns & Grove, 1993; Henry, 1990; Lincoln & Guba, 1985). Strategies for selecting samples in focus groups differ markedly from those in survey or experimental designs. In focus groups, there is a reliance on purposive samples, because a purposive sampling strategy is designed to choose the focus group participants that are congruent with the study's goals (Morgan, 1998). Thus, in this study, purposeful sampling was conducted to recruit registered nurses currently working in the home care setting and regularly performing blood access procedures, who were willing to discuss perceived barriers and facilitators to safe practice with their co-workers.

The principle of segmentation was used for the sampling plan for phase two focus groups. This applies to the creation of homogeneity within groups and variability between groups (Morgan, 1988). It is important to note that it is homogeneity in background, not in attitudes, that is one of the goals of the sampling plan for focus groups. The success of the focus group is in creating an atmosphere where the subjects feel comfortable, and participate openly and freely. Therefore, it was important for the subjects to be familiar with each other. The background variables of homogeneity selected for this study were place of employment, R. N . profession, and current practice with blood access procedures on a regular basis. Therefore, along with inclusion criteria, to achieve homogeneity within groups in this study, subjects for each separate focus group needed to be recruited from their respective agencies.

To achieve variability between groups, there needed to be variation between the types of agencies that were used to recruit subjects. The purpose of achieving variability in this study was to allow for considerable diversity between agencies

across the entire set of focus groups (Morgan, 1998). This would facilitate comparisons across the groups. The following table summarizes the characteristics of the four agencies used in phase two and illustrates the attempt to use variability in the sampling plan:

AGENCY	**A**	**B**	**C**	**D**
TYPE	government, affiliated with Public Health Department, not-for-profit, community-based	for-profit, part of national chain	not-for-profit, university-affiliated, hospital-based	not for profit, community-hospital based and affiliated
AVERAGE # YEARLY VISITS	25,000	90,000	46,996	22,520
AVERAGE PATIENT CENSUS	150	850	425	200
#RNs EMPLOYED	20	99	44	22
SERVICES OFFERED	general medical-surgical	hospice pediatrics psychiatric mother-baby medical-surgical	pediatric psychiatric mother-infant medical-surgical	general medical-surgical psychiatric mother-infant
VISIT LOCATIONS	primarily urban	urban suburban rural	urban suburban	suburban rural
PAYMENT SOURCES	Municipal funds Medicare MediCal Private insurance	Medicare MediCal Private insurance	Medicare MediCal Private insurance	Medicare MediCal Private insurance

In each of the four agencies, a slightly different approach was used to obtain the sample. In group #1, a sign-up sheet for phase two (distributed at a previous focus group from this agency as part of the Home Care Project) was used to contact potential participants. Several potential subjects on this list did not meet the inclusion criteria. Snowballing, or using potential subjects to recruit other subjects, was then used for this first group (Miles & Huberman, 1994). In group #2, the largest agency, the contact person allowed a flyer to be placed in the agency and prospective participants were contacted by telephone. Six persons were recruited, but two did not show up for the focus group. In the third focus group, the contact person posted flyers in each individual nurse's mailbox, potential participants contacted the focus group leader directly, and a group of ten was recruited, of which eight attended the entire session. In group # 4, the recruitment of subjects was controlled by the agency. The contact person at the agency posted a flyer on the main bulletin board and arranged for prospective participants to contact her if they were interested in participating. Eight participants were recruited and eight showed up for the group. Given the lack of control for recruiting subjects in this study, it was not possible to ensure that the resultant samples were representative of each of these agencies.

Criteria for Sample Selection

Inclusion criteria were employment for at least six months at the home care agency, the ability to read and write in English, job classification of a registered nurse, the involvement in blood and body fluid access procedures on a routine basis in the home care setting, and consent to participate in a focus group session. Exclusion criteria were refusal to participate or absence of any of the inclusion criteria.

Recruitment of Subjects for Phase Two

A contact person from each agency was used to help recruit subjects.

Permission to post flyers was obtained from the agencies. At agency D, permission to participate in the study was obtained from the Nursing Bioethics Committee. Letters of support for the study were obtained from all four agencies. Flyers were placed on the agencies' bulletin boards and in nurses' mailboxes. At agency D, the contact person was in control of the subject's names until the day of the focus group. In the other three agencies, direct contact with potential subjects occurred. Confirmation letters and consent forms were mailed to participants in agencies A and C, and reminder phone calls were made the day before the sessions. In agency B, potential participants expressed their interest three days before the session, and reminder phone calls were made the day of the session.

Exclusions and Drop-outs

Three subjects planning to participate in focus group #1 were disqualified before the session since they were not currently performing blood access procedures. Hence, two other subjects were recruited by the snowball technique. In group #2, the two persons who initially agreed to participate but did not show up for the group were drop-outs. In focus group #3, one subject who had not been pre-screened left the group without fully participating. The contact persons at the four agencies did not notify the moderator regarding any initial refusals; thus it is not possible to quantify initial refusals.

Subjects-at-Risk and Risk/ Benefit Definitions and Considerations

The Department of Health and Human Services (DHHS, 1983) define a "subject-at-risk" as "any individual who may be exposed to the possibility of injury, including physical, psychological, or social injury, as a consequence of participation as a subject in any research, development, or related activity which departs from the application of those accepted methods necessary to meet his/her needs, or which increases the ordinary risks of daily life, including the

risks inherent in a chosen occupation or field of service" (as cited in Public Health Service, 1991, p. 13). The registered nurses who participate in the focus group discussions are defined as the subjects-at-risk in this study. It is possible that contributing to the discussions will bring back unpleasant memories of a past needlestick injury or that the questions deal with a topic sensitive to nurses. The nurses may perceive a confidentiality risk if they disclose any practices that may be considered unsafe during the focus groups. They may also perceive a confidentiality threat if the results of the interviews were to be viewed by their employer, potentially having an impact on their jobs and livelihood.

The risks of unpleasant memories or feelings can be justified to the potential benefits of information that may be gained from this study. It may be possible that a nurse, as a result of participating in this study, will be more likely to use a safety product or to dispose of a needle in a safer manner, and, or influence co-workers to do so, and perhaps prevent future needlestick injuries. On a wider scope, information obtained from this study may be used to make the home care workplace safer for nurses and other health care workers by identifying predictors of needlestick injuries, which can be used in education, policy development, and safety product design. Such a benefit may also be achieved in other health care settings with further study. There is potential for needlesticks and resultant bloodborne diseases to be prevented.

Confidentiality and Human Subjects Assurance

The potential subjects were informed on the consent form for the focus group, that there would be no names, social security numbers, or other identifying information in the written transcripts of the focus group sessions so that the identity of the respondents would remain confidential. Subjects were also informed that employers would only have access to aggregate data from the entire study. Respondents were also informed that the results may be published,

but that there will be no way to identify respondents.

The research proposal was presented to the Committee on Human Research at the University of California, San Francisco, as part of the requirements for a doctoral dissertation. It received approvals for the proposal and the consent form on January 28, 1999, approval number H8668-15967-01. (A copy of the consent form and approval from the Committee on Human Research is located in Appendix C.)

Nature and Size of Sample

This phase consisted of 26 participants in four focus groups. The age range was 33-64 with a mean age of 47. There were 23 females. Two nurses had a 2-year Associate degree, three had a nursing Diploma, 19 nurses had Baccalaureate degrees, and two were Master's prepared. Range of years of nursing experience was from five to 34, with a mean of 19 years. The range of usual number of visits made per day was two to seven. Sixteen (62%) participants reported a range of visits in an average day instead of one number (e.g., 5-6; n= 7 and 4-5; n=4). Using the midpoint of the range for the 16 respondents and the single value reported by the remaining ten respondents, the mean number of visits made per day was 4.9. The range of hours worked per week was 20 to 60; the mean number of hours worked per week was 38.6. Two persons were currently working in the acute care setting besides home care, while 23 (88%) had worked in acute care at some time in the past.

Criteria for Determining the Number of Focus Groups to Conduct

The goal of qualitative research is to achieve theoretical saturation of the topic. Theoretical saturation in this study was defined as adding more focus groups until the responses to the focus group questions do not yield any new information (Morgan, 1998; Glaser & Strauss, 1967). Existing recommendations for the ideal number of focus groups to be conducted range from three to six

(Morgan, 1998, 1988; Asbury, 1995). Krueger (1988) recommended, as a general guideline, four groups, with re-evaluation after the third. In this study, it was determined that groups would be held until theoretical saturation of the topic occurred. In the de-briefing session after group #3, there was discussion between the moderator and the assistant moderator regarding saturation. The assistant moderator thought she had heard new information, but the moderator thought that this information had been elicited in the second group (this research assistant was present in groups #1 and #3 only). After the fourth group was conducted, the moderator analyzed the data and determined that saturation of themes had been achieved.

Data Collection Methods

Technique

The data collection technique for phase two was the focus group interview. The description, advantages and disadvantages of this data collection technique, as well as steps taken to decrease threats to validity and reliability, are described.

The Focus Group as a Data Collection Technique

The focus group is defined as a form of qualitative research using group interviews where the "reliance is on interaction within the group, based on topics supplied by the researcher, who typically takes the role of the moderator" (Morgan, 1988, pp. 9-10). The purpose of focus group interviews is to elicit discussion about a topic of interest among persons who are interested in discussing the topic of interest in a group setting. Focus groups were originally used to interview groups of soldiers regarding their specific responses to training films in the 1940s (Merton, 1987). More recently, other applications for focus groups have been on health education and compliance to medical regimens, smoking cessation, high risk HIV behaviors, teenage pregnancy, and high blood pressure (Basch, 1987). Focus groups typically range in size from four to twelve

participants, and last for one and one-half to two hours in length (Asbury, 1995; Basch, 1987; Morgan, 1988). The number of focus groups to include in a study depends on several factors including the purpose of the study, the number of variables being considered, budget constraints, and time limits (Asbury, 1995; Folch-Lyon & Trost, 1981; Kingry, Tidje, & Friedman, 1990; Krueger, 1988; Morgan, 1998).

Focus groups are designed to produce a great deal of information, including experiences and opinions of participants, in a relatively short time (Morgan, 1998). It is possible with this technique to generate discussion among participants about topics that they might not bring up in everyday conversation. Assumptions of this technique are that the group is responding truthfully to the questions and that the effect of the group is strong in this type of interview. Thus, the discussion at hand at any given time may be that of the groups, and not individuals.

Advantages of Focus Groups for Use in this Study

There are numerous potential advantages of the use of focus groups to study barriers to and facilitating conditions for safe needle use and practices. First, there is an opportunity to observe a great deal of interaction within a limited time (Morgan, 1988). Additional benefits are reduced pressure on participants to respond to every question, ability of the researcher to obtain a record of verbal and non-verbal communications and group interaction with audio tapes, notes from research assistants, and written transcripts of the session, and flexibility (Basch, 1987). Due to the sensitive nature of the use of Needle Safety Precautions and bloodborne disease-related issues, the use of focus groups may provide a setting conducive for participants to express their opinions and experiences without having to be afraid or without being criticized (Kingry et al., 1990). The use of focus groups often results in a synergetic effect with "the potential to

uncover important constructs that may be lost with individually generated data" (Kingry et al., 1990, p. 125). To date, the use of focus groups to explore barriers to practicing Universal Precautions (UP) has not been published. Yet there is potential for use of this technique to explore this topic in a group setting, where others may feel more comfortable discussing what makes it difficult or easy to use safe practice in the home care setting. This potential synergetic effect may yield valuable information on this topic.

As has been illustrated throughout this paper, UP compliance involves human behavior and is multi-factorial. Another benefit of this methodology has been described as its utility for exploring the determinants of behavior, such as how and why people behave in particular ways (Folch-Lyon & Trost, 1981). Thus, the focus group technique may be well suited for studying barriers to safe needle use and practices, in exploring why nurses do or do not use safe practice in the home setting. Finally, focus groups can be used for validating questionnaires, exploring topics and generating hypotheses, all of which might add to knowledge regarding compliance with use of Needle Safety Precautions (Morgan, 1988).

Disadvantages of Using Focus Groups

Focus groups are not without disadvantages, which include the threat of social desirability, attempts of group members to conform and therefore be unwilling to express different opinions, the risk of some persons not responding at all or group reluctance to discuss sensitive issues, or one or more members monopolizing the conversations or exhibiting unnecessarily negative behavior. They also involve the need for trained moderators, higher cost than self-report surveys, ineffectiveness in testing hypotheses or generalizing findings to larger populations, subjectivity to bias from researchers and moderators who may try to sway the group in certain directions, and that groups are not conducted in

natural settings (Dilorio, Hockenberry-Eaton, Maibach, & Rivero, 1994; Kingry et al., 1990; Morgan, 1988). However, with careful planning and a skilled moderator, some of these threats can be minimized. It is also important to solicit members in the focus groups who are willing and eager to participate.

Plans to Minimize Disadvantages and Threats to Validity and Reliability

To decrease both the threats of social desirability as well as reluctance of participants to discuss the topic of use of safety devices and practice, the consent form and introduction by the moderator contained wording regarding the importance of safety in the home care setting. In addition, it was emphasized during the moderator's introduction that there were no right or wrong answers and that the purpose of discussing practices such as recapping needles and placement of sharps into other than a sharps container was to understand the circumstances surrounding these actions, not to point a finger or place blame.

To minimize the problem of moderator bias in the questioning, focus group questions were developed collaboratively with the dissertation committee. The questions were designed so that they were objective and did not contain opinions or assumptions of the moderator. When appropriate, questions were preceded by statements attempting to clarify and objectify the upcoming questions. Gestures such as head nodding or subjective responses such as "Um hmmm," or "Good," were minimized so as not to indicate bias of the moderator.

Back-up written responses were practiced by the moderator to use in case certain persons monopolized the conversation or exhibited excessively negative behavior. Written responses were also developed by the moderator to use in re-directing the group conversation if the discussion got off the track (Krueger, 1998).

There were three opportunities built into the question design where each participant was asked to give a response, in a roundtable format. This was

planned for three reasons. The first was to minimize the phenomenon of group think (where the topic of discussion at any time might be reflective of the group's opinion but not individual opinion) and to elicit individual opinions. The second reason was to decrease the possibility of one or more participants monopolizing the conversation, by giving everyone an opportunity to speak. The third reason was to minimize what Morgan termed "social loafing," where it is difficult to determine if someone is not participating because they agree and have nothing to contribute or if they disagree and do not wish to express disagreement (Morgan, 1988).

It was previously mentioned that variables in this study used to create homogeneous groups and to therefore facilitate participation, were the inclusion criteria and formulation of focus groups with participants who worked at the same agency. While creation of homogeneous groups in this study was desirable, there were some potential disadvantages. These included that participants might fear loss of confidentiality, especially when the group was conducted at their place of employment, or perhaps adverse effects in future employment situations at their agency, if they divulged certain information. To minimize these potential disadvantages, the consent form and moderator's introduction assured participants that their employers would not be present at these groups, that any reports generated from this study would be devoid of any identifying information, and that only aggregate data would be presented. Participants were also assured that there would be no adverse effects at their places of employment for refusing to participate or for participating.

Loss of confidentiality as a potential adverse consequence was addressed in the consent form. Participants were advised to not divulge any information in the group that they were not comfortable sharing, to not discuss what was said outside the group, and that the researchers could not guarantee that any

participants would not discuss what was said outside the group. This created a situation where participants had to decide what to share in the groups and what not to share, that could result in some sensitive topics not being discussed.

In qualitative research, the terms "internal validity, external validity, and reliability" are analogous to "credibility or trustworthiness, transferability or fittingness, and auditability or dependability" (Miles & Huberman, 1994; Lincoln & Guba, 1985; Nyamathi & Shuler, 1990). (See Chapter Four "Definition of Terms".) Attempts to decrease threats to these criteria and to strengthen the study design are discussed here.

Field note sheets were developed for the research assistant to use during each focus group. (The field note sheets are located in Appendix C.) These sheets contained all the focus group questions, follow-ups, and probes that could be anticipated to be used. These field notes are important for several reasons. First, they allowed the assistant moderator to document answers to the questions. Second, they facilitated a method for recording notable quotes. Third, they served as a valuable back-up in case the tape recorder malfunctioned (Krueger, 1998). Finally, notes from the assistant moderator were a way to achieve intra-rater reliability by comparing to the written transcripts and inter-rater reliability between the assistant moderator and the moderator.

Debriefing sessions were held immediately after the session by the moderator and assistant moderator to discuss impressions, problems, or possible modifications that needed to be made in questions in the remaining groups. Additional advantages of a de-briefing session are the ability to share perceptions about important points, notable quotes, and immediate reactions to the group that may later help in the analysis (Morgan & Krueger, 1998). The uses of field notes and de-briefing sessions were designed to strengthen both the credibility and dependability of the data.

Use of member checks was another step in the planning process to strengthen the credibility or trustworthiness of the data. The moderator developed a procedure for the member checks that were planned to be carried out with two to three members from the four focus groups in phase two. According to Lincoln and Guba, whose guidelines were used to structure the member checks, "The purpose of this comprehensive check [member check] is not only to test for factual and interpretive accuracy but also to provide evidence of credibility" (1985, pp. 373-374). (For a description of the procedure used for member checks, see "Procedures." The forms used to conduct the member checks are located in Appendix C.)

Methodological verification throughout the analyses of phases one and two continued with the assistance of a qualitative researcher (SK) who was a member of the dissertation committee. To further strengthen the auditability and credibility of the findings of this study, two experts, nurses with extensive experience in home health care nursing, reviewed the analysis of phase two and the Discussion chapter. This purpose of this review was to supply theoretical verification as well as address the credibility of the findings.

Data Collection Instruments

Instruments used to conduct and collect data from the focus groups included focus group questions and field notes. Demographic information was also collected.

Demographic Data Questionnaire

A questionnaire was used to collect information regarding the participants. The purpose was to describe the sample. Variables included age, nursing education received, number of years of home care experience, number of years of nursing experience, average number of home visits per day, and average number of hours worked per week. (A copy of the demographic data

questionnaire is in Appendix C.)

Focus Group Questions

The data collection instruments for phase two consisted of the focus group questions designed to answer the research questions for this study. Because the questions are the primary technique for data collection, it was essential that the questions were carefully planned. According to Kingry et al. (1990), focus group questions should be carefully structured and sequenced, and be based on the purposes of the study, a review of the literature, and consultation with content experts. The content of the questions for phase two was based, in part, on the findings from the preliminary study and phase one results. For example, that the majority of needlesticks in the preliminary study were related to needle disposal required inclusion of this topic in the questions, particularly to explore barriers to safe needle disposal. The fact that one of the three devices nurses would like to have modified in the home as a result of phase one was a sharps container reinforced inclusion of the topic for further exploration in phase two. In addition, the questions in phase two were designed with probes to validate the themes extracted in phase one. For example, the theme identified in phase one, "conditions unique to the home care setting" that may act as barriers to safety practices, are further explored and verified by the questions in phase two.

In addition, the moderator's 13 years of experience and expertise in analyzing needlestick injuries and evaluating safety products in the hospital setting also contributed to the question content. A literature review of the use of safety products in home care was scant, indicating that more information was needed. Literature on the epidemiology of needlestick injuries in the general health care field was reviewed (see Chapter Three) to generate ideas for questions that needed to be explored in the home care setting. Most importantly, the content of the questions was targeted to answer the research question, "What

are perceived barriers to and facilitating conditions for nurses' use of needle safety devices and practices in the home care setting?" The dissertation committee made recommendations on the questions. The theoretical framework guiding the study, the PRECEDE/PROCEED Model, served as a guide for the question design, to incorporate the predisposing, reinforcing, and enabling factors.

In phase two, the questions were developed using the "questioning route" versus "topic guide" of questioning strategies. The "questioning route is a sequence of questions in complete, conversational sentences" versus the topic guide of "a list of topics or issues to be pursued in the focus group" (Krueger, 1998, p. 9). Advantages of the questioning route over the general topic guide are increased confidence for the moderator, enhanced quality analysis by minimizing subtle differences in questions, and enhanced consistency of questions from one group to the other (Krueger, 1998). This route was chosen over the topic guide as it was believed that the topic guide might not produce consistent results. Open-ended questions were used for all but the opening question to facilitate discussion. Questions flowed from general to specific and from positive to negative (e.g., ask what makes it easy before what makes it difficult). Probes (e.g., "please tell us more, can the rest of you add anything to that") were designed to be used sparingly to save time for the key questions. Probes were directed to the whole group to decrease the potential for a two-way conversation between moderator and one participant. The follow-up questions were used as necessary to obtain answers to the key questions. (A list of the focus group questions is located in Appendix C.) Guidelines from experts on focus groups were used in formatting the focus group session (Morgan & Krueger, 1998; Kingry et al., 1990.) The format used for the questions is discussed further here.

An opening question, closed-ended in nature, was used to begin the session.

The purpose of the opening question was to make subjects feel comfortable by identifying characteristics they may have in common. It was important to make participants comfortable to set the tone for the rest of the session, produce a non-threatening environment, and facilitate future discussion.

Next, an introductory question was used. It had two purposes: (a) to introduce the general topic of discussion or to provide participants with the opportunity to reflect on experiences and their connection with the overall topic, and (b) to validate themes from phase one. This lead-in question was about the conditions in home care under which the nurses work. Several follow-up questions were prepared to stimulate discussion and validate the home care conditions described in phase one of this study.

A transitional statement was presented with four objectives: (a) to move the conversation toward the key questions that drove the study, (b) to help the participants envision the topic in a broader scope, (c) to link introductory questions to key questions, and (d) to set the stage for productive key questions. Here the moderator described the types of devices and practices the research team was interested in learning more about. These included devices such as safety syringes, blood-drawing devices, needleless intravenous systems, and practices such as recapping used needles, placement of used needles into other than a sharps container, and not immediately disposing of used needles.

Key questions were posed next, designed to drive the study and which would require the greatest attention in the analysis. These questions dealt specifically with barriers to and facilitating conditions for use of safe devices and practices in this setting. There were five key questions, as well as several possible follow-up questions for exploration, elaboration, or clarification.

Two ending questions followed, the purposes of which were to bring closure to the discussion and to enable participants to reflect on previous comments and

to determine which are most important, or most in need of action. They were also designed to elicit individual opinions of the participants regarding the themes of what made it easiest and most difficult for them to use safe devices and practices in this setting.

The moderator then presented a brief summary that listed perceptions of the most important findings, tied in the discussion results with the rest of the study, and gave the opportunity for clarification of issues or the addition of information that may have been missed. After the summary, a final question was posed by the moderator to ensure that critical aspects of the information had not been missed.

Procedures

Training of the Research Assistant to be Assistant Moderator

Due to the scheduled times of the focus groups in phase two of this study, it was not possible to use the same research assistant for all four groups. One research assistant was present at focus groups #1 and #3, another at focus group #2, and a third at focus group # 4. The research assistants served as the assistant moderator in each focus group. Duties included making sketches of the seating arrangements of the participants; taking field notes of answers to the focus group questions, notable quotes, observations of body language, and summary points; assisting with obtaining consent from the participants; running the tape recorder and changing tapes; and participating in the de-briefing sessions.

Each research assistant was trained before the focus group session. The assistant was provided with a checklist describing the responsibilities of the assistant moderator. Training consisted of: a description of the study; how focus groups are conducted; a review of the focus group questions and the consent forms; procedure for collecting receipts; overview of the field notes; and discussion regarding the need for the de-briefing session at the end of the focus

group. The training session lasted one hour.

To maintain a consistent process in data collection, all the sessions and procedures were conducted according to the same plan. In addition, the research assistants received identical written materials and instructions.

Focus Group Procedures

Each focus group was conducted in a similar manner. Subjects were greeted as they entered by the moderator and assistant moderator, were asked to read and sign a consent form, complete the demographic questionnaire, participated in the focus group according to the format outlined earlier in this chapter, were provided with refreshments, asked to sign a receipt at the end of the session, and compensated $50.00 for their participation at the end of the session. The four focus groups in phase two were conducted outside working hours and were scheduled for two hours. Focus groups were conducted in a meeting room at each agency.

The assistant moderator, using forms developed specifically for these sessions by the moderator, took written notes during the focus group discussions. Taking notes is a primary responsibility of the assistant moderator (Krueger, 1998). (See Appendix C for form used for recording field notes.)

Within two weeks after each focus group session, participants were sent a copy of the consent form, receipt, and letter of appreciation. In addition, a letter of appreciation was sent to the contact person at each of the four agencies.

Debriefing Sessions

After each focus group, a debriefing session was held between the moderator and assistant moderator. This session was audio-taped. The de-briefing session conversations were included in the written transcripts of the focus group sessions. De-briefing sessions lasted approximately fifteen minutes. During these sessions, the moderator and assistant moderator compared notes, discussed

notable quotes, gave opinions about how the group went and made suggestions about whether any questions needed to be modified in future sessions.

Transcriptions of Tapes

For each focus group tape, a separate transcript was prepared by a transcription service in San Francisco, California. A diskette with the transcription was also prepared and provided by the service. Before releasing the tapes to the transcriptionists, copies of each tape were made in case the originals were lost or damaged.

Data Cleaning

Cleaning data is defined as "checking raw data to determine errors in data recording, coding or entry" (Burns & Grove, 1993, p. 763). As the transcripts were recordings of the spoken words on the audio tapes, it was essential that incorrect words be corrected and missing words be added if possible. Each written transcript was reviewed several times. First, it was reviewed while listening to the corresponding audio tape to check for accuracy. Any errors in content or spelling were corrected on the diskette. In addition, inaudible phrases were reviewed and it was often possible to fill in missing words on the transcripts. Next, the transcripts were reviewed with the purpose of locating areas with personal identifying information. All such identifying information was removed from each transcript.

Member Checks

Members from the four focus groups were contacted to obtain two to three members willing to individually review the findings of the study and give their opinions about its credibility. The materials presented to the participants included a cover letter describing the purpose of the member check, a summary of the categorization schema and definitions (to be reviewed in Chapter Seven), and four questions (see Appendix C). Members were asked to provide an overall

opinion regarding the believability of the findings; state major concerns, issues, factual or interpretive errors; and identify missing themes or additional items.

Members who had been key informants in each of the groups were targeted for selection. The moderator contacted one key informant from focus group #1 who agreed to participate in the member check. The moderator contacted four key informants from focus group #2, but none could participate. However, during this time, the original targeted key informant from focus group #2 subsequently became available. For focus group #3, the moderator contacted one key informant who agreed to participate. No participants from the fourth agency were available to assist on the project.

Three member checks were conducted, two in person and one by telephone. The member checks were audio taped. Thus, one member each from agencies A, B, and C was included; no participants from Agency D were available.

Use of Experts for Theoretical Verification

Three experts in home care nursing were requested to review the analysis and interpretation of the findings from phase two. The experts were asked to respond to the same questions posed to the participants in the member checks, but they were asked to review more materials than the members, including how findings were integrated into the theoretical framework.

Data Analysis

In qualitative research, data collection and analysis often occur simultaneously (Burns & Grove, 1993; Krueger, 1998; Miles & Huberman, 1994). During the questioning, the researcher must be able to analyze what has been said, and may need to modify the question format or sequence based on what has been answered. This is necessary if the current format of the question does not elicit the information it was designed to elicit, or if the sequence of the questions does not produce a logical flow for the participants or researchers to

follow. In the final section of the focus group, the moderator must restate what has been said to that point to clarify and validate the information with the participants. Information obtained in one group may require changes in the next group's questions. This may be necessary, for example, if one group does not understand a particular question. It might therefore be necessary to include additional statements before that particular question that clarify the question for participants in remaining groups.

Analysis of Demographic and Work-related Variables

Descriptive statistics were used to represent the demographic and work-related variables from the demographic data sheets to describe the study sample (see "Nature and Size of Sample").

Analysis of Transcripts from Phase Two

In this section, the process used for analysis of the phase two transcripts is outlined. This is followed by a detailed description of each level of analysis used in this study.

Process Used for Analysis of Phase Two Transcripts

Data from the transcripts were analyzed according to a process entitled "transformation" by Harry Wolcott (Coffey & Atkinson, 1996; Wolcott, 1994). According to Wolcott, the transformation of qualitative data can be broken down into three levels. The first level is called "description" and is designed to answer the question, "What is going on here?" In this level, the "data consist of observations made by the researcher and/or reported to the researcher by others" (Wolcott, 1994, p. 12). Wolcott offers ten strategies for completing this descriptive level. It is important during the descriptive level that researchers allow the data to speak for itself, using the participants' own words whenever possible.

The second level of transformation, or "analysis" is defined as "the process

by which the researcher extends data beyond a descriptive account" (Coffey & Atkinson, 1996, p. 9). This level requires that there be systematic and careful attention to the data to identify key factors and relationships (Coffey & Atkinson, 1996; Wolcott, 1994). This level is designed to answer the question of how things work or how they are related. Wolcott employs terms to describe the analysis phase, e.g., " ... cautious, controlled, structured, formal, bounded, scientific, systematic, logico-deductive, grounded, methodological, objective, ... carefully documented, and impassive" (1994, p. 23). Wolcott offers ten strategies for completing this level of transformation.

The third level of transformation, or "interpretation" is designed to address questions of meanings and contexts to answer the question, "What is to be made of it all?". To distinguish this level from analysis, Wolcott uses terms to describe the interpretation level, e.g., "... inductive, holistic, generative, systemic, and impassioned" (1994, p. 23). It is important in this level that the links between the qualitative and descriptive inquiry and the interpretation are clear and relevant (Wolcott, 1994). Wolcott lists eleven ways to conduct interpretation and states that interpretation is where "the researcher transcends factual data and cautious analyses and begins to probe into what is to be made of them" (p. 36).

Level One: Description and Categorization

In this study, the strategy employed for completing the first level of transformation, or description, was "following an analytic framework." Wolcott defines this strategy as "developing a narrative around one framework that has proved particularly useful" (1994, p. 20). In this case, the framework selected was the PRECEDE component of the PRECEDE/PROCEED Model. Specifically, the predisposing, reinforcing, and enabling constructs of the PPM were used to structure the focus group questions. The purpose was for responses encompassing perceived barriers and facilitating conditions to safe practice to be

described using this model's framework.

There were several steps employed in the descriptive level. The first step was coding of the transcripts to identify key phrases or ideas to assist with the description. Miles and Huberman define codes as "tags or labels for assigning units of meaning to descriptive or inferential information compiled during a study" (1994, p. 56). Examples of codes assigned to data in this study to describe environmental conditions of home care nurses included, "pets as distractions, lack of work space, lack of equipment, and cleanliness." These codes were assigned to all sections of the transcripts from each focus group session. This open coding was the first stage of the descriptive transformation and began to address the question of "What is going on here?" Along with assigning codes to the data, quotes that illustrated these key ideas were marked.

After the initial coding, the responses to each of the focus group questions were reviewed. (All the major responses to the summary focus group questions are found in Appendix C.) The next step was to describe the findings from the key focus group questions using data examples to illustrate themes identified during the open coding. The range and variation of the themes were therefore presented by descriptive summaries of the following question responses: conditions unique to the home care work environment, factors or circumstances making it easy and difficult to dispose of needles safely, factors or circumstances making it easy and difficult to use needle safety devices in this setting, circumstances surrounding placement of a used needle into a location other than a sharps container or recapping of used needles, factors influencing nurses' use of needle safety devices and practices, attitudes toward safety, effect of past blood exposures on future safe practice and attitudes, and the most important thing the nurse would do to assure that work is done safely or that nurses use safety devices.

The focus groups were designed so that besides the group discussion focused on barriers and facilitators to safe practice, participants would be asked to individually describe those factors or conditions that made it easiest and most difficult for them to use safe needle devices and practices in the home health care setting. These individual questions served as an opportunity for the participants to summarize and analyze their responses in the sessions up to that point, as well as to offer time for reflection. These responses were used to complete the next step in level one, which was the development of an initial categorization schema for barriers to safe needle use and practices. In this step, six schema components were listed, defined, and further described, using data illustrations when appropriate.

However, using Wolcott's transformation method, "the goal of description is to tell the story of the data in as descriptive a way as possible" (Coffey & Atkinson, 1996, p. 9). To reach this goal, it was necessary to encompass the descriptive accounts of all the focus group questions and probes into this initial schema (not simply the responses to the summarizing focus group questions). In the next step of this descriptive level, the six categorization schema components were abstracted and further subdivided to fully represent the themes that were coded from all the questions.

In summary, level one consisted of open coding of the transcripts, marking of notable quotes, describing responses to the focus group questions, using data examples to illustrate themes extracted from the questions, formulation of categorization schema to summarize the description of the summary focus group questions, and further development of categorization schema to encompass the responses to all the focus group questions. The product of level one was a six component categorization schema summarizing the descriptions of what home care nurses perceived to be facilitating conditions for and barriers to safe

practice.

Level Two: Analysis

The strategy selected for the second level of transformation, or analysis, was "to flesh out whatever analytical framework guided the data collection" (Wolcott, 1994, p. 33). Wolcott states that using this strategy requires that the "data are collected according to the requirements of framework being followed" (which in this study is the PRECEDE component of the PPM, and which was discussed under level one) and that "one collects and reports what the framework calls for" (Wolcott, p. 33). The fleshing out strategy also requires display of the results using the selected analytical framework. In this analysis level, the framework of the PRECEDE component of the PPM was used not only to display the findings from level one, but findings were integrated into this framework and expanded it. The purpose of analysis for this study was to further elaborate and refine conceptual themes and to describe their relationships. Thus, the schema was further analyzed by integration into the predisposing, reinforcing, enabling and environmental factors. Relationships between factors were also integrated into an expanded version of the model. The goal of this level of analysis was to provide a framework for understanding barriers and facilitators to safe practice.

In summary, level two analysis integrated the categorization schema from level one into the PRECEDE component of the PPM, creating an expanded representation. In addition, relationships between predisposing, reinforcing, enabling, and environmental factors identified from the study findings were proposed.

Level Three: Interpretation

The purpose of interpretation is to derive meanings from the findings. Of the eleven possible strategies for completing this level of transformation,

"interpretation of the analytic process" was selected. In the context of this study, the analytic process produced an expanded version of the PRECEDE component of the PPM. In level three, the findings from level two required further interpretation. In particular, it was necessary to determine the meaning of this expanded model. This was accomplished in several steps. First, the complex nature of rewards, punishment, and positive and negative reinforcements in the context of the study findings was discussed. Next, the additions of other potential examples of particular factors are proposed. Potential relationships between the predisposing, reinforcing, enabling, and environmental factors and their influence on the use of safe needle practices were proposed from the interpretation and identified as future areas of research. Finally, the meanings of the findings in relation to the second research question (What are the perceived barriers to and facilitating conditions for nurses' use of needle safety devices and practices in the home care setting?) were discussed.

CHAPTER SEVEN: TRANSFORMATION OF PHASE TWO

The transformation of phase two findings is presented in this chapter, using Wolcott's "transformation" method for qualitative data analysis (1994). It begins with level one's description and categorization of findings. Next, the results of level two analysis are presented. The final section of this chapter consists of level three: interpretation.

Level One: Description and Categorization

This section begins with a description of the findings from the focus group questions, using data examples to illustrate themes. (The major responses to the focus group summary questions may be found in Appendix C.)

In each of the subdivisions, the range and variation of the themes are presented by descriptive summaries of question responses. The second portion of this section reviews the initial categorization schema based upon the two focus group questions that lent themselves to summarize or analyze the facilitating and barrier conditions to safe practice. These two questions are: (a) "what factors or conditions make it easiest for you to use safe needle devices or practices in the home care setting?", and (b) "what factors or conditions make it most difficult for you to use safe needle devices and practices in the home care setting?" The final portion of this section is a summarization of the description and categorization of the findings that will be integrated into the second level of transformation.

Conditions Unique to the Home Care Environment

The home health care environment for the four agencies included in this study was part of a large geographical section of the San Francisco Bay Area. This area extended into Marin county to the north, San Francisco to the west, Livermore to the east and Gilroy to the south. The registered nurses made visits in urban, suburban, and rural areas. For some, visits were made to urban

residential hotels consisting of little more than one room. For others, the homes visited were mostly in suburban areas. Thus there was a wide range in the socioeconomic status of the clients served by the four agencies in this geographical area. Persons in residence ranged from single patients to extended families. The majority of client services were general medical-surgical; however, mother-baby, pediatrics, psychiatric, and hospice services were offered by these nurses. Thus, the range of activities performed in the homes included single blood-draws to management of acutely ill patients with complex care needs for illnesses such as chronic renal failure; advanced HIV disease; terminal cancers; and respiratory illnesses requiring intubation, respiratory treatments, and respirators. Examples of such complex care needs included insertion of peripherally-inserted central venous catheters, enterostomal wound care, care of port-access devices, and manipulation of pumps designed to deliver intravenous medications.

Conditions of the home care environment were often compared by nurses with the standardized conditions found in traditional inpatient hospital units where there is generally more predictability, fewer environmental constraints, deficits, and distractions are minimized. The participants described the home health care environment as characterized by lack of control, lack of a standardized work space, inadequate or unfamiliar supplies, unknown situations and with many distractions. As one person stated, "It's not a controlled environment. The home environment is the patient's environment. It's not controlled by medical personnel, so it's very...it's unknown, what you're going to walk into and how it's going to be and how organized or disorganized it's, you don't know." Another said, "You never know what you are going to find when you go into the home." This "unknown" was supported by data examples referring to the patient's condition, the persons who would be present in the

home and their condition (e.g., family member under the influence of drug or alcohol), the supplies available for the procedures that needed to be performed, and cleanliness of the home.

Numerous specific conditions were listed as those unique to home care. These conditions included the following: poor lighting; temperature extremes; poor electrical access; inadequate or absent handwashing facilities; inadequate refrigeration for medication; difficult access to patients for procedures; and unsanitary conditions (e.g., presence of cockroaches, rodents, fleas, and other pests).

Poor lighting outside the house created safety concerns; poor lighting in the house interfered with procedures. A nurse reflected, "Lighting in the house is sometimes a very large problem, because many of the newer homes do not have overhead lighting, and particularly if they're fairly indigent, they don't have a lot of furniture to begin with, getting decent lighting is a big problem, even with our flashlights. I mean, I must have I don't know how many different kinds of flashlights, including a head lamp that I'm going to start carrying with me, but it's very difficult." One nurse had to go into a home that had experienced a power outage and stated, "I started an i.v. once by candlelight."

Extremes in temperature, while comfortable or even necessary for the patient, may create an uncomfortable working environment for the nurse. As one nurse related, "My biggest problem is a cold, dark apartment where the patient is freezing cold. It's very hard to get veins when the person is--when the house is damp and cold." At the other extreme, concerns were voiced regarding hot temperatures, such as "Oh, the heat, that's another one. It's so hot."

Inadequate handwashing facilities ranged from lack of hot water and absence of paper towels, to "having to wash hands in the bathtub because the kitchen sink did not have running water."

One agency serves an urban area with residential hotels. Such hotels often serve indigent persons who might have advanced HIV disease and no family support. A nurse described the inadequate set-up of these tiny rooms and the inability for the medication to be maintained at an adequate temperature. "One patient has to do the injection and he has to keep the vial in the freezer, and he doesn't have a freezer."

Patients do not always have a standard-sized bed, in fact, some cultures do not even use beds, or patients may be in chairs or some other location. As one participant stated, "You find them lying on couches, sitting in recliners, in the bed up against the wall and they can't move, you know, on the floor, various positions and places in the home. I have literally crawled on the bed with my knees to get to the other arm." Another stated, "Some people by culture do not believe in beds. They just have a mat on the floor." These conditions resulted in nurses having to access patients from different angles and heights, creating awkward working conditions including difficult body mechanics for procedures.

Unsanitary conditions exist in this setting, as evidenced by the presence of cockroaches, mice, other pests, and pets. For example, one said, "The environment isn't always as clean as you'd like it to be" and another stated, "I've been in apartments that were really dirty, and there's been dog hair and dog...you could smell dog and urine and it wasn't very clean." Regarding doing wound care with a patient who has a dog, a nurse said "I can't tell you how many times I've pulled dog hairs out of his wound." Nurses described a reluctance to bring equipment in or lay it down in homes with cockroaches, for example, for fear of contaminating their equipment. Regarding cat boxes that aren't clean, one nurse declared, "Cats are my biggest problem", in the context of what conditions were unsanitary in the home. Concerns with contamination of

the nurses themselves were illustrated. For example, one nurse was sitting on a couch and said, "then you feel this wet feeling and you're going--oh no. Wonder what it is. I sat in pee once. I think it was towards the end of the day, and I didn't have to go to someone else's house [but] I don't carry a change of clothes."

There were situations and factors described as unique distractions in this setting. These included pets, other persons present in the home, and the patients themselves. A distracting environment was described as not conducive to conducting safe work practices in some instances. As one nurse reported, "I, one time, ended up leaving the house because it was so distracting...but it was just so distracting that I couldn't do my job."

Along with contributing to unsanitary conditions, pets were also described as a distraction to performing procedures. Particular pets mentioned in this context were dogs, cats, and birds. Cats would often jump onto a clean or sterile work area when the nurse was attempting to do a procedure. She said, "I have more problems with cats. They love to bite at the lines." Dog-related distractions including barking, dogs jumping on the nurse, and fear of being bitten, which could interfere with concentration on procedures such as drawing blood. As one nurse related while trying to do a blood draw, "And the dog did not stop barking for the entire visit, so it was pretty nerve wracking." In another blood drawing situation, a dog stood nearby growling while the nurse was accessing the vein. She said, "See, my concern today was-- was this dog going to bite, because he barked consistently when I was there. And I was also nervous about being stuck with this needle. I mean should--would the dog come and bump me when I'm sticking her or something." Some nurses had been bitten by dogs. In one home, a bird constantly screeched, making it extremely difficult for the nurse to work. In another situation, the patient's bird was perched right near the bed and kept spitting seeds on the nurse while she was doing wound care.

Other persons present in the household are sometimes distracting for the nurse. Nurses recounted the following examples: family members who ask numerous questions or talk while the nurse is trying to care for the patient, unattended children who are allowed to run through the immediate vicinity of the nurse, or persons who are in the home at the same time as the nurse who may be performing other services (e.g., repair). Visitors, particularly in certain cultures, may like to observe the nurse and may make it difficult for that nurse to concentrate.

Noise from the television or loud music can also distract the nurse. In fact, one nurse listed television as the factor that makes it most difficult for her to do her work safely.

Even patients themselves were viewed to be distracting at times. A nurse stated, "Distracting too if the patients, when they start screaming..." or "... in pain, and you're not really doing anything or they're just scared". In this case, this nurse was listing examples of reasons why a patient may react suddenly by moving during a procedure, which can result in distracting the nurse from the procedure.

Combinations of these situations may increase the problem. As one nurse said, "If you're in an active household, the TV's on, kids are running around, things like that, and you find yourself possibly distracted. You know, you may have asked the client or the caregiver to have little Johnny stay in the other room while you're doing something and then he comes flying through and you're like...you know, you're kind of apprehensive where you are in your procedure, and what's safe and you've got your eye on one corner of the room. And you know, it's distracting. I think that sets up for a potential problem."

A particularly poignant quote illustrating the combination of distracting conditions in home care was, "I had one man at his apartment, I'm sure it ran

about 105 and he had a little dog that never stopped barking, and he smoked, chain smoked. The light bulb was 25 watt but with the smoke, it was 10, I'm sure. And stereo blaring and maybe the radio in another corner talking about something else, so--."

Finally, when asked to describe conditions or circumstances unique to the home care work environment, there were numerous examples of how it differs from the hospital environment, with both positive and negative aspects. Positive aspects included one-on-one relationships with the patient in this setting, a better sense of job satisfaction, and the ability to practice the nursing process. For example, as several nurses related, "You're seeing one patient at a time without other patients buzzing you," and "There's positive aspects. We kind of ignored those, but...you do get much more one on one with the patient and the family" and "It's probably closer to the nursing process, you know, the holistic nursing process that you learned in school".

Negative aspects included the lack of available supplies, lack of other health care workers to use as a back up or to ask questions, lack of a standardized work space or even enough space in which to work, and many supplies with which the nurse is not familiar. As one nurse related, "You're in the home by yourself, you don't have someone else to grab and say come help me if you need to start an i.v. or want a second opinion. You know, you're out there by yourself." Regarding the lack of a standardized work space, one nurse said, "One of the issues that comes up for me that's unique about home care is that you have to create your own work space, because there isn't necessarily an over-bed table and a nice, neat place to get all of your things, so you have to be creative to create a work space where you can accomplish your job in as safe as possible manner."

Another difference repeatedly described was that of being on the patient's "turf" in home care. One nurse said, "but we're on their territory at home, we're

not controlling the schedule, vital signs, q4, and all this stuff, and when doctors come in and do their thing and everyone's kind of on a schedule, when you're still dealing with individuals, but at home, we're really on their territory." Another validated this statement with, "Yeah, you're on their turf".

In summary, the participants provided a rich description of conditions unique to the home health care environment. These conditions were described as characterized by lack of control; unique environmental conditions (e.g., poor lighting, temperature extremes, poor electrical access, inadequate handwashing facilities, inadequate refrigeration for medications, difficult access to patients for procedures, and unsanitary conditions); distraction from other persons, patients themselves, or pets; different from the hospital environment; lacking available supplies or a standardized work space; and with unfamiliar supplies for the nurse. The nature of the conditions described is that they most typically occur in combination, thus increasing the complexity of the care experience.

Factors or Circumstances Making it Easy and Difficult to Dispose of Needles Safely

The most frequently cited factor facilitating the disposal of needles safely was a sharps container. There were a wide variety of sharps containers available in the home settings for the nurses in this study. Desirable characteristics of these containers were presence in the home, ability to hold all sizes of syringes and needles, ease of use, and a space to place it in the home during the procedure. One particular infusion company supplied a particular sharps container that the nurses in one agency liked. The following examples describe this container: "For i.v. patients, they have large sharps containers, and I like those", "Oh, I like those" and "They are very large, and usually you don't take it around, and if the patient is receiving an i.v. therapy and if you need to draw the blood, it's really safe to drop everything in there and then when it's full you close it, and it's [a]

really safe cap on the top". These positive characteristics were identified as making safe needle disposal easy.

The sharps container was also a factor making it difficult for the nurse to dispose of needles safely. Criticisms of the containers included inadequate size to hold items; instability (particularly in the car, resulting in containers tipping over and contents falling out); inferior design construction; overfilled sharps containers; and loose or missing tops. One nurse stated, "A sharp's container is something I feel is a hindrance. The ones we use are very long and the opening is about an inch and a half, about this long, and the opening could open and things could fall out." Another said, "Once mine [sharps container] fell over in the car and the lid popped and some of the stuff came out, so it's not very safe, really." Lack of a container in the home created disposal problems as well as patients' use of makeshift containers from items such as bleach bottles, coffee cans, and glass jars. The design of specific sharps could interfere with sharps disposal, particularly the butterfly needle with tubing that was described by the nurse as often recoiling, creating the potential for a needlestick exposure: "Butterflies, yeah, they're light plastic, and when you have to have at least three hands sometimes to get all these...hold onto everything and put them in the box [sharps container], they're very light, and they sometimes turn up. And that's what I'm worried about--getting stuck."

In summary, the responses to this question focused on the sharps container itself. Depending upon its availability and characteristics, it could serve as a facilitator or a barrier to safe needle disposal and safe needle practices. Facilitating conditions were presence in the home at the time of the nurses' visit, a large enough size to hold all sizes of needles of syringes, ease of use, and adequate space in which to place it during the procedure. Negative characteristics were inadequate size to hold all items, instability (e.g., tipping

over in the car and contents falling out), constructed with inferior design, being overfilled, and having loose or missing tops.

Factors or Circumstances Making it Easy and Difficult to Use Needle Safety Devices in This Setting

Responses to these questions in the four groups ranged widely between very specific qualities of devices making it easy or difficult to use them to factors or conditions in the home that made it easy or difficult to use safety devices. Questions regarding what makes it easy to use the devices invariably resulted in what makes it difficult to use the devices; thus the responses to both questions are summarized here. It is important to note that the types and choices of devices available in their practice settings among the four groups varied considerably.

Examples of specific safety devices used in the home included needleless systems for entering intravenous lines, syringes with sheaths that could be retracted over the needle after use, retractable devices for drawing blood to test glucose levels, butterfly syringes for drawing blood that had plastic sheaths to slide back over the needles after use, and a blood-drawing device with a safety cap to be placed over the needle after use.

Ease of use, familiarity and experience with the devices, ability to use with one-hand, and availability were facilitators for use of needle safety devices. The opposites of these qualities (e.g., not available, unfamiliar with use, inexperience with the devices, and requiring the use of two hands) were barriers to the use of these devices. This is illustrated by one of the nurses, "For me it's simply the availability of supplies of safety devices. If they're there, I use them. No question. And the hardest thing is the opposite, when you're not provided with safety devices."

Several nurses remarked that a sharps container whose size allowed it to fill up too quickly or not having one available at all made it difficult to use safety

devices in the home. In one group, the safety butterfly needle was the only one provided for drawing blood and that fact was described as making it easy to use devices, "Well, I suppose the butterflies. That's all we stock are the ones with that [safety sheath], so that's all there is." In this case, the device was described as easy to use because of the lack of product choice.

One nurse described gloves as being a help and a hindrance to the use of safety devices, "Well, I think the other thing that makes it difficult but protects you at the same time is gloves. Because of gloves, I can't grasp things as easily, and so I'm wearing them in case but a finger stick's not going to--you know, that's going to go right through the glove, so its kind of useless for that, but yet I still can't feel things or the tape gets stuck in my gloves or you can't feel what you're doing and it slips out. So gloves, I think, are really a catch-22. It's a hazard, but it also protects."

Factors or conditions that were identified as making it difficult to use safety devices included family members who were watching the nurse very closely during the procedures; not having enough time to use the device; and distractions (e.g., pets, small children, and poor lighting). Examples of situations influencing the time factor might be a heavy patient case load that day; an expected time that the visit should take the nurse; or the time required to manipulate a device might compromise the procedure (e.g., placing the safety sheath over an intravenous safety catheter after placement into the patient, while the nurse needs to make sure that the intravenous line is taped and flowing at the same time in order not to lose the line placement). In many situations, the pharmacy supplied sharps containers and devices for entering intravenous lines. When cost savings affect the types of supplies provided, the result can be difficulty in using safety devices. As one nurse remarked, "It's pharmacy-dependent, you know. Each pharmacy has its own way to save money and it

depends which brand they use. If they don't try to save on the supplies for nurses, then supplies are fine, no problems, but if they try to cut the corners there, sometimes it's not good."

Circumstances Surrounding Placement of a Used Needle in a Location Other Than a Sharps Container or Recapping of Used Needles

Participants were asked to describe circumstances surrounding their action of placing a used needle into something other than a sharps container or recapping a used needle. In many instances, these actions were related to the fact that there was not a sharps container available for a variety of reasons. Examples of reasons for the sharps container not being available included: (a) the patient did not have a sharps container; (b) someone (e.g., nurse, patient, family member) had removed a sharps container since the last time the nurse visited or during the visit; (c) the nurse had not brought in a sharps container from the car; (d) the patient or a family member had moved the sharps container to another location in the home than the location where the nurse needed to use the container or had moved it during the procedure; and (e) a combination of several reasons. Descriptions of these situations with data illustrations from the respondents are presented.

A patient may not have a sharps container because the product was not physically available. In one example, a sharps container was not there because the patient had not been supplied one by any outside source: "It's [the sharps container] not supplied to them." Reasons for this might include the infusion company being out of stock of the containers or having failed to send them to the home for an unknown reason. In situations where the patient was not supplied a container, makeshift containers were often fashioned from household items such as bleach bottles, coffee cans, or corn oil bottles. For example, one said, "I had a patient who had a plastic, a perfect plastic container to put the sharps in there....

A bleach bottle. Well, this last one gave me a container like those Tupperware ones. She said that we could use those for her sharps [container]." Another example was, "I was at a patient's home and she did not have a sharps container. I think it had filled up and somebody returned it to a pharmacy, and at this point, she didn't have anything, so we used, like, a peanut butter jar. It was high enough that the whole syringe could fall. She had no kids. It could go in there, she was by herself, so we used a glass jar until she got a sharps container."

In other cases, the patient may be unfamiliar with the requirement for a sharps container or the definition of an officially approved sharps container. One nurse said, "Yeah, some of my patients don't even know what it is, a sharps container." As a result of this reason, some patients do not use any receptacle for disposing of needles, for example, "Some of them will just throw them into the trash, just straight into the trash."

Nurses may find themselves in a situation where a sharps container has been removed from the home since the nurse last visited. Reasons for this might include disposal by the patient or a family member, removal by a waste retrieval company, removal by another nurse, or unknown reasons for its absence. Two nurses gave examples of this: (a) "[We] put it in a sharps container, and when the sharps container is full take it to...like we bring it in and put it in a special place [in the home] and they disappear, somebody takes care of it" and (b) "They [the sharps containers] magically disappear. Don't know where they go after that".

Nurses described practice incidents where they either forgot the sharps container in the car or planned to use an intermediate step for sharps disposal. For example, one said, "Yeah, I've done it once when drawing blood and I forgot to take the sharps container, but I had my cooler, because we transport blood in coolers and took it out--and then took it out and put it in the sharps container."

In another account, one nurse found out that another did not routinely carry a sharps container into the home, asked, "You don't carry a sharps container?" and she replied, "I don't. I put whatever used sharp back in a little box inside the bigger box [a tackle box] and then when I get back to my car, I put it in a sharps container." Another said, "If I forget to bring the container in from the car, I'll make sure it goes out to the car. And then I will admit, I will recap, but it goes right to the car and into the container."

Someone else in the home may actually move the sharps container away from where the nurse performs a procedure. This may happen since the nurse's last visit or while the nurse is making the visit such as this nurse described, "What I've done with like this patient I saw today, you know, because she put her sharps container in the bathroom, so I gave her an injection, and what I did is I just left the needle on the table, I didn't recap it, you know, because she's not going to touch them, went into the bathroom, get the sharps container, bring it out, and then put the needle in." Another said, "At home, yes, the patients don't want to keep sharps containers so other people can see, they want to hide it somewhere." One nurse stated, "I had somebody move it [the sharps container]. Changing a portacath [Huber] needle, on a lady with--who starts decompensating the minute you turn off her--. And I had everything all set up on the table and somebody being helpful moved the table over, so when I wanted to go right to sharps [container], it was out of reach, and then ...unsterile, so I laid it on the table and said don't come close to this. Mostly they're [the family members] not that helpful."

There was an example of an uncommon practice where one nurse manipulated a used syringe to dispose of a needle without a sharps container. She stated, "I put the needle inside the syringe and put the plunger on .... Yeah, that's a container [sharps] and then I throw it away. I push the plunger down

until it breaks the needle and pushes it in, and then I just sort of...and then I just throw it away." In this example, the nurse used the barrel of the syringe as a receptacle for the needle, however, this technique is not without risks of being stuck from the manipulation or of the needle falling out of the barrel and perhaps sticking someone who empties the trash receptacle where it was subsequently placed.

There were circumstances surrounding recapping of used needles and placement of used needles into something other than a sharps container besides the absence of sharps containers. Being in a hurry, for reasons described earlier, was one example, "If I know I'm going to start an i.v. or draw blood, I put the sharps container like on the floor by my feet, someplace where I can go say when I'm walking back. If I'm in a hurry, I do less steps, I don't think it through as clearly. I'm pretty methodical, and if I'm not in a hurry, I remember all the little steps: one, two, three, four, five, how I like to do things. I usually like the--I don't like to--well, where's the sharps container? I get everything all set up, put the sharps container at my feet, you know, so I just have to reach down. If I'm in a hurry and I'm often at night, I'll forget something and invariably it will be the sharps container, you know, to bring it closer to me, and I have to walk across--."

Leaving the sharps container in the car coupled with time constraints was described by this nurse: "I--when you go in, sometimes I go to places where there's a lot of residents in one home and my car is out in the parking lot, and it's got my drug stuff and some supplies back there, the needles, sharps stuff, and I get someplace and all of a sudden it'll be like, oh, I need this B-12 shot. Well, it's a lot quicker and easier for me to give that B-12 shot and recap it and take that needle out to the trunk of my car than it is to walk out there, get my stuff, walk back, then give them the injection, then turn around and go take it back out. Because it just saves time. And that's one of the issues, I think."

For some nurses, not placing a used sharp into a sharps container or recapping it was related to the limited work space or the way that a patient had to be accessed for a procedure. One related, "Well, I've recapped i.v. needles like when you're at the bedside and you're trying to start an i.v. and the sharps container is, like, not convenient because of where all the stuff is around the bed, and I've had to cap the i.v. needle cap, not a syringe but an i.v., and trying to start it and just take and set it back in the container. When I get done, I'll just recap it safely using the one-handed method, just because the sharps container is not where I can reach over and drop it in. And you have to set it on the bed and it's, like, on...and if the patient moves, then you've got these needles flying around and...so I recap it." Another said, "When you do an i.v. between the wall and the bed, you can only...you don't really have a spot to work comfortably, it's very uncomfortable sometimes and this whole bunch of problems arrive when you have to carry syringes or needle or whatever device to drop it off at the container. Sometimes it's a difficult environment at the patient home for the nurse." Finally, "I have a patient whose house is just totally cluttered and [Mr. A] caught me recapping his needle, but I always do because the sharps container is, was, way off into the distance and it's hard to, like, get around and so I recapped it to get to the sharps container, because I didn't want to trip with this needle in my hand to get to the sharps container. It's very cluttered. We don't work in optimal environments for--."

Factors Influencing Nurses' Use of Needle Safety Devices and Practices

Nurses were asked to discuss factors influencing their use of needle safety devices and practices in the context of what devices their agencies made available to them. Follow-up questions related to influences of co-workers' needle disposal practices on nurses; attitudes of nurses regarding the effectiveness of such devices in reducing blood exposures; and attitudes

regarding the safety of devices for patients, families, and nurses. Attitudes regarding general safety, as well as those regarding the safety and comfort of the patient versus that of the employees emerged from these discussions. Also in the context of these discussions, several nurses shared experiences with past needlestick injuries and how that affected future practice issues. Thus in describing the range and variation of themes in this discussion, they can be organized into attitudes regarding safety and effect of past exposures on future safe practice and attitudes.

Attitudes Towards Safety

Themes regarding attitudes towards safety could be further subdivided into attitudes about specific safety products and practices, comfort and safety of patients, and personal safety. When discussing decisions to use a safety device versus a standard device for drawing blood, one nurse stated, "I always play the safety game first, because I know if I have a problem, I don't have a leg to stand on if I didn't use my safety device or didn't try to." Another nurse stated the importance of safety practice, such as immediate disposal of a needle into a sharps container, being based on the individual , "... but I think a lot depends on the cognizance of the nurse utilizing the device, whatever it is, she has not had the experience and the understanding of making sure that whatever she does is safe, whether it does go in directly out of the vein and into the sharps container or makes a stop on the way. I think, you know, a lot depends on the individual nurse."

Conversely, there were numerous examples where nurses did not believe that certain safety devices were safe or that recapping was unsafe, and therefore these attitudes affected their practices. One nurse felt that ease of use determined if a device was safe for her. She was discussing the difference between using a safety butterfly and a syringe to draw blood, and said that the safety butterfly

required her to hold too many things at once to enable activation of the safety feature. She then added, regarding the safety butterfly needle, "I have to say that many times I feel like I'm further jeopardized by an item that is supposedly designed for my safety. And for that very reason, I won't choose to use it, because I don't feel I'm safer, I'm less safe." In this case, the nurse does not feel that the product is safe and does not choose to use it.

Attitudes towards the safety of recapping varied among the nurses. Some were adamant about not recapping as it was never perceived to be safe. Others felt it safer to recap than to leave a sharp lying around or if there was not a place nearby for immediate disposal. An example of the former attitude is seen in this situation where a nurse had finished a procedure and found that the patient had put the sharps container in the bathroom. Rather than recap, the nurse placed the needle down on the table, walked to the bathroom, brought the container to the table, and disposed of the needle into the container. Her rationale was, "I didn't recap it. I figure it's not worth taking the risk." Another described how she used to recap before syringes had a safety sheath, "Well, I've recapped before when we didn't have those sheaths, and now we have those, I don't. And the only reason I recapped was because I didn't want the needle lying around." In the first example, the nurse perceived it as safer to leave the syringe uncapped and bring the sharps container to the needle. In the second example, the nurse previously felt it safer to recap than leave a needle lying around but now used the safety sheath on the syringe to cover the needle. Another nurse routinely recaps needles in cluttered homes because the sharps container is not near to where the procedure is conducted. In this case, this nurse felt it was safer to recap than risk tripping with an unsheathed needle on the way to the sharps container. He stated, "so I recapped it to get to the sharps container, because I didn't want to trip with this needle in my hand to get to the sharps container."

Several discussions centered on what influenced decisions to use a safety device versus a standard device when the nurse had a choice. These discussions revealed themes of placing the comfort and/or safety of the patient first, the safety of the nurse first, or conflicts with whom to place first. A poignant example of the conflict of whom to place first was, "It's kind of your...it's a push-pull situation, and I think you've heard it from a few other people already. It's what's going to work best. You know you want to be safe, but you have to be doing what's going to work for the patient best as well."

Two agencies had the choice of a safety butterfly needle for drawing blood and a traditional needle without a safety sheath. The traditional needle had a smaller gauge size. The question asked by the moderator, was "Okay, hypothetical situation--you go into a home and you have a safety butterfly and a regular butterfly to draw blood. What would influence your decision to use one or the other?" An excerpt from one of the transcripts with several participants discussing this issue follows:

Nurse 1: "I would prefer to use the safer one as opposed to the gauge.

Nurse 2: Not me.

Nurse 1: Because I don't die for--

Nurse 2: Well, if it hemolyzes the blood, though.

Nurse 1: But it's never happened to me, I can use any gauge and use it on any vein. So, using a butterfly and then putting a cap over the needle, I wouldn't use that first, even if I had a bigger gauge [for the safety butterfly], I would use that [the safety device] first.

Nurse 3: I would always go for the gauge.

Nurse 1: I'd go for gauge.

Nurse 4: I'd go for the gauge, too, especially fragile veins, and plus I'd want to protect the vein for the future.

Question: What if you had the same gauge ?

Nurse 4: The same gauge, then go for safety.

Nurse 5: Safety.

Nurse 4: Then absolute safety.

Nurse 5: I go for the gauge, too, because actually I want to protect the patient. I don't want to have to stick the patient twice, you know. So, I mean, it's more that...because I care about the patient. You know, I know how painful it is to be stuck twice, you know, and you don't get the blood, you know, so--".

This excerpt is a striking example of the differing attitudes that nurses have towards the patient's comfort and safety versus their own personal safety. For some, comfort and safety of the patient come first. Examples of placing the comfort and safety of the patient first were related to having to stick a patient more than once for a blood draw because the gauge of the needle on the safety device was larger than that of the traditional devices, or thinking about the future of a particular patient's veins for future blood draws given those conditions. For others, personal safety of the nurse was paramount. Yet there were also some for whom the decision was not clear cut, but required a balance between patient and nurse safety.

Effect of Past Blood Exposures on Future Safe Practice and Attitudes

At least seven nurses shared the experience of a past needlestick or blood exposure. The experience of a past exposure may have influenced a nurse to change his or her attitude toward personal safety. This was the case for a nurse who described how she was stuck with a needle that she did not immediately dispose of into the sharps container. She recounted, "Well, I stuck myself with a needle one time with a patient when I was working at the hospital, and that's--taught me to be more careful, more careful about--what happened is I gave them

their injection, I removed an i.v. and I put gauze in there, he was having breathing problems, and then I gave him an injection....I gave the injection and suddenly he started bleeding profusely from the vein. So, my first thought was get a gauze, and when I had the needle here and the gauze before to put in there and when I did this, the needle went in my arm. Yeah. So it's like, I didn't think about--okay put the needle there because I give the injection and suddenly there's blood, so I just went like this and the needle --so, now I know that even though he's bleeding, I have to put--Yeah, we have to put the needle immediately into the sharps container, no matter what happened. We have to do that, because if I put it on the table and I could put my hand on there, so it has to go to [the sharps container] I learned the hard way. It was just something so sudden, I just got distracted with the blood and I just went like this [makes movement simulating needle going into arm]." In this example, the nurse had put the safety of the patient first but now would immediately dispose of the needle first to avoid future needlesticks.

For others, fear of contracting a bloodborne disease such as HIV infection or hepatitis from a needlestick influenced their attitudes on safety. Two nurses shared how their past needlestick experiences now influenced their decisions to not recap a needle or to dispose of a needle immediately. The first one said, "I think about AIDS too. I stuck myself once before the needleless systems were being used. It was a demented man and I had just drawn blood and I was putting it into the tube and he was thrashing, and he knocked me and I stuck myself and it just really scared me. He had HIV and I had to go through all that entails. And I've known people who have converted from needlesticks. I know a couple of people from [Hospital A]. We're not friends, but I know that happens. In this example, both the nurse's experiences and knowing of other nurses' experiences influenced her. Another R. N. validated this unpleasant waiting experience after

a needlestick by stating, "Yeah, I think of HIV too, because the person I stuck myself from, he had HIV and also he was--HIV and also had hepatitis B and C. Yeah, so I went through the whole hell, the whole year. It's a long time." In this case, the source patient was positive for three bloodborne infections, which greatly increased the nurse's risk of contracting a bloodborne disease. In both examples, the nurses reflected on "all that entails" and "the whole hell" as the waiting period to find out if the nurse has contracted HIV, hepatitis B or hepatitis C infection from their needlestick injury. This period can be emotionally draining both for nurses and spouses, who sometimes have to wait for up to a one year period to find out if they have seroconverted to one of these bloodborne pathogen infections, especially if the source patient was positive for both HIV and hepatitis C.

In one of the focus groups, one nurse discovered that a co-worker did not routinely carry a sharps container in her supply bag. This nurse then shared her experience with a needlestick that occurred when she did not have a sharps container and how that affected her in carrying one in the future. "You know what, [Nurse C], I did--this was maybe four or five years ago--I did not --I was new at all this. I didn't put my needle in the sharps container pronto. I laid it down and stuck myself and I had to go through the AIDS testing and everything. I know, and I said I'll never do that again, ever. I'll take the time to do it, to put it in the [sharps] box." In this example, not only did this nurse have a strong conviction regarding not lying down a used syringe again, but appeared to try to influence her co-worker into not getting stuck as the result of such an action.

An enterostomal nurse therapist had been stuck with a used scalpel blade and was asked what, if anything, she does differently with the scalpel as a result of the experience. She stated, "I try not to manipulate it with one hand, turn it around from one end to the other with one hand, because that's how I, in fact,

did it [got cut]. And when I put it down, it goes in the instrument tray." She now had a very specific procedure for handling the scalpel as a result of the cut.

In the next example, knowing someone else who had been stuck by a needle influenced this nurse's attitude toward protecting her own personal safety. As she described, "But one of the things I thought about was the fear, the fear of needlesticks, because I worked with two nurses who were both stuck with needles from HIV patients, and luckily they both did not seroconvert or contract it, HIV, but just knowing the fear of a person--a nurse would go through by getting stuck with a needle, and that really encourages and forces me to always consider the safest avenue versus taking risks or taking short cuts."

One nurse had stuck herself while recapping a used needle and vowed to never recap again as a result of that experience. As she described, "I recapped once, but unfortunately--this was many years ago, about ten years, when I was out in the field, and the safety was not emphasized and you didn't hear don't recap a lot, so we --a lot of us were always recapping, and I recapped and unfortunately the needle went right through the cap. And once I did that, that was the last time I ever recapped. So, I'll take any kind of precaution I can to not --I would never. Because that's pretty scary when you get stuck."

These rich descriptions of past exposure experiences illustrate the profound effect of these experiences on both the attitudes and future practice of these nurses. There was not one example of a nurse who shared such an experience that did not alter her practice or attitude in some way as a result.

In summary, the range and variation in attitudes towards safety as well as past exposure experiences illustrate the complexity of the decision making that surrounds use of safety products and practices in this setting.

The Most Important Thing The Nurse Would Do to Assure that Work is Done Safely or that People Use Safety Devices

Participants were asked by the moderator," If there were such a thing as a needlestick prevention coordinator at your agency, what is the most important thing that person should do to assure that work is done safely or that people use safety devices?" A summary of response themes follows.

Education was the most frequent response to this question, and constituted several aspects. One aspect was the timeliness of the education, characterized by not being too far before of use of a particular safety product. One nurse stated, "Education- timely. You know, if it's [the product] coming out in January, don't teach us in September and then we wait all that time." She implied that waiting would influence her ability to know how to properly use a new device.

Another aspect of education was the target audience and responses suggested that not only staff, but managers, policy makers, and persons responsible for staffing of the agency be included in the education. If persons who do staffing were included in the education, it may result in increased awareness of the conditions under which the nurses work and how time constraints can be a barrier to safe practice. A nurse expanded on this, "I would just educate the staffing people. I mean, they need to be educated about what we have to do and how much time we need to do it. We are pretty competent and able to do but we're going to mess up if we keep having to run this fast." There were also suggestions to include managers and policy makers in the education. For example, one nurse suggested, "Maybe an education not just for the field staff but for management, for people who make the policy, who run the budget, or whoever it is that--education for them."

Another aspect of education was suggestions for different types of education. One suggestion related to preparations of materials required for different patient

situations, so that the nurse could be prepared in advance for such a variety of situations. A nurse said, "And, yeah, with educating what's out there, so you can prepare your car so you don't run into a situation where you don't have the right supplies." Others described the need for inservice-type educational programs that included hands-on experience with different products, for example, "Inservice so that they knew it and had hands-on experience with it." Expanding upon the idea of hands-on experience were suggestions to use a skills' checklist for safety devices, such as, "I would make sure that everyone got an adequate in-service on it, at least like we do on our glucometers. We have to be checked off every year or something on our glucometers. We should have to be checked off every year on these--sharps safety devices." Another nurse stated, "Talking about it is one thing, but doing it, have like a skill lab, that's what needs to be done, and probably check all skills, how people feel comfortable. Sometimes, I guess, you show a new device and it's like the principle, yeah, I know how it works, but have you actually worked with it, can you do it safely, that's different." Nurses perceived that education should include opportunities for the nurse to practice with a device in the office or non-clinical setting before going into the home care setting. The next example illustrates the need to use a device in a practice setting along with learning the principles of its use: "Try to have practice stuff on hand that anybody can go in any time and play with [the devices]."

One nurse suggested that another staff member go with the nurse into the home setting to observe and assist with use of devices, by stating, "Plus going out with you in the home, making sure that you're doing it correctly." In this case, the nurse could be checked the first time she used it in the home as a safety check. Another nurse suggested having annual sessions among staff to discuss different devices and real life experiences with such devices in the home care

setting, by stating, "Yeah. When you mentioned about education, I was thinking that other than once a year education for the device, how to use the device, maybe share experience, because home setting is totally different, and it's not always in the book." In this case, the nurses would have the opportunity to share how they had used the devices, problem solve on procedural problems with the device and perhaps learn new uses for the device from each other that might enhance the safety of their practice.

Besides education, another response theme to this question was the need for policies and procedures regarding the use and availability of needle safety devices and practices in each agency. Such policies and procedures needed to be complete, standardized, updated, and accessible. Examples were, "have a good policy or procedure book updated" and "more standard procedures". For one nurse, having a policy on use of safety devices would require the agency to provide both the devices and the education on such devices. She said, "Yeah, but if there were a policy, then the agency is mandated to provide the correct stuff and education to do it."

Several participants verbalized the desire for the agency to have one system of products. This would make it easier for the nurses in their practice and for education and use by patients as well. A nurse illustrated this idea, "One system, right? And we don't care what the infusion company's deal is, we should still be one system. Because we can't keep teaching people different things." This theme was expanded to include participation of the nurse in choosing the one system; another nurse said, "Preferably one system that you'd have some input in choosing as a nurse." This idea of nurse input was eloquently described by one nurse who had participated in a three day workshop on input into product design, "Where are you going to get the time to sit down and look at things, but it would really be nice to have the input of people who actually use the

equipment to decide what's the right safety equipment? I mean, that to me is like a primo setting, because then you're going to do it, so, hey, this one works, so let's order this, but we're not in charge of ordering things and they don't ask us what we like. I think that steps to the next position which is when you have bad equipment, you've got to write up a report saying this stuff isn't working and why and [none of] these things come through."

Thus, various aspects of education, adequate policies and procedures, and participation with the design and selection of safety devices were described by the nurses as the most important things that they would do to assure that work is done safely or that people use safety devices. Additional responses to this question included adequate staffing, advance knowledge of the situations the nurse was going into in the home setting, and a better sharps container.

Categorization Schema for Facilitators and Barriers to Safe Needle Practices

The focus groups were designed so that along with the group discussion focused on facilitators and barriers to safe practice, participants would be asked to individually describe those factors or conditions that made it easiest and most difficult for them to use safe needle devices and practices in the home health care setting. These two questions therefore also served as an opportunity for the participants to summarize and analyze their responses in the sessions up to that point, as well as offer time for reflection. These responses enabled the researcher to develop initial categorization schema for facilitators and barriers to safe needle use and practices. The components of this initial categorization schema are delineated and defined as follows:

1. Safety devices- specific needle safety devices and specific qualities of these devices.

2. Environmental factors- characteristics within the environment that impact safe practices of the nurses (e.g., lighting; access to patients in beds,

chairs, other; lack of space to perform necessary procedures; clutter).

3. Organizational factors- characteristics of the home health agency that influence the ability of the nurses to practice safely (e.g., safety device availability, accessibility, options for use of equipment, safety climate of the agency, policies/procedures, enough planning time, and education).

4. Distractions- unique conditions or situations that divert the nurses' attention away from safe performance of procedures (e.g., noise, pets, presence of others).

5. Personal R. N. factors- characteristics of the nurses which influence their ability to perform safe practice (e.g., experience with specific devices).

6. Patient/situational factors- characteristics or conditions of the patient or situation that impact safe practice (e.g., unpredictability of patient status, uncooperative patients, and particular procedures required).

These schema components are further described, along with data illustrations from the respondents regarding what made it easiest and most difficult to use safety devices and practices in this setting.

Specific devices mentioned that facilitate safe practices were the sharps container, the butterfly syringe for drawing blood, and a closed intravenous access system in which the nurse never has to have contact with blood. Participants stated, "What makes it easiest for me is having a sharps container" and, "Because I do infusion therapy all the time, the easiest thing is access to a needleless system and almost more than 90% of the situations I do have it so... availability and access of a needleless system". Another example was, "I found the easiest was a closed IV or closed blood access system. I never have to be exposed."

On the other hand, there were specific devices that hindered safe practices including one agency's sharps container (described as the top can open and

sharps can fall out), an open-ended intravenous system in which there is direct exposure to blood, and butterfly needles whose tubing may recoil when placed in the sharps container or whose sheath may retract prematurely during a blood-drawing procedure. Two nurses described their difficulties with this latter device as, "The most difficult is using those light plastic needles [butterfly] and that recoil when you're putting them in the container. I think that's the scariest part for me. Or when the safety shields on the [butterflies] come down. Those are the biggest problems for me" and, "Actually I've had that trouble too, with the plastic coming off the [butterfly]. I don't like that. It comes off very easily and sometimes I'm not ready for it to come off. Oh, it's off! [laughs]. And I get [it] to be a little tighter, so I have to make sure it comes off; it just doesn't come off by itself. I've learned to remember most of the time. That would be the one thing."

Qualities of devices that enhance safe practice included a sharps container of small size that could fit in the nurses' bag, a sharps container that is not overfilled, and devices that can be used with one hand. More general qualities of devices were described as being easy to use, not cumbersome, and what one nurse described as "ease of use within the context of a given procedure." One nurse summarized, "I need mine [safety devices] to be easily manipulated, so that I don't need two hands, I don't need a strong hand, it's easy to access."

Qualities of devices hindering safe practice were described. These included specific qualities of sharps containers that made it difficult for nurses to use safely, including containers that are too small and fill easily, full containers, and containers that were not safe or sturdy. More general qualities of devices were inability to manipulate with one-hand or two simple steps at once, sudden changes in devices, or having too many brands of a device. For example, "I put for the most difficult having different brands and types, because you end up having pieces from one and pieces from another, but never enough to do it

safely." In this example, having too many parts to a device was perceived as compromising safety.

Environmental factors facilitating safe practice included adequate space in the home to set up the supplies and do the necessary procedures, lack of clutter, adequate lighting, and proper equipment in the home. One nurse described the need for an adequate work space as, "How about space for me to put all the supplies together, at least a table or a chair." An additional comment on the importance of work space and proper equipment was, "When you arrive at a patient home, and proper home environment, where you create your own work space at this minute, and of course, availability."

Alternatively, environmental barriers to safe practice were inadequate space and lighting, dark cluttered homes, families designing their own sharps containers, or the absence of a sharps container. An extreme example of a space barrier was described by one nurse as, "And the most difficult is no place to sit or no place to stand."

Organizational factors facilitating safe practice included the availability of safety devices; accessibility to these devices, especially in the supply room of the agency; support from the agency (e.g., having a "safety conscious agency"); realistic work assignments; having enough safety equipment and enough planning time; available options for use of equipment; and working with a competent infusion company. The importance of the availability of safety devices from the agency was illustrated by, "Just having them available. You know, if you have them all in your possession, it's real easy to use, it's really nice."

The importance of having adequate time, both with planning a visit and conducting a visit, was illustrated with two examples: "I agree with [Nurse A], I think time-wise, if you're given more time with a visit, you plan it carefully and you do each step carefully, but if you're in a rush sometimes, you know, oh, I

have to meet, to be at another patient's house within half an hour. I mean you really have to....You rush, you make mistakes easily" and "Enough planning time to know what you're doing". In the first example, adequate time serves as a facilitator to safe practice, while the opposite may result in a nurse making a mistake. The second example implies that given enough time, a nurse is more knowledgeable in his or her actions, while this may not be the case if not given adequate time.

The importance of organizational factors such as the availability of safety devices and an agency with a supportive safety climate was illustrated by this example, "Oh, I put pretty much what [Nurse B] did, just availability of the devices, there's plenty if you need them, and also this agency tends to support safety. They are constantly updating and making sure we get the information we need."

Organizational factors that could hinder safe practice included not having safety devices available, not having competency exams on i.v. management, and increased responsibilities or expectations including the nurse having to make numerous patient visits in a day or having to perform numerous procedures in any one visit.

One nurse described minimal distraction as a facilitating condition for safe practice, "I put, actually, minimal distractions from other factors [as factor making it easiest to use safe work practices]." Distractions were described as barriers to safe practice and included other persons in the home watching the nurse perform a procedure, children or pets or both running around, and having the television on. One nurse found the television to be the biggest barrier to safe practice and stated, "I think you have to have a really strong nerve system to listen to the TV and work."

Personal experience factors facilitating safe practice were described as

"consistent practice of safety techniques with the devices we have," previous experience with a device, and familiarity with the device. One nurse described the factor making it easiest for her to use safe practices was, "previous experience with a particular product, to be familiar with it. So familiarity." This was validated by another nurse who answered with, "Being familiar with your devices."

On the other hand, personal experience factors that were barriers to safe practice were described as infrequent use of the equipment, being unfamiliar with the equipment, and being uncomfortable with a new device. One nurse stated that the factor making it most difficult for her to use safety devices as, "I put infrequent use of equipment, any time I'm unfamiliar with equipment."

Patient/situational factors emerged as a barrier to safe practice and were described as having to do a hard blood draw, de-accessing a Huber needle from a port or similar device, uncooperative patients, being out in the field and not having the needed supplies, and finding oneself in an unexpected situation. The specific procedure of removing a port access needle involves a recoil action with potential for sticking the nurse. As one nurse described, "Well, the most difficult for me remains de-accessing the Huber needles in the ports. That's a constant thing." Unpredictability of the patient or situation can also serve as a barrier to safe practice. As one nurse stated, "I kind of said the same thing of sudden changes in equipment or the situation or the patient, that they [the nurses] don't take the time to use the safety equipment because things change."

In summary, the facilitating conditions for and barriers to safe needle use and practice for registered nurses in the home care setting can be organized initially into these six components: (a) safety devices, (b) environmental factors, (c) organizational factors, (d) distractions, (e) personal R. N. factors, and (f) patient/situational factors. However, using Wolcott's transformation method,

"the goal of description is to tell the story of the data in as descriptive a way as possible" (Coffey & Atkinson, 1996, p. 9). Therefore, in encompassing the descriptive accounts of all the focus group questions and probes, there are additional barriers and facilitating conditions that should be added to this initial schema. In particular, the rich description of conditions unique to the home care setting as well as attitudes of nurses towards safety are salient to this categorization. When describing the themes that emerged from all the questions, the categorization schema can thus be abstracted and further subdivided as follows (additions are underlined):

1. Safety devices- specific needle safety devices and specific qualities of these devices.

2. Environmental factors- characteristics within the environment that impact safe practices of the nurses (e.g., lighting; temperature; sanitation; electrical outlets; handwashing facilities; refrigeration; access to patients in beds, chairs, other; lack of space to perform necessary procedures; clutter).

3. Organizational factors- characteristics of the home health agency that influence the ability of the nurses to practice safely (e.g., safety device availability, accessibility, options for use of equipment, safety climate of the agency, policies and procedures, work assignments, planning time, education, and increased job responsibilities).

4. Control factors- conditions or situations in the home care setting not under the control of the nurse, which may influence the performance of safe practice (e.g., distractions), interference with care vs. assistance with care, turf issues (patient's versus nurse's), work space, and differences between home and hospital).

5. Personal R. N. factors- characteristics of the nurses which influence their ability to perform safe practice (e.g., experience with specific devices, familiarity

with devices, flexibility, attitudes towards patient comfort and safety, personal safety, recapping, and effect of past blood exposure on safe practice).

6. Patient/situational factors- characteristics or conditions of the patient or situation that impact safe practice (e.g., unpredictability of patient status, uncooperative patients, patients moving during procedures) and particular procedures that are difficult to perform safely.

The further development of the components of this categorization schema enables the movement of the data transformation into the next level of Wolcott's model- analysis.

Level Two: Analysis of Findings in Relation to the PRECEDE/PROCEED Model

The next level of analysis required the components of the categorization schema for barriers to and facilitating conditions for safe practice to be further expanded beyond a descriptive account. Wolcott defines analysis at this level as involving "systematic procedures to identify essential features and relationships" (Wolcott, 1994, p. 24). The purpose of this section is to further analyze the components of the categorization schema developed in level one by integrating them into the PRECEDE component of the PRECEDE/PROCEED Model. This will provide a framework for understanding barriers and facilitating conditions to safe practice.

Target Behavior

In this study, the employee's desired health behavior was targeted as use of needle safety devices (e.g., safety syringes, blood-drawing devices, needleless systems for accessing intravenous lines) and practices (e.g., immediate disposal of used needles and sharps, disposal of needles and sharps into approved containers, and NOT recapping used needles). What study participants perceived as facilitators or barriers toward achieving the target behavior are integrated into the PRECEDE portion of the PPM framework of predisposing, reinforcing,

enabling, and environmental factors.

Predisposing Factors

In the PPM, predisposing factors are defined as individual or group knowledge, attitudes, beliefs, values and perceptions that positively or negatively influence motivation for a behavioral change (Green & Kreuter, 1991). Green and Kreuter state that "beliefs, values and attitudes are independent constructs, yet the differences between them are often fine and complex" (1991, p. 156). In this study, questions posed by the moderator did not contain the terms "attitudes, beliefs, values, or perceptions" to avoid influencing the descriptive responses of the participants. Yet the processes of description and categorization of findings enabled this group of factors to be analyzed.

In the components of categorization schema described in the first level of analysis for phase two, personal R. N. factors that may serve as predisposing factors for nurses' use of needle safety devices and practices include nurses' knowledge, attitudes towards recapping and safety devices, belief that a consequence of a needlestick could be a bloodborne infection, values towards patient comfort and safety and towards personal safety, and perceptions.

In this study, the answers to the focus group questions illustrated that many of the nurses were knowledgeable about the dangers of recapping needles as well as the importance of disposing used needles into appropriate sharps containers. In addition, several nurses in each focus group session illustrated their knowledge of specific safety devices by showing others in the group physical examples of specific products, as well as describing different devices' use and applicability to specific procedures.

Knowledge of the stressful waiting period that resulted after an occupational needlestick exposure influenced nurses' future behavior in the direction of using safety products and not recapping used needles. A nurse's previous experience

with a needlestick injury and its resultant effect on safe practice was an important theme extracted from the focus group interviews. This past exposure may have occurred in the nurse or in a friend or co-worker of the nurse. This experience might increase a nurse's knowledge about bloodborne infections, change personal risk perception about acquiring a bloodborne infection, and change his or her attitude towards the safety of practices previously not considered unsafe (e.g., recapping needles) so that now the nurse believes such practices to be unsafe and therefore avoids them.

The attitude of a nurse toward the safety of recapping used needles could affect the act of recapping. Nurses who perceive recapping as an unsafe behavior will avoid this behavior. Reasons it might be perceived as unsafe include the potential risk of getting stuck when doing so or having already been stuck while doing so. On the other hand, another nurse might perceive the act of recapping as a safer alternative to carrying a used, unsheathed needle for long distances to get to a sharps container or as a risk to someone else who might be stuck if the needle is set down unsheathed while trying to find a sharps container. Thus, it is important to note that such attitudes could be a facilitating condition for one nurse and a barrier to safe practice for another.

The attitude of a nurse about the safety of a device designed as safe or about practices considered safe could also predispose a nurse toward or against safe practice. There were several examples of nurses in this study that illustrated that their attitudes either supported safety devices and not recapping needles as well as those whose attitudes supported recapping or use of conventional devices as safe practices.

If nurses believe that a potential consequence of a needlestick is to acquire a bloodborne pathogen infection, this belief may predispose those nurses towards safe practice. An example of this was a statement by one nurse who described

knowing of several health care workers who had seroconverted to HIV positive status. The potential for such a consequence influenced her towards not recapping needles.

If a nurse valued patient's safety and comfort first, when given a choice of a blood-drawing device that was a safety device with a larger gauge versus a non-safety device with a smaller gauge, the nurse might choose the smaller gauge because it would be less likely to require a second stick in a patient, thus causing less pain. On the other hand, a nurse whose value toward personal safety was paramount would probably always choose the safety product. Within the context of the PPM, the value placed on personal safety might be higher for some nurses while the value placed on the safety and comfort of the patient may be higher for other nurses.

Perceptions that could influence needle safety use and practices include the risk of getting a bloodborne infection from a needlestick. Several nurses described their fear of getting a bloodborne disease from a needlestick and stated that these fears influenced them in the direction of using safety devices and not recapping used needles.

In the context of the PPM, it appears that the effect of a past blood exposure may influence the predisposing factors for safe needle use and practice of home care nurses. For example, a nurse may know that the risk of acquiring HIV from a particular needlestick may be as low as 0.3% and therefore not be motivated to stop recapping needles. However, if the nurse has had a needlestick or knows someone who has had one, the nurse may perceive that risk to be significant and enough to influence the nurse to not recap needles anymore.

In summary, relating the components of the categorization schema that fit into the predisposing factors of the PPM framework would result in the following expansion of this section as follows:

Predisposing factors towards safe needle use and practices:

1. Knowledge of-

(a) needle safety practices

(b) specific safety devices and their use

(c) the stressful waiting period post-needlestick.

2. Attitudes-

(a) about the safety of recapping

(b) about the safety of devices designed as "safe".

3. Beliefs- that a bloodborne infection (e. g., HIV, hepatitis B, hepatitis C) is a potential consequence of getting stuck while recapping or not using a needle safety device.

4. Values-

(a) placed on the safety and comfort of the patient

(b) placed on the personal safety of the nurse.

5. Perceptions- of the risk of acquiring a bloodborne infection post-needlestick or blood exposure.

Reinforcing Factors

In the PPM, "Reinforcing factors are those consequences of action that determine whether the action receives positive or negative feedback and/or is supported socially after it occurs" (Green & Kreuter, 1991, p. 165). According to Green and Kreuter (1991), "reinforcing factors include social support; peer influences; feedback and/or advice by health care providers; as well as physical consequences (e.g., pain from adopting an exercise regimen [negative], alleviation of symptoms from taking required medications [positive])" (p. 165). Reinforcing factors are the rewards and punishments received. Rewards may sustain continuation of the target behavior while punishments might influence cessation of the behavior. In addition, the concepts of positive and negative

reinforcement apply to this set of factors. Reinforcement may sustain the continuation of positive and negative behaviors. In the context of the PPM, behavior can be influenced by rewards, punishment, positive reinforcement, and negative reinforcement. Thus these factors may hinder or facilitate continuation of a behavior such as use of needle safety devices and practices.

A negative consequence of not using safe needle practices or devices would be the potential for a needlestick or other type of blood exposure. In this study, there were salient examples of nurses who had experienced or knew someone who had experienced such exposures and claimed that now they would always use safety devices or would never recap a needle again. Thus, the subdivision in the component of personal R. N. factors of past needlestick exposure appears to fit into the reinforcing factors section of the PPM.

As mentioned previously, organizational safety climate has been found to be associated with Universal Precautions compliance in several studies. In the PPM, it has been categorized as a reinforcing factor. The rationale for its inclusion is that management's support of safety practices may reinforce worker's participation in a target safety behavior. In this study, one of the facilitators for safe use of needle devices and practices was having an agency which supported safety. When asked by the moderator, "What makes it easiest to use safe needle devices and practices?", several nurses responded with "having an organization which supported safety." This example illustrates that organizational safety climate reinforces the nurses' use of safe practice.

In one focus group, there was a singular example of a nurse who appeared to be influenced into not recapping needles when she heard that management would be checking the contents of sharps containers to see if sharps had been recapped. The moderator asked, "What influences have your co-workers' needle disposal practices had on you? [They] could be positive, negative experiences of

people when they are disposing of needles and there's not been a positive outcome and then maybe you change your practice, something like that?" Her response was, "One time a couple of years ago I heard a lecture, some infectious disease topic or something, said that [institution 'X'] was going to x-ray the boxes to make sure you didn't recap the needle. That frightened me." She also added that she did not recap needles. In this example, negative consequences resulting from recapping needles might include disapproval or reprimand from management, or co-workers' disapproval upon discovery that a particular nurse had recapped used needles.

The concepts of rewards, punishment, positive and negative reinforcement are complex and when analyzed with the study data, result in several scenarios. In this study, there were examples of punishment and negative reinforcement from using safety devices and practices. Several nurses verbalized dissatisfaction with a particular butterfly needle due to factors such as requiring two hands, taking more steps, and taking more time to use. Thus, there were punishments for using the device (e.g., inconvenience, increased risk of a needlestick) and negative reinforcement for the alternative behavior of not using safety devices, (e.g., using conventional devices that did not take more steps or more time to use). (To avoid use of judgmental terms, the word "punishment" is substituted with "adverse consequences", "disincentives", and "adverse outcomes" in the remainder of this paper.) Nurses who claimed that they never recapped or would always choose safety products over conventional products may well have received some form of positive reinforcement from such behavior; however this was not identified.

Thus, personal R. N. factors (e.g., previous experience of nurse, friend or co-worker of nurse with needlesticks); organizational factors (e.g., organizational safety climate); and the concepts of rewards, punishments, positive and negative

reinforcement were integrated into in the following expansion of the model:

Reinforcing factors for safe needle use and practices:

1. Previous experience with a needlestick or blood exposure in

(a) home care nurse

(b) friend of home care nurse

(c) co-worker of home care nurse.

2. Home care agency with safety climate supporting use of needle safety devices and practices of home care nurses.

3. Adverse consequences for nurses recapping needles or not using available safety products (e.g., reprimand or disciplinary action from management, needlestick).

4. Deterrents for nurse for using safe devices and practices (e.g., taking longer to do a procedure, not having both hands available to do a procedure).

5. Negative reinforcement for nurse for NOT using needle safety devices and practices (e.g., having more time to do a procedure, having two hands available to do a procedure, not having a needlestick).

Enabling Factors

Enabling factors facilitate the performance of an action by individuals or organizations. These include "availability, accessibility and affordability of resources." These may "also include new skills required by a person, organization, or community that are needed to carry out a behavior or environmental change" (Green and Kreuter, 1991, p. 161). It is important to add that enabling factors are often conditions of the environment.

Two components of the categorization schema described in the first level of analysis for phase two fit into this group of enabling factors. The first component of organizational factors includes availability of safety devices; planning time, options for use of the equipment, realistic work assignments and job

responsibilities; and accessibility of needle safety devices to home care nurses. Nurses in the study stressed that the safety devices not only need to be purchased by the home care agency; these devices must be physically accessible to the nurses. The need for adequate planning time for preparing to make a visit or do a procedure was another enabling factor. The nurses also verbalized preferences for having options for the use of the devices as a facilitator for safe practice. For example, should the nurse need to do a procedure, there should be options for using devices necessary for that procedure, allowing the nurses to use their assessment and skills to choose what devices are necessary. Having unrealistic work assignments (e.g., too large, complex caseload) was identified as a barrier to safe practice, as was an increase in job responsibilities (e.g., more extensive documentation, responsibility for knowing how different i.v. pumps work).

The second component of personal R. N. factors that enables safe practice is familiarity with devices and experience with specific devices. Just being familiar with a device (e.g., knowing it is available for a particular use and how it is supposed to work) is important for its safe use. However, having had additional, consistent experience with a device is also perceived as necessary for influencing safe practice. Both familiarity and experience with devices contribute to the skills of the nurses using these devices, thus enabling the use of needle safety devices and practices.

Integrating the components of the categorization schema to the PPM framework is summarized as follows:

<u>Enabling factors for safe needle use and practices:</u>

1. <u>Availability</u>

    (a) of needle safety devices at home care agency

    (b) of adequate planning time to plan home care visit and/or home

care procedure

(c) of options for use of safety devices for home care nurses

(d) of realistic work assignments and job responsibilities of home care nurses.

2. Accessibility of needle safety devices to home care nurses.

3. Skills

(a) familiarity of home care nurse with availability of and technique required to use safety devices

(b) experience of home care nurses in using safety devices.

Environmental Factors

According to Green and Kreuter, "Environmental factors are those external to an individual, often beyond his/her control, that can be modified to support the behavior, health, or quality of life of that person or other's affected by that person's actions" (1991, p. 28).

Four components of the schema appear to serve as environmental factors in this section of the model. In this study, the participants provided a rich description of the conditions unique to the home care work environment. These environmental factor components include physical conditions such as lighting, temperature, sanitation, electrical outlets, handwashing facilities, and refrigeration; access to patients in beds, chairs, or other locations; lack of space to perform necessary procedures; and clutter. Many of these conditions were perceived as barriers to the home care nurse participants in their ability to perform safe practice.

An additional higher order of abstraction of all focus group questions resulted in the second component of control issues, defined as conditions or situations of the home care environment not under the control of the nurse, which may influence the performance of safe practice. This component was

further subdivided into distractions, interference with care versus assistance with care, issues of patient versus nurse turf, work space, and differences between the home and hospital work environment. These subdivisions illustrate the complexity of this setting as a work environment as well as the lack of control over many of the environmental components that nurses identified as having major impact on their safety practices.

The third component from the schema that fits into environmental factors of the PPM is patient/situational/procedural factors. The nature of the patient and the situation surrounding the procedure to be performed influence the ability of the nurse to perform the procedure in a safe manner. This component is more abstract than the first and second components, yet it is obvious that it contributes to the work environment of home care nurses. For example, if there is an extremely uncooperative patient who moves during a procedure involving a needle, even if the nurse has the resources and skills that enable her to perform the procedure safely, this additional environmental component may serve as a barrier to the nurse's safe performance. The unpredictability of patient status may also be a barrier to safe practice. Several nurses recounted experiences where they went into the home and found that the patient's status had changed (e.g., veins had collapsed and were harder to access), resulting in situations that made it more difficult to use safe practice. Repeatedly throughout the focus group sessions, nurses used the example of removing a port access needle from a port access device as one of the most dangerous procedures that they perform in the home care setting. Thus the performance of this specific procedure in this setting is an example of a procedural factor of the home care environment influencing the safe practice of the nurse.

Finally, a fourth component of the schema, safety devices, is placed into this section. Specific safety devices and specific qualities of those devices are

influenced by the environment in which they are used. For example, a sharps container that has a large opening and is not designed to be placed on uneven surfaces may tip over in the home care setting (e.g., when placed on the patient's bed). Butterfly needles for drawing blood often have tubing attached to the needle that can recoil during disposal, thus posing a potential for needlestick injury. The awkward postures and body mechanics and inadequate work space characteristics of the home care setting can contribute to difficulties in using this particular device. An example of this would occur if a nurse was using a butterfly needle on a patient in a chair and had to reach across the chair to dispose of it, and the tubing recoiled and caused a needlestick.

Organization of the physical conditions, control issues, patient/ situational/procedural factors, and safety device components and their qualities into the environmental factors section of the PPM results in the following expansion:

Environmental factors of the home care work environment influencing safe needle use and practices:

1. Physical conditions (e.g., lighting, temperature, etc.).
2. Control issues
    (a) distractions
    (b) interference with care vs. assistance with care
    (c) patient turf versus nurse turf
    (d) differences from hospital environment (e.g., lack of back-up personnel or equipment).
3. Patient/situational factors
    (a) cooperative vs. uncooperative
    (b) unpredictability of patient status
    (c) patient movement during procedures.

4. Procedural factors- particular procedures that may be difficult to perform safely (e.g., removal of port access needle from a patient's port access device).

5. Specific safety devices and specific qualities of safety devices used in the home care setting.

This expanded portion of the PPM based upon the study results is illustrated in Figure 3.

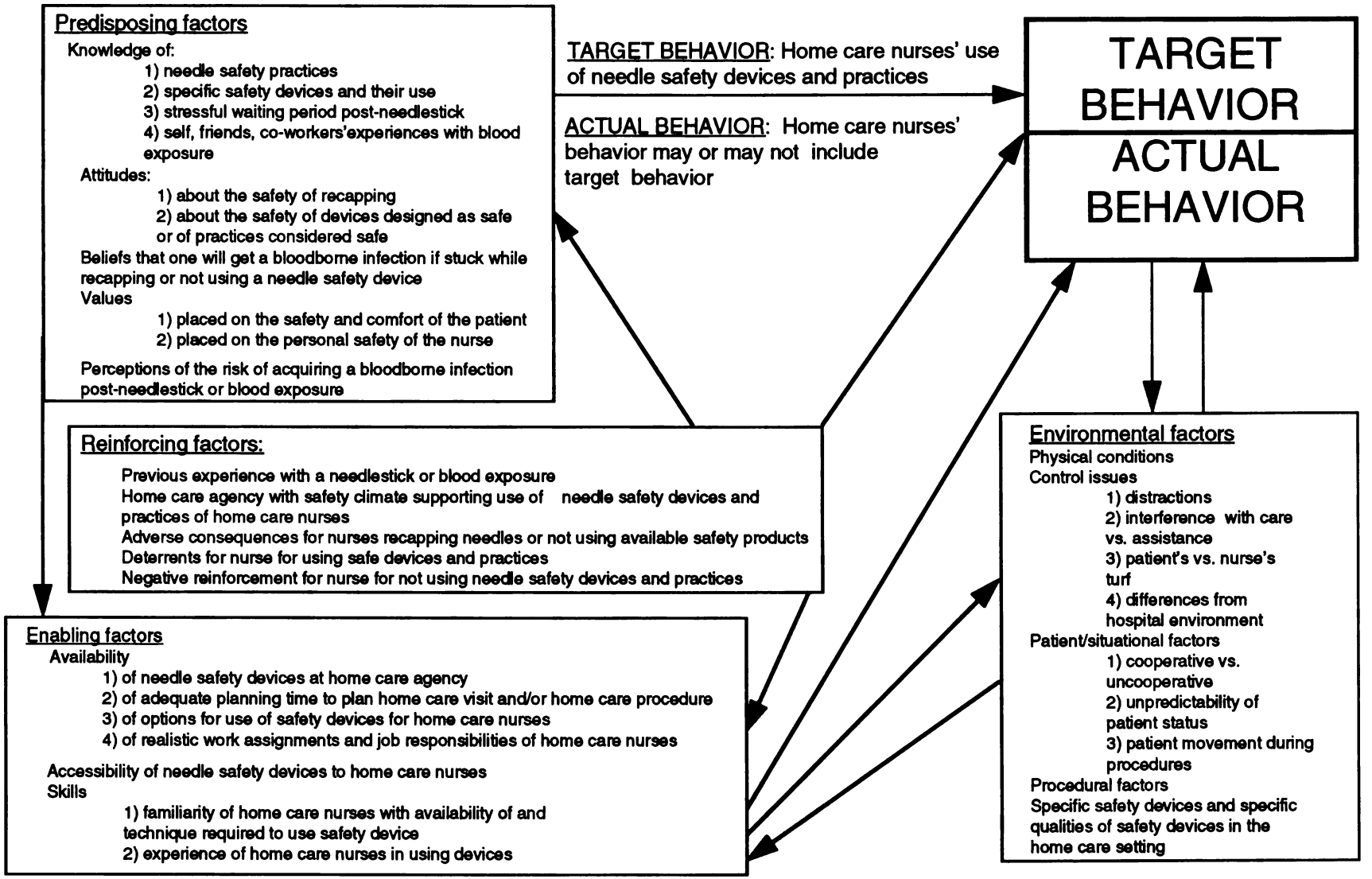
Relationships Between Factors in the PPM

In the original PRECEDE portion of the PPM (see Figure 1), the predisposing, reinforcing, and enabling conditions are represented as influencing the actual behavior of individuals, groups, or organizations. In addition, enabling factors influence environmental factors, which in turn either influence behavior or are influenced by behavior. Finally, enabling factors influence reinforcing factors and reinforcing factors influence predisposing factors. The target health behavior is represented as a function of predisposing, reinforcing, enabling, and environmental factors. These relationships are illustrated by uni- and bi-directional arrows in the model.

One of the objectives of this portion of the data transformation, the analysis portion, is to describe the relationships between the factors identified from the study that relate to the predisposing, reinforcing, and enabling conditions of the PPM. These relationships are represented by superimposing directional arrows on the expanded version of the PPM that was developed in this section (see Figure 3). The rationale for describing the relationships is based on the integration of study results into the expanded model of the PPM developed from the components of the schema.

Along with the arrow from enabling factors towards environmental factors in the original PPM, an arrow from environmental factors back towards enabling

Figure 3. Integration of Categorization Schema into PRECEDE Component of PPM



factors is added. There were numerous examples from the data where the physical conditions in the home care environment, the characteristic lack of control, as well as patient/situational/procedural factors influence the ability of the nurse to perform safe practice, even when safety devices and skills to use them were present. Thus, it can be said that the environmental factors are not only influenced by, but also can influence the enabling factors of the nurse for using safe needle devices and practices.

The relationship between the predisposing and enabling conditions emerges from this study's results. It appears from several data examples that if a nurse's attitudes and beliefs support safety, this may affect personal skills and experience in using safe practice. Whether enabling factors (e.g., the availability of a needle safety device) influence the nurses' knowledge, attitudes, etc., or influences these predisposing factors, did not emerge from this analysis. This requires further study. Thus, the relationship of enabling factors and predisposing factors is represented by a solid arrow in one direction only.

The relationship between reinforcing and predisposing factors appears to be uni-directional from the results of this analysis. In other words, predisposing factors may be influenced by reinforcing factors. For example, a nurse may have certain attitudes and beliefs about safety device use and practices, but may be influenced toward or against such use by reinforcing factors such as co-workers' attitudes, management's attitudes, or actual needlestick experiences on the job. This representation implies that such experiences can influence knowledge, perceptions, beliefs, and attitudes surrounding the circumstances of using needle safety devices and practices. The rationale for this representation is the salient data examples from the focus group sessions that illustrated how such an experience could influence these predisposing factors.

The data example of the nurse who did not recap because she heard that the

agency would be x-raying sharps boxes may have her predisposed perception and beliefs reinforced by this fear of punishment. On the other hand, whether others' attitudes are affected by a person's predisposed factors was not illustrated by this study's results.

It does appear that reinforcing factors can influence enabling factors in this study. If, for example, a home care agency has an overall supportive safety climate, it can influence the availability of safety devices for the nurses, as was illustrated in this study. Whether enabling factors, such as availability of devices or skills of the nurse in using the devices, influences the reinforcing factors, did not emerge from the data.

Actual Behavior Versus Target Behavior

The actual behavior described by the home care nurses was influenced by predisposing, reinforcing, enabling, and environmental factors identified in this study. For some, the actual behavior was the target behavior of use of needle safety devices and practices. For others, it was not, as evidenced by unsafe practices. Therefore, the representations of actual behavior and target behavior have been placed to the right in the integrated model; both actual and target behavior is influenced by the predisposing, reinforcing, enabling, and environmental factors.

Summary of Level Two

In this analysis level, the components of the categorization schema have been integrated into the PRECEDE component of the PPM, creating an expanded representation. In addition, relationships between the predisposing, reinforcing, enabling, and environmental factors of the PPM that were identified from the study are proposed. These relationships are represented by a revised figure for illustration. The final component of transformation of the data, or "interpretation," is presented next.

Level Three: Interpretation

In this section, Wolcott's third level of transformation, "interpretation," is conducted to derive meanings from the findings. This is accomplished using several steps. In the first section, the complex nature of rewards, punishment, positive and negative reinforcements in the context of the study's findings are proposed. Also included in this first section is the addition of other potential examples of particular factors. In the next section, potential relationships between predisposing, reinforcing, enabling, and environmental factors and their influences on the use of safe needle practice are proposed from the interpretation and identified as future areas for research. Finally, the meanings of the findings in relation to the second research question (What are the perceived barriers to and facilitating conditions for nurses' use of needle safety devices and practices in the home care setting?) are discussed.

Predisposing, Reinforcing, Enabling and Environmental Factors

The components of the categorization schema in phase two were integrated into the predisposing, reinforcing, enabling, and environmental factors sections of the model, expanding these sections. There were a few factors that appear to overlap into two sections. The first is inclusion of past experience of a nurse, co-worker, friend, etc., into both enabling and reinforcing factors. When probing deeper into these factors, it is possible to make a distinction. Under predisposing factors, it is the knowledge of the nurse herself having been through an exposure situation or knowing of another who has been through such a situation that may predispose that nurse toward using safer products or practices. The knowledge pertains to the stressful period that follows the exposure and the uncertainty of potential resultant seroconversion to a bloodborne illness such as HIV, hepatitis B, or hepatitis C.

Under reinforcing factors, this issue of a past needlestick behavior becomes

much more complex when examining it in the context of rewards, punishment, positive and negative reinforcement. In this study, there was evidence of punishment for nurses recapping needles or not using available safety devices, in the form of potential reprimand or disciplinary action, or in the worst case scenario, a needlestick injury. There was also evidence of nurses experiencing deterrents for using a safety device, such as taking longer to do a procedure or not having both hands available to do a procedure. One adverse consequence not illustrated in the study but possible within the context of reinforcing factors in the PPM might include disapproval by co-workers or peers for not using safe practices. What was also not illustrated in this study but is certainly possible, is for a nurse to experience adverse consequences by NOT recapping a needle or from using a safety device. An example of the first possibility is if a nurse did not recap a needle for whatever reason, and laid it down on a table, getting stuck later when picking it up. An example of the second possibility would be a nurse using a new product with which she perhaps had not been trained or had not used very often and got stuck. In both examples, it is possible to understand how a needlestick injury could be a facilitating condition for using safe devices and practices as well as a facilitating condition for not using safe devices or practices. In either case, the needlestick experience reinforces some behavior, but it may or may not be the target behavior.

There was also evidence of negative reinforcement for nurses not using safety devices in this study, in the form of having more time to do a procedure, having two hands to do a procedure, or not having had a needlestick. Such negative reinforcement for the undesirable behavior serves to sustain the behavior. What were not illustrated in this study but are also possibilities are rewards and positive reinforcement for using safe devices and practices. If a nurse continued to use safe devices and practices that resulted in her not getting

stuck or not acquiring an infectious disease as a result of a needlestick, this might be considered a reward that sustains the target behavior. In addition, approval from management, positive performance evaluations, and the absence of a bloodborne disease might also serve as positive reinforcement to sustain the target behavior.

Although not a finding of this study, nurses who continue to recap needles may have been rewarded for this behavior (e.g., patient, family member, or another nurse not stuck by a needle left uncapped by these nurses) or had not been punished by one of these adverse outcomes. It is important to note that the same outcome, not getting stuck by a needle or not getting a disease as a result of getting stuck by a needle, can be a reward for using safe devices or practices, as well as negative reinforcement for not using safe devices and practices. For example, if a nurse consistently used conventional devices (not safety devices) and/or consistently recapped needles without ever getting stuck, this would be negative reinforcement for an undesirable behavior. In addition, getting stuck by a needle could be a punishment for using a safe device that perhaps malfunctioned. For example, if a nurse had been stuck while using a safety device, this adverse consequence, or punishment, might serve to reinforce the nurse to NOT use that device again. Thus, the complex nature of rewards, punishment, and reinforcement for both desirable and undesirable behaviors is illustrated.

The point was made earlier that past needlestick experience appeared to overlap into both predisposing and reinforcing factors. It is probable that the knowledge of such an experience may predispose a nurse toward a target behavior or an undesirable behavior, and that the complex nature of rewards, punishment, and reinforcement serves as reinforcing factors towards desirable and undesirable behavior.

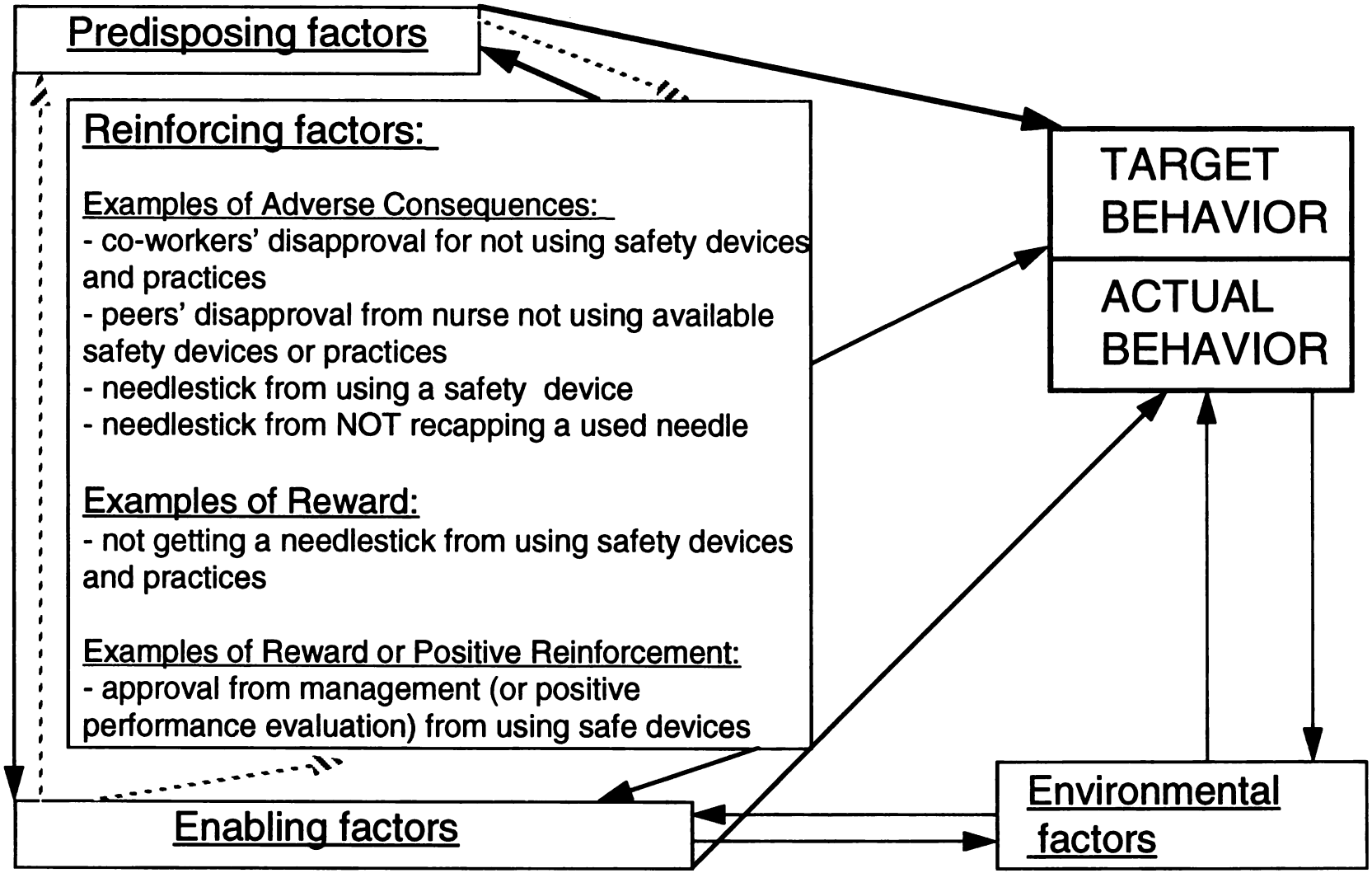
Relationships Between Predisposing, Reinforcing, Enabling and Environmental Factors

As mentioned previously, the PRECEDE component of original PPM was designed as a framework for comprehensive educational and environmental diagnosis and evaluation of predisposing, reinforcing and enabling factors. In this study, relationships between predisposing, reinforcing, enabling and environmental factors in influencing the actual or target behavior or both were suggested from the results of the analysis (see Figure 3). It is also important to discuss potential relationships that deserve further attention.

Predisposing factors were found to influence enabling factors in this study. How enabling factors might influence predisposing factors would occur if resource availability and accessibility affected knowledge, attitudes, beliefs, values or perceptions about safety devices and practices. These influences could be both positive and negative. For example, if a home care agency made safety devices available and accessible, this might positively influence a nurse's attitude towards or knowledge about such devices. This in turn might influence the nurse toward the use of safety devices. If, for example, a nurse was not skilled or experienced in the use of certain devices, this might negatively affect her attitude about the safety of such devices. As a result, the nurse might be reluctant to use specific devices or practices. Thus, these are just two examples suggesting that there may be a relationship between enabling factors and predisposing factors. This potential relationship is indicated by a dotted arrow between these two factors in Figure 4.

In the analysis, a relationship between reinforcing and enabling factors was demonstrated. Whether enabling factors influence reinforcing factors is also possible. For example, if there were safety devices available and accessible at a

Figure 4. Potential Additional Examples of Factors and Relationships in PPM for Future Testing



specific agency and that agency had a positive safety climate that encouraged and rewarded use of safety devices and practices, it is feasible that this might influence a nurse toward safe practice. If another agency had choices of safety and conventional devices but made it known to the nurses that safety devices were more expensive and not effective, this could feasibly negatively influence a nurse's attitudes about the safety of specific devices or beliefs about getting a bloodborne infection. The result might be a reluctance by a nurse to use specific safety devices. Thus, this potential relationship between enabling factors and reinforcing factors is represented by a dotted arrow in Figure 4.

While examples of reinforcing factors influencing predisposing factors were demonstrated in this study, the opposite was not. However, it is possible to infer how such an influence could occur, both in a positive and a negative way. An example of a positive influence would be a nurse with a predisposed belief that it is possible to get a bloodborne pathogen infection from a needlestick. If that nurse then hears about a co-worker who sustains a needlestick from recapping a used needle and contracts hepatitis C, it may positively influence the other nurse towards continuing her practice of not recapping. An example of a negative influence of predisposing factors on reinforcing factors would be a nurse with a predisposed attitude that safety devices are cumbersome and not inherently safe. If that nurse is stuck while using such a device, it may deter future use of the device. Thus, although not demonstrated in this study, it is possible that predisposing factors may influence reinforcing factors and this is represented by a dotted arrow in Figure 4.

The integration of the study results from the analysis resulted in an expanded version of the PPM as depicted in Figure 3. The interpretation of this analytic process, in particular, the addition of other potential examples of the particular factors as well as potential relationships between the predisposing,

reinforcing, enabling and environmental factors and their influence on the use of safe needle devices and practices, produce a further potential expansion of the model as depicted in Figure 4. Future studies using this framework will need to be conducted to expand, test, and validate these findings.

Meaning of Findings in Relation to Research Question #2

The focus group questions in phase two were designed to explore the answer to the second research question (What are perceived barriers to and facilitating conditions for nurses' use of needle safety devices and practices in the home care setting?). The six components of the categorization schema were as follows: (a) specific devices and qualities of devices, (b) environmental factors, (c) organizational factors, (d) control factors, (e) personal R. N. factors, and (f) patient/situational/procedural factors. The complex nature of these components and their inter-relationships as perceived barriers or facilitators are striking. For example, having a particular device available may not be sufficient for it to be a facilitator for safe practice if there are too many distractions in the home. Performing a particular procedure that may be quite risky may be facilitated by the nurse's value of his or her own safety, enabling the nurse to be most careful during such a procedure. On the other hand, a safety device with which a nurse does not have experience may actually be perceived as a barrier to safe practice for that nurse. Having difficult patient access (e.g., having to start an i.v. line in a patient who is in a chair in the corner of the room) may serve as a barrier to safe completion of a particular procedure even if that nurse has an agency that supports safe practice and supplies safe devices.

Another most striking finding regarding these factors was that the same factor may serve as a perceived barrier to one nurse while it may be a facilitating condition for another. There were several examples of this both illustrated by the data examples as well as implied by some of them. Some nurses disliked a

particular sharps container and perceived it to be safe while others in the same agency disliked it and perceived it to be unsafe. The same was true for a particular safety butterfly needle designed for drawing blood.

One of the most salient findings in this study was the apparent effect of a past needlestick injury on the future safe practice of the nurses. This implies that an exposure incident may actually serve as a facilitator for future safe practice of needle safety precautions (e.g., not recapping used needles, immediate disposal of used needles into sharps containers, and consistent use of safety products).

The targeting of education by the study respondents as a necessary element of safe practice implies that adequate education can be a facilitator to safe practice while inadequate education, a barrier. Thus, perceived barriers to and facilitating conditions for nurses' use of safe needle devices and practices in the home care setting were identified. The significance, implications, and future research opportunities relating to these findings are discussed in Chapter Eight.

CHAPTER EIGHT: DISCUSSION

This final chapter addresses the conclusions of the study, their implications, significance, and the study's strengths and limitations. First, the findings from the three parts of the study are synthesized. Next, theoretical, methodological, and practical issues are discussed. Finally, implications of the study for home care nursing and other settings are discussed, and suggestions for future research are proposed.

Significance

Synthesis of Significant Findings

The most significant findings from the three phases of this study are synthesized in the following statements about the phenomena of needlestick or other blood exposures and nurses' safety practices in home health care:

1. Needlesticks and blood exposures in the preliminary background study were most often related to disposal, improper disposal, or during manipulation of intravenous lines and access ports. Devices most often associated with needlesticks and other blood exposures were port access needles, blood glucose testing devices, and safety syringes with retractable sheaths.

2. Safety devices, particularly sharps disposal containers, have not been specifically designed for use in the home care setting. Major design flaws of sharps containers, for example, include instability when placed on surfaces in the home setting, inadequate size of openings, and tendency to open and spill contents during transport. Sharps disposal containers are an integral piece of safety equipment for home care nurses.

3. There is wide variation, between the home health care agencies in this study, in the types of safety devices available for home health care workers.

4. There is wide variation, in knowledge and experience with particular

safety devices and practices, as well as in education and communication regarding these devices and practices, among registered nurses who work in the home care setting.

5. Perceived barriers and facilitators to safe practice are part of a complex relationship between predisposing, reinforcing, enabling and environmental factors (see Figures 3 and 4). The same factor may be a barrier to one nurse and a facilitator to another.

6. The complex nature of reinforcement (both positive and negative), rewards, and adverse consequences influence safe needle practices and use, as well as undesirable behavior (e.g., recapping used needles).

7. Environmental conditions unique to the home care setting seem to influence the safe practice of home care nurses and are distinctly different from those of the hospital setting. In particular, the unpredictability of the individual setting and the lack of control over the environment were key differences.

Theoretical Significance

In this section, the contributions of this study to the extant substantive literature are discussed. The discussion is framed around the PRECEDE components of the PPM, including predisposing, reinforcing, enabling, and environmental factors.

Predisposing Factors

In this study, it appeared that attitudes and beliefs regarding recapping influenced recapping activities. In addition, health care workers' perception of risk may influence needle safety behaviors. Evaluation of these issues has been addressed in prior studies. For example, Becker et al. (1990) found that two significant patterns regarding recapping emerged. Physicians and nurses who believed that recapping would protect them from acquiring AIDS were significantly more likely to believe that UP recommended recapping. Conversely,

those who knew that UP reduced the risk of AIDS, were aware that UP recommends against recapping.

In the current study, these attitudes and behaviors were also expressed. Some of the nurses in the focus groups believed that leaving an unsheathed needle to be unsafe, hence they stated they would recap it. Others, however, believed it to be unsafe to recap needles, so did not do so. Further, a nurse who does not perceive high personal risk of a bloodborne disease as a result of a needlestick may be less predisposed to use safe practices or devices than a nurse who does not perceive herself to be at high personal risk. In this way, risk perception can act as a facilitator of safe practices in some situations and as a barrier in others.

How nurses perceive the relative risk of various exposures may also influence safety practices. Kendra et al. (1996) found that both home care administrators and home care staff ranked geographic location of home care visits and visits in high crime area as being particularly risky activities. In this study (phase one), nurses also identified personal safety as a concern. If nurses perceive personal safety as more threatening than exposure to blood, this may affect their safety practices. For example in limited circumstances, a nurse who forgets to take a needle safety disposal container into a home in a high crime area, may choose to recap a needle rather than return to the car to retrieve the container. On the other hand, it is not inconceivable that nurses would be capable of dealing with competing risks equally.

In this study, it appeared that knowledge of self or other's exposure situation serves as a predisposing factor toward specific needle handling behaviors. In a study comparing medical students who had and had not been stuck by a used needle (Shalom et al., 1995), "those who experienced a needlestick while recapping were more likely to believe that recapping is more dangerous than the

risk of downstream injuries" (p. 847). This challenges the finding in a study of safety practices in the construction industry (Dedobbeleer and German, 1987), where knowledge of friends or co-workers injured on the job did not significantly contribute to workers compliance with safety practices. This study represents the first (to the author's knowledge) qualitative report where the effects of health care workers' experiences on their practice have been illustrated with descriptive accounts.

It is possible that there are predisposing factors, such as attitudes or beliefs, that may need to be modified in order for education to be effective in changing behavior. In several studies of UP compliance, health care workers who believed that personal protective equipment was cumbersome, interfered with the health care worker-patient relationship, or took too much time were less likely to use the PPE (Michalsen et al., 1997; Williams et al., 1994). In order for education to be effective, the three domains of learning, cognitive, affective, and psychomotor, must be addressed (Bastable, 1997). Knowledge is the target for the cognitive domain, skills in the psychomotor domain, and attitudes and beliefs in the affective domain. When educating nurses about safety products, one must target attitudes and beliefs, along with availability of and knowledge about the device as well as how to use it. This also implies that nurses with positive attitudes and beliefs about the safety of a device or practice may be more receptive to learn than a nurse who believes it to be unsafe.

The value of safety and comfort of the patient versus the safety of the nurse appears to be an important influence on safe practice of home care nurses. Some nurses may choose one value over the other, depending upon the circumstances. For others, it appeared that they always operated under one value (either the patient's safety and comfort or the safety of the nurse). This finding supports those of two studies of UP among health care workers (Gershon et al., 1995;

Michalsen et al., 1997). In the first study (Gershon et al., 1995), compliance among health care workers at three medical centers was higher in employees who perceived a low conflict of interest between the need to protect themselves and the need to provide patient care versus those who perceived a high conflict of interest. Thus, this conflict may be one of a matter of degree, where when the degree of conflict is low, UP compliance will result but when it is high, patient safety will come first. In the second study, (Michalsen et al., 1997), conflict of interest among physicians was found to be significantly and negatively correlated with compliance to general UP. The current study's findings extend those of these previous studies by providing several scenarios to explain this conflict: (a) there may be health care workers (HCWs) who are predisposed to always protect the patient's safety first, (b) there may be HCWs who always place their own safety first, or (c) there may be health care workers who make value decisions based on specific circumstances.

It is important to recognize that this conflict in values may only be a factor that influences safety behavior in other occupational settings where there is a third party involved, such as a patient or customer. It is important to explore why one nurse places patient safety first and another nurse does not, as this may be a unique component of safety behavior in health care work environments.

Reinforcing Factors

The complex nature of positive and negative reinforcement, rewards, and punishments and their effect on worker safety behaviors, has been reported in other occupational settings (Peters, 1991). Peters reports that incentives have been demonstrated to positively influence safety compliance, while disciplinary action has not been found to increase compliance.

The positive influence of a negative event on future safe practice of home care nurses (e.g., not recapping after sustaining an injury) was demonstrated in

this study. In addition, deterrents for using a safe device (e.g., requires two hands, takes more time) or not using safe devices (e.g., needlestick injury) were identified. A literature search has found no other qualitative report demonstrating these self-identified influences in a health care setting.

Peters also found that if deterrents were delayed and infrequent, they thus may not trigger behavior change. Conversely in this study, respondents reported that sustaining an injury did result in a change in future practice. For those who have not experienced a needlestick, other incentives or reinforcing factors, such as education and training, may serve to foster safe practice.

There are numerous potential combinations of rewards, disincentives, and reinforcement that influence both desirable and undesirable behaviors. Identification of several different combinations in this study is an important first step. Once more complex interactions are identified, strategies for changing undesirable behaviors and for reinforcing desirable behaviors can be designed.

Enabling Factors

Availability and accessibility of safety devices, and safety support from the agency were reported to be positive enabling factors by nurses in the study. These findings support other studies where positive safety climate significantly influenced compliance with Universal Precautions in the health care work environments (Gershon, Felknor & Delclos, 1993; Gershon et al., 1995 & 1999; Michalsen et al., 1997; White & Berger, 1992). Specifically, these findings validate those of Cohen (1977), where strong management commitment to safety and evidence of added features or variations in safety practices were found to be distinguishing characteristics of successful safety programs in industry.

In the original PRECEDE component of the PPM, training is depicted as influencing enabling factors (see Figure 1). Respondents in all four groups in phase two stated that training was needed to ensure that safe devices and

practices would be used. However, the effect of training on compliance with Universal Precautions or on decreasing needlesticks has varied. In several studies, education was ineffective (Edmond et al., 1988; Lineman et al., 1991; McCormick et al., 1991), while in others, it was effective (Beekman et al., 1990; Haiduven et al., 1992, 1995; Wong et al., 1991). It is noteworthy that in the studies where education was effective, it was combined with other interventions (e.g., convenient placement of sharps containers, communication of needlestick injury data to employees), as found by Haiduven et al. (1992, 1995) and repeated at regular intervals to produce a booster effect (Becker et al., 1990; Haiduven et al., 1992, 1995; Fahey, Koziol, Banks & Henderson, 1991). However, it was not possible to determine whether education alone or a combination of factors contributed to changes. Becker et al. (1990), have suggested that UP educational programs may be too didactic and should focus more on specific issues, such as the risks to healthcare workers from recapping needles. It has also been recommended that education be provided before devices are used as well as after they have been in use for some time, in order to be effective (Ihrig, Cookson, Campbell, Hartstein, & Jarvis, 1997).

The descriptive suggestions of the respondents about education on specific safety products were very informative. They suggested developing skills labs where nurses could practice using devices and have their skills checked at regular intervals; conducting joint home visits when devices are first used in the actual home environment; including managers, staffing coordinators and policy makers from the agencies in the educational sessions; having training not too far before when the device will be used; and having meetings with other nurses at the agency to share product experiences. Hands on experience with devices have been recommended in several reports (Bonner, 1999; Fisher & Schmitz, 1992; Fisher, 1994; Vason, 1999). Respondents in this study verbalized a desire to be

included in device development and selection, so that devices could be designed specifically for the home care setting. This finding validates those in other reports that emphasized the need to include front line workers in product development, evaluation, and selection (Bonner, 1999; Chiarello, 1995; Fisher & Schmitz, 1992; Fisher, 1994; Kroc & Pugliese, 1993; Oda & Askari, 1994; Simpkins et al., 1995; Spear & Askari, 1994).

Environmental Factors

The unique working environment of the home care nurses in this study underscores the importance of the effect of the environment on behavior. In a study of occupational risk perception in home health care workers (Smith, 1995), concludes that there is "a need to re-conceptualize the concept of work environment...especially when the environment is unstructured and unpredictable as in the home health care setting" (p. 204).

The finding from this study, which richly describe the unique environmental workplace conditions in home care from the perspective of the worker, validate the finding of Smith (1995), and provide, possibly, the first published qualitative report of the influence of this environment on safe needle use and practice. The need to recognize and identify environmental factors relative to each type of occupational setting was identified in this study. If researchers and administrators understand these factors, it may assist them in designing interventions to modify the environment to remove barriers or fortify facilitators to safe practice in any occupational setting.

In this study, it appeared that there was a bi-directional relationship between the environment and enabling factors. If the relationship is confirmed, it could extend the original PRECEDE component of the PPM (see Figure 3). This bi-directional relationship has not been discussed in other studies using the PRECEDE component of the PPM (Michalsen et al., 1997; Dedobbeleer &

German, 1987). In fact, the environmental component was not included in the models in these studies. Further research on the relationship between the environment and enabling factors may serve to assist occupational safety and health professionals to understand the complexities of safe practice in the worksite.

Significance of Findings Relating to Other Behavioral Theories

In this study, nurses who felt comfortable with and had experience with a particular device were more likely to use such a device. This reinforces Bandura's Theory of Self-Efficacy (1977, 1982), whose basic premise is that "the expectation of personal mastery and success determines whether an individual will engage in a particular behavior" (Salazar, 1991, p. 130). Specifically, the self-efficacy expectancy was illustrated in this current study, whereby nurses who believed that they could successfully execute the behavior of using particular safety devices or practices were more likely to use such devices and practices (Bandura, 1977, 1982; Salazar, 1991).

Perceived barriers served as significant deterrents to use of safe needle devices and practices in this study. This finding is consistent with previous findings that consistently identified perceived barriers as a significant factor in explaining the variance of safe behavior (Hainey & Krantz, 1999; Janz & Becker, 1984; Pender, 1996; Williams et al., 1994). The design of the current study facilitated not only listing of barriers, but included the opportunity for respondents to provide detailed descriptions of such barriers and how they affect safe practice.

In this study, it was demonstrated that the same device, such as a sharps container or a butterfly needle, may be a barrier to one nurse and a facilitator to another. It appears that other factors may interact to influence whether a particular device is considered a hindrance or a facilitator. Such factors that were

identified by nurses in the study include previous experience with and knowledge of particular safety devices, training on the use of devices, beliefs that a device may compromise patient safety, challenging environmental conditions, and numerous others (see Figure 3).

Methodological Significance

The methods used in studies on compliance with Universal Precautions have included observation, self-report surveys, intervention studies, and combinations of these methods (Gershon et al., 1994; Larson & Kretzer, 1995; Levin, 1995). Major limitations in these studies have been the lack of a standardized definition and measurement of compliance as well as inconsistencies in the reporting of compliance. Another limitation has been the lack of a theoretical framework upon which to base these studies (Larson & Kretzer, 1995; Levin, 1995).

Obstacles to universal precaution compliance and other safe practices were well described by Williams et al., 1994. Seventy percent of subjects identified three or more obstacles that prevented them from full compliance. In addition, training was demonstrated to have a significant effect on practice.

The current study built upon the work of Williams et al. (1994) by use of open-ended questions. These allowed nurses to more fully describe barriers and facilitating conditions as well as identify new ones that could be missed with forced-choice questionnaires or Likert scales. The format of the focus group, with probes and follow-up questions, enables the researcher to explore and clarify responses of participants to gain a more thorough understanding of factors influencing their practice.

It has already been established that compliance is rarely 100% and that barriers have been the most significant predictor of compliance (see Chapter Three). At this time, it appears that the emphasis should shift from measuring compliance to improving it. To prevent blood exposures, it is necessary to design

studies that can identify and explore such barriers. Identification and exploration of such barriers are necessary to improve compliance by understanding why health care workers behave as they do.

The use of focus groups in this study may have enhanced the understanding of factors influencing safe practice by allowing opportunities for participants to verbalize and explore their perceptions. Hypotheses regarding these factors can be generated from this type of data collection method and tested with other methodologies. However, further strengths of this method are its ability to serve as a self-contained research method as well as a technique that can be used in conjunction with other methods (Morgan, 1988). For example, observation studies in the home care setting could be conducted and findings incorporated into focus groups of participants for validation, clarification, and further exploration.

The focus group method deserves consideration as a valuable tool for studying factors influencing compliance with Universal Precautions and other safe behaviors. In this study, it has provided an initial understanding of the barriers and facilitators that influence the ability of home care nurses to use safe practice and has identified areas for further exploration and validation using this method.

The use of focus groups in this study enhanced the understanding of the factors that influence the ability of home care nurses to use safe practice, by documenting their experiences in their own words. Allowing workers a voice validates their perceptions, and hopefully will help to effect change by providing administrators a framework for understanding the challenges faced by home care nurses.

Practical Significance

It is possible that findings from this study may be used to design

interventions to remove the barriers to safe needle use and practice and to reinforce those facilitating conditions for such safe practice. Many of these examples use the principles of participatory research, a collaborative process of researchers, management, and workers (Kraus, Gardner, Collins, Sorock, & Volinn, 1997; Schurman, 1996). Because these interventions would be based upon the subjective experiences of the workers, the design would be strengthened. The following recommendations for improving work practice in home care were developed based partly on the information gleamed from the participants' comments:

1. Design sharps disposal containers specifically for use in the home care setting. Involve nurses who will be using these devices in product design.

2. Design a portable work surface that can be placed into the home care supply bag or that is part of the bag that allows home care nurses to have a standardized work surface from which to conduct their procedures (Robert Gross, personal communication, October 1996).

3. Improve communication and educational processes within home care agencies about the use of specific safety devices as well as safe practices. Include demonstrations and practice with new products in these processes. Allow time for participants to share both positive and negative experiences about specific products or practices to prevent future exposure incidents in themselves and other home care nurses.

4. Discourage unsafe practices by involving co-workers who have sustained a needlestick in motivational sessions for co-workers.

5. Develop practice scenarios simulating the environmental conditions of the home care setting. Conduct sessions to troubleshoot potentially hazardous situations and to develop strategies for manipulating the environment so that it facilitates safe practice (Bonner, 1999; Fisher, 1995).

6. Advise managers of home care agencies to periodically update the nurses on the risks of acquiring a bloodborne infection from a needlestick or blood exposure. Use the most current information from the Centers for Disease Control and Prevention for this purpose.

7. Involve nurses and managers in development of policies, procedures, and guidelines that will facilitate standardization of supplies sent into the home to avoid the situation where nurses do not have adequate supplies or have supplies with which they are unfamiliar.

8. Involve managers of home care agencies in creating a positive safety climate. Include use of safe products and practices in performance evaluations, and recognize such use in the presence of co-workers, thus rewarding safe practice.

9. Review the circumstances of all blood exposures in each home care agency for purposes of complying with the revised Cal/OSHA Bloodborne Pathogens Standard as well as for designing interventions for prevention of future injuries. Communicate exposure information from the agency directly to the home care personnel on a regular basis.

10. Develop a mechanism for review, evaluation, and product trials of new products designed for safety within the home care agency. Encourage manufacturers to elicit input from product users. Conduct formal product evaluations in the home care setting before purchasing new products (Bonner, 1999; Simpkins et al., 1995; Fisher & Schmitz, 1992; Fisher, 1994).

11. Include registered nurses in safety committees and device evaluation committees.

12. Include health care workers in participatory research in the health and safety field (Kraus et al., 1997; Schurman, 1996).

Critique of the Study

In this section, a critique of this study is presented, with an emphasis on phase two. (Specific limitations to the pilot study and phase one are discussed in Chapter Five.) Within each sub-section, potential limitations and strengths are discussed. The sub-sections include sampling technique and sample selection; methodological issues; credibility, dependability and confirmability; theoretical saturation; group versus individual think; and validation of preliminary study and phase one findings in phase two. This section concludes with a discussion of the usefulness of the PRECEDE/PROCEED model as an organizing and theoretical framework.

Sampling Technique and Sample Selection

The sampling method employed in this study was purposive. In addition, the principle of segmentation was used with the purpose of creating homogeneity within groups and variability between groups. Criticism of the purposive sampling technique focuses on its ability to ensure that the sample selected is representative of the groups sampled. While it is not possible to generalize the results of this study to a particular group, it is possible to assess the representativeness of the sample. In qualitative research, the term "external validity" is analogous to terms of "transferability and fittingness" (Miles & Huberman, 1994). One technique for assessing transferability and fittingness is to compare the characteristics of the sample with the larger population from which it was drawn. This is accomplished by comparing the sample's demographic characteristics to those of registered nurses who work in home care in the United States, or ideally, in California.

Such a specific demographic data base was not available for either U. S. or California home care nurses. There are however, three ways that the representativeness of the sample from phase two were assessed. The first was by

comparing the average number of visits made per day by nurses in the sample to those from home care nurses in national surveys. Four surveys were conducted between 1990 and 1997 and reported by the National Association of Home Care (NAHC, 1999). The average number of visits made per day in the combined surveys was 4.8. In this study, the mean number of visits made per day was 4.9. Thus, the sample used in this study experienced a similar number of visits per day when compared to the national population of home care nurses used in the four surveys.

Another method for assessing representativeness of this sample was by comparing it to the California population of registered nurses from which it was drawn. In a recently released report on the California nursing work force (Sechrist et al., 1999), surveys from the Board of Registered Nursing 1997, the California Nurse Information System Data File 1997, and the Sixth National Sample Survey of Registered Nurses 1996, were used to compile demographic and educational statistics on nurses working in California. The mean age of nurses in the three surveys was 44.8 years. The mean percentage of nurses of male gender was 6.6%. The mean percentage of nurses with Baccalaureate degrees was 31.3%. In the phase two sample from this study, the mean age of the 26 respondents was 47, male nurses comprised 11.5% of the sample, and the percentage of Baccalaureate prepared nurses was 73%.

The third way to assess the representativeness of the sample is by how well the four agencies in phase two represented the different types of home care agencies currently in operation in the United States. The four agencies included small and large size; government, not-for-profit, and for profit organizations; offered a range of services from limited to comprehensive; and served urban, suburban, and a limited number of rural areas.

Using these three methods of assessment, the study sample appeared to

represent a particular subgroup of registered nurses in California. These nurses were older, had a higher percentage of males, and had higher numbers prepared at the Baccalaureate level (the four agencies represented in phase two did not require a Bachelor's Degree in Nursing for home care nurses). Because there is no comparable demographic data base of home care registered nurses in California, it is not possible to ascertain whether this sample was more representative of home care nurses. The number of visits made per day was similar to the national average of home care nurses. Finally, their places of employment represented the range of types and sizes of home care agencies in the United States.

As mentioned previously, there is selection bias inherent in the focus group as a data collection tool. In this study, participants in both phases one and two were present because they wanted to participate; it is unknown how they might differ from those who did not participate. In addition, participants were paid to participate in the focus groups. Thus, the threat of social desirability could have been operating in those who participated, and it is unknown if those who did not participate may have offered differing responses (Burns & Grove, 1993; Lincoln & Guba, 1985).

The major limitation of the sampling plan was the lack of moderator control in selection of the subjects. Therefore, generalizing the results of this study to any setting of registered nurses is not possible due to both the methodology and the sampling technique used.

It would not be a valid criticism to compare the relative percentage of nurses employed in each agency with those who participated in the focus groups. The reason is that a target number of participants was set for all four groups. The number was not intended to represent a specific percentage of nurses employed in each agency. The intent was to have a comfortable number of participants conducive to eliciting information. In the second focus group in phase two, for

example, six persons were scheduled and four actually participated. This was the agency that had the largest number of registered nurses in its employ and the focus group with the smallest number of participants. On the other hand, it was also the session that provided the thickest description of the home care setting. Clearly, the small number of participants did not hinder and may have enhanced the group dynamics.

Methodological Issues

The potential bias of the investigator as moderator in influencing the responses of the participants is a potential limitation in any type of interview format used in qualitative inquiry. Attempts to decrease this threat have been described as "checking for researcher effects" on the participants (Miles & Huberman, 1994, p. 265). In this study, this threat was minimized in both phases by adhering to the original questions; not making judgmental comments; not correcting the participants' responses; and attempting to minimize personal movements, particularly head nodding (Krueger, 1998).

Clarifying assumptions beforehand was conducted by this investigator's dissertation committee in the formulation of focus group questions, to design questions that were non-judgmental. In addition, further efforts to decrease this threat were made by including comments in the moderator's introduction in both phase one and two that there were no right or wrong answers. In the de-briefing session of phase two, focus group #1, this investigator and the research assistant noted that no one had related experiences with recapping a used needle. It was surmised that perhaps no one had related such experiences because they knew it was not recommended. It was decided to preclude this question in the remaining focus group sessions by stating that the purpose of this question was not to point a finger or accuse of wrongdoing, but to make the workplace safer, it was necessary to understand the circumstances that surround the need to recap a

needle or to dispose of it in other than a sharps container. In the subsequent three groups, participants did relate such instances. Whether this may have been partially due to the modified question or that the attitudes and behaviors of group #1 were different is difficult to ascertain; however, this was probably a useful modification in clarifying assumptions.

Credibility, Dependability, and Confirmability

In qualitative research, the truth value of the data is assessed to evaluate the internal validity (Lincoln & Guba, 1985). The criterion of credibility was used for this purpose. The member check was one method used to assess credibility of the findings. (See Appendix C for complete list of questions used in member checks and expert checks.) The members were asked to respond to the following: "After reading this summary of findings, please give your judgment of the overall credibility of these findings. Are they believable to you as representing what makes it easy or difficult for you to use safe devices and practices in the home care setting?" The responses from the three members regarding the overall credibility of the study results are as follows:

Member #1-"I think all of the things on here (study summary of categorization schema components) are credible."

Member #2- "I think it's very believable and presents all the issues regarding the use of safety devices in the home."

Member #3- "Yes, I found them to be believable. Yes, things pop to mind [when reading the results] that I've been there, done that, and I know what most of them mean. [These findings] fit your experience [as a home care nurse]."

According to Lincoln and Guba (1985), "the member check...is the most crucial technique for establishing credibility" (p. 314). These member comments imply that the persons who participated in the groups believed that the summary of results was an adequate representation of the focus group discussions. In

addition, the comments reinforce that the findings of factors influencing their practice of home care nursing were true. Having a member from the fourth focus group may have added to the credibility of the findings, but there were no volunteers.

The use of three experts in the field of home care nursing for substantive verification had the purpose of strengthening the auditability and credibility of the findings. According to Miles and Huberman (1994), this use of peers or colleagues to review the results facilitates establishment of dependability (e.g., auditability and thus reliability) of the findings. Two experts reviewed the categorization schema, the three levels of transformation, and a draft of the discussion section of the dissertation, while a third reviewed just the schema. When asked, "What major issues or concerns do you have with either the findings or the interpretation?" and "Are there any factual or interpretive errors?" the comments from the first expert (with over 25 years of home care experience) were as follows: "I have no major issues or concerns about the findings or interpretation. There was nothing out of the ordinary with either the issues or interpretation of findings." The second expert stated, "All that I have read is typical and believable and it does happen in home care." Finally, the third expert was able to give examples from her own experiences of most of the schema factors and added, "The statements are believable and seem to be inclusive."

When asked to comment on the overall credibility of the findings, the first expert commented, "I feel all of the findings represented in this document are credible. Over the years, I have experienced almost all of the scenarios described or have heard them described repeatedly by peers." According to Lincoln and Guba (1985), the criterion of credibility is established when the experts agree with the researcher's conceptualizations. This can best be illustrated by one of the

reviewers who stated, "I think the focus groups provided candid and honest information about what the situation is in home care in 1999." Such collaboration (e.g., use of colleagues and peers to review) also strengthened the dependability (reliability) of the data (Miles & Huberman, 1994; Lincoln & Guba, 1985). For example, if the experts agreed with or reached the same conclusions as those of the researcher, this would demonstrate that the processes of the study were reasonably consistent and stable (Lincoln & Guba, 1985).

Finally, a qualitative researcher (SK) was used for methodological verification throughout the transformation process. Activities included performing coding checks, collaboration with the development of the categorization schema, and with its integration into the theoretical framework. The coding checks contribute to the dependability of the data (Miles & Huberman, 1994). The collaborative process in development of the schema and integration into the theoretical framework strengthened the confirmability (objectivity) of the findings (Miles & Huberman, 1994) as well as the credibility (Lincoln & Guba, 1985). This was achieved with the development of the components of the categorization schema as the result of this collaborative process.

Theoretical Saturation

It was the intent of this study to continue conducting focus group sessions until the themes resulting from the research questions had been exhausted. At the completion of the fourth focus group session in phase two, it did not appear that any new information regarding perceived barriers to and facilitating conditions was being collected. After the transformation process, it was apparent that not every factor in the PRECEDE component of the original PPM had been illustrated in the study results. Those factors specifically noted to be absent were evidence of the influence of reinforcing factors such as peer or co-workers'

attitudes. However, the absence of this factor was more likely related to the way that the focus group questions were worded, especially since none of the four groups' responses resulted in production of this factor. Thus, it is also unlikely that additional groups in this study would have yielded this information. Future focus group questions may be needed to elicit this type of information.

In each of the four focus groups in phase two, there were different combinations of specific available safety devices and policies regarding their use. Given the variety of devices available in the marketplace, it is unlikely that each potential combination would be exhausted by conducting more focus group sessions. What was exhausted and validated in phase two, however, was the theme of variation in training on and communication about safety devices from phase one. It is likely that this variation contributed to the variety of devices that nurses were able to discuss in the focus group sessions.

No examples of nurses who had been stuck by a safety device were identified in this study, although it is possible that such instances have occurred and that these incidents may discourage future safety product use. It is possible that holding additional focus group sessions might eventually have led to an example of this. However, it is also probable that this might not have been the case, as this information is sensitive. In addition, the small number of subjects in the focus group sessions may have limited the ability to obtain this information. Questions may need to be specifically worded in future focus groups or individual interviews, due to the sensitive nature of the topic, to elicit this information. Use of questionnaires that reach more people and may be more likely to obtain this information, should also be considered.

In summary, it is appears that theoretical saturation of the PPM framework was achieved to the extent possible, given the wording of the focus group questions. Whether more focus groups or additional questions would have led to

additional information regarding needlesticks related to the use of safety devices or not recapping needles, is not possible to definitively ascertain.

Group Versus Individual Think

As previously mentioned in Chapter Six, a phenomenon of focus groups is "group think." Focus group questions in phase two were designed to counteract this phenomenon and determine what each nurse individually perceived as factors making it easiest to perform safe practice as well as factors making it most difficult. However, there were several instances in focus group #3 where group think was occurring on topics tangential to the purpose of this study. For example, several minutes were spent discussing how the staffing coordinators planned the schedules and how several of the participants were dissatisfied with this arrangement.

Validation of Preliminary Study and Phase One Results in Phase Two

A strength of this study was the validation of the findings of the preliminary study and phase one in phase two of the study. Themes expressed in phase one were validated and explored in phase two. The expansion of the phase one theme, "Conditions unique to the home care setting" in phase two allowed an understanding of the context with which these nurses must perform procedures involving blood and body fluids on a daily basis. Many nurses recognize that this uncontrolled environment creates challenges to safe work. The persistent theme of distractions in the home care setting in phase two as a barrier to safe needle use and practice is a significant one and strongly validated phase one findings. The frequency of disposal-related needlestick injuries in the home care setting from the preliminary study was better understood in the context of the environmental conditions delineated in phase one and expanded in phase two. The needlestick risk demonstrated in the pilot study from manipulating port access needles was reiterated in both phases one and two in nurses' descriptions

of one of the most dangerous procedures they are required to perform. Finally, the sharps container as a major factor contributing to sharps injury in the pilot study was reinforced and further expanded both in phase one and phase two.

Usefulness of PPM as an Organizing and Theoretical Framework

The PRECEDE component of the PRECEDE/PROCEED Model was useful as an organizing and theoretical framework for this study for several reasons. First, it served as a guide for the development of the focus group questions, particularly the follow-up questions, for phase two. In this way it was possible to formulate questions that were designed to explore facilitators and barriers to the target behavior while at the same time using a framework that included predisposing, reinforcing, enabling and environmental factors. Next, the PRECEDE component provided means for organizing the results of the study into these factors, through the components of the categorization schema. It was then possible to integrate the study findings into this framework and expand the framework (see Figure 3). Included in this integration was the addition of examples of the different factors as well as relationships between the factors based on the study findings. The model was also useful as a framework from which additional factors could be explored and added if substantiated. Thus, the framework was useful in planning the study, integrating and interpreting the study results and serving as a framework for future studies. It is also likely that this framework could be used to explore safe practice in nurses in other work settings, and in non health care settings.

If there is a gap in the usefulness of this model for this study, it would be in the area of organization. This model is particularly limited in the organizational influences on enabling factors. In a diagram of the original model depicted in Figure 1, only policies, regulations, and organization are listed and appear to influence only enabling factors. These factors comprise the PROCEED portion

(policy, regulatory, and organizational constructs in educational and environmental development), which has been recently developed and not as well tested as the PRECEDE component (Green & Kreuter, 1991). In this study, however, there were numerous examples of organizational factors identified by participants as well as from the discussion about the context of the home care industry. Therefore, the implication from this study is that future use of the model will need to include a more comprehensive set of organizational factors. A representation of the model, with an "explosion" of the PROCEED component, is presented in Figure 5. Further testing of this model should be used to identify a comprehensive set of organizational factors influencing safe practice as well as to determine their relationship to predisposing, reinforcing and enabling factors.

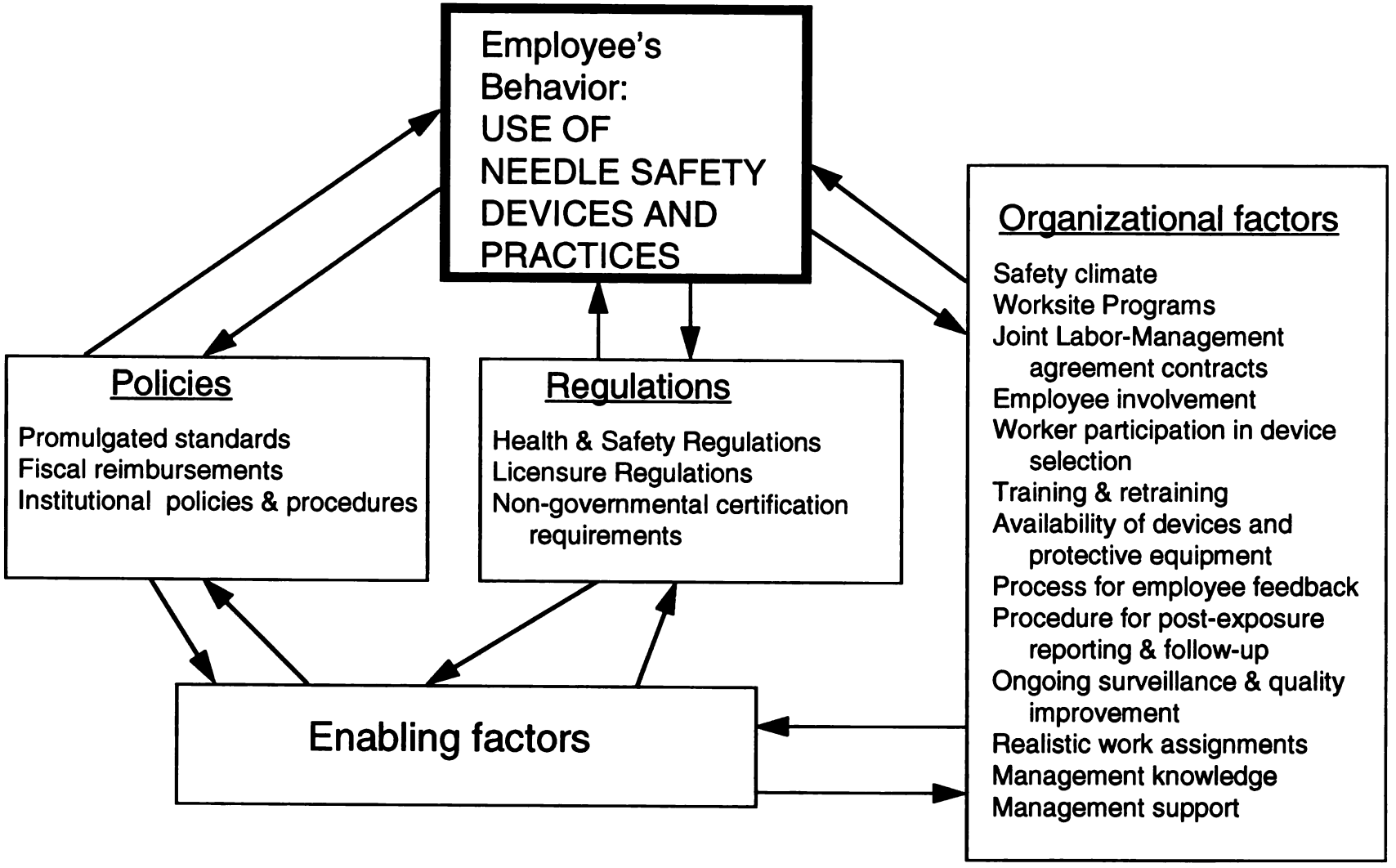
In summary, for purposes of this study, the use of the PRECEDE component of the PRECEDE/PROCEED Model as an organizing framework was overwhelmingly positive. It also serves as a useful matrix for designing a set of factors and relationships influencing safe practice to be explored.

Implications

Focus Groups as Intervention/Education

An additional finding of this study with implications for both nursing and other occupational health settings was the positive response from nurses as a result of participating in the focus group sessions. The research team in both phases one and two noted instances that implied that a future behavior change or some type of learning or both might occur in other participants as the results of participating in these focus group sessions. There were several different examples. In phase one, when asked about ways that nurses communicate difficulties with safety devices in their agencies, one nurse responded, "I think if we had more of these kinds of opportunities [focus groups] to share information

Figure 5 . Potential Explosion of PROCEED Component of PPM for Future Testing



with each other, which this organization does not lend itself to giving us that time to meet and share how we do things and what we find works--giving really good suggestions about how we can help each other--and one way that we could really learn a lot of information."

In phase two, there were other examples. One nurse brought in samples of particular safety devices and in the context of the discussion, demonstrated them to the other participants. Some of the other participants, who were from the same agency, indicated that they had not been aware of several of the available safety devices. Thus, as a result of this focus group session, several nurses were informed about the availability of certain products. When discussing removal of port access needles, one nurse described how she has the patient hold the site, so that if there is a recoil action, the patient will be stuck by his or her own needle instead of the nurse. One or two other nurses replied that this was good idea, implying that they might consider doing this in the future. In the third group, one nurse described how she has the patient use a Kleenex to grab the glucose blood testing strip, to avoid getting blood spillage on the nurse. Three of the other nurses responded, "good idea, good thing we had this talk, and yeah, how nice". One of the participants was instructed by two nurses about a procedure that they felt she was performing incorrectly. At the end of one session, unsolicited, one participant added, "I think we had a chance to discuss so much." Another nurse stated, "Now I can go out and do the next infusion. And feel good about it." Finally, one nurse stated that she signed out several sharps containers at once, to avoid the situation of being without one in the field. Right after this, the moderator asked what influence their co-workers needle disposal practices had on them and another replied, "None, but I just learned a new way to do it [sign out more than one sharps container]."

These examples imply that use of focus groups as an intervention for

encouraging safe practice or for educating nurses has potential to decrease future exposure incidents. In such situations, however, the moderator would have to take a more active role than that in this study, by correcting incorrect statements or procedures that could jeopardize the safety of the nurses. Allowing the opportunity to share experiences with particular products or practices, as well as to demonstrate correct use of specific products, could be incorporated into these sessions. Use of focus groups as an intervention or education strategy also has implications for other occupational settings that involve use of personal protective equipment or safety devices.

Previous Blood Exposure Incident as Facilitator for Future Safe Practice

In this study, the effect of a past needlestick exposure on future safe practice was an important finding. In other words, the consequence for recapping used needles was a needlestick injury along with the stressful post-exposure waiting period. This adverse consequence appeared to be sufficient encouragement for the affected nurses to not recap needles again.

For workers who have not experienced a needlestick, the abstract threat of a potential needlestick may not be enough of an impetus to influence behavior. Actual experience with a personal or another's blood exposure might be necessary to predispose a nurse toward the use of safety devices. Organizing motivational sessions with health care workers who have been stuck by a needle and whom have suffered adverse consequences might be helpful (Becker et al., 1990). Whether such effects will be followed by a change in behavior and if so, whether that behavior is sustained over time, is unknown but the experience may serve as a powerful motivator.

Role playing the aftermath of a simulated needlestick experience at staff meetings or educational sessions, may also be effective. Simulating the testing, counseling, risk notification, and stressful waiting period might serve to

discourage unsafe practices or encourage use of safe devices. With both of these interventions, the emphasis would be on fortifying reinforcing factors of or disincentives for unsafe behavior as well as the predisposing factors of knowledge of the needlestick experience.

An analogous approach has been used by Lusk and associates to improve use of hearing protection among construction workers (Lusk et al., 1999; Lusk, Ronis, & Kerr, 1995). A training film, in which barriers were operationalized by including them in a conversation between a construction worker and an occupational health nurse, was used to demonstrate what makes it difficult to use hearing protection and how to reduce or eliminate these perceived difficulties. Thus, barrier items were translated into an intervention, use of instructional dialogue in the training film. However, the effectiveness of this intervention has not yet been tested.

It might be helpful to use a film where health care workers who had sustained needlestick injuries and resulting seroconversions, and their family members, were interviewed. The difficulty with having to use safe sex practices during the post-exposure period, after having been in monogamous relationships for many years, could be illustrated. Examples of other topics to be included in such films are health care workers who might have contributed to needlesticks in others (e.g., by leaving an unsheathed needle out instead of disposing of it into a sharps container), health care workers who might have been stuck because of another's carelessness, or sustaining needlesticks that could have been prevented by use of safe practice or devices.

Use of role playing and training films to reduce unsafe needle practice warrants further investigation. However, because role playing and films would be based on the subjective experiences of those who work in the home care setting as a result of this study, it is likely that such efforts may improve target

behavior.

It is possible to understand, as a result of this study, why workers do not consistently wear personal protective equipment or use safety devices. However, the challenge is to design interventions to extinguish such behavior and motivate workers towards safe practice. If such negative experiences have become predisposing or reinforcing factors for those individuals, it may be more difficult to change the influence of these factors toward the target safety behavior.

Influence of the Environment on Safe Practice

In this study, the apparent influence of environmental factors on behavior was illustrated. The environmental factors of the home health care setting created numerous challenges for safe practice. These findings could have implications for other occupational settings. The importance of assessing the physical environment of the worker cannot be overemphasized. This assessment should include the equipment that is used, the work space of the employee, the nature of potential distractions, and other persons present in the environment. Barriers to safe practice in each working environment should be then be evaluated and removed or addressed whenever possible. If specific safety equipment is required but is not possible to use safely in a particular environment, then modifications to existing equipment or changes to a different device may be necessary. Distractions (e.g., noises, clutter, other persons) need to be minimized so that work can be performed in as optimal conditions as possible.

The implications for product design are also noteworthy. In this study, evidently the environmental conditions of the home care setting are markedly different from the hospital setting. This implies that safety products need to be designed specifically for the setting in which they are used.

Values of Safety and Comfort of the Patient Versus Nurse's Safety

The influence of the value a nurse places on the comfort and safety of the

patient versus that of the nurse appeared to be an important predisposing factor for the use of safe devices in the home care setting. To those for whom the former was a priority, the emphasis was not on use of safety products if they were felt to cause discomfort or risk to the patient. For those to whom the latter was a priority, the emphasis was on consistent use of the safest device available. If the nurse places more value on the patient's safety, it may compromise that nurse's safety.

There are several implications from these findings. The first is the need to explore what contributes to the development of placing self-protection as a priority and the need to influence nurses to value their own safety as a priority. If this is presented as a choice between self and patient, however, it has ethical implications. Traditionally, nurses have been trained that their primary responsibility is to their patients and according to Florence Nightingale, "... the first requirement...that it should do the sick no harm" (Bartlett, 1992, p. 492). The occupational health field, with its emphasis on the health and safety of the worker, however, was not formally established until the twentieth century (Rogers, 1994). Conflict between these two perspectives may serve as a barrier to use of safe devices and practices in the health care setting. Creation of a safe work environment for both patients and health care workers, where the two values do not have to be in conflict, is essential. This may require continued efforts by occupational health professionals in educating health care workers about the hazards and risks they face in this setting, and by manufacturers to design devices optimizing patient and staff safety.

Future Research

A specific aim of this study was to generate researchable questions and hypotheses for further testing. Results of this study have numerous implications for future research in safe practice for home care nursing, nursing in the hospital

setting, and alternative occupational health settings. The exploratory and descriptive nature of this study yielded valuable preliminary information regarding perceived barriers to and facilitating conditions for nurses' use of needle safety devices and practices in the home care setting. Future research must be conducted to add to this preliminary information, replicate it in this setting, and extend the findings to other settings where safe practice is the target health behavior.

Home Health Care Nursing

There are several areas that should be further explored in the home care setting. Using the framework of the PPM, additional focus groups could be used to identify additional reinforcing factors, particularly the attitudes of peers and co-workers, which may influence safe practice. In addition, participants should be specifically questioned about past needlestick experiences involving the use of particular devices or from not recapping needles to validate the inference that this may serve to influence the use of particular safety devices or sustain the practice of recapping. Further exploration of nurses' values regarding patient safety and comfort versus their own safety is necessary to understand this phenomenon and to design strategies for increasing the value that the nurse places on his or her own safety.

Focus groups of managers of home care agencies should be conducted using the framework of the PPM. Particular emphasis should be placed on exploration of managers' attitudes towards safety and the resultant atmosphere created in the workplace, or safety climate. Such exploration may yield valuable information that can be used to design interventions among managers to create a safer workplace. It would also be important to explore the ways that managers reward safe behavior and discourage unsafe behavior, or if they in some way may reward unsafe behavior. This is necessary due to the complex nature of

rewards, punishment, and reinforcement that was illustrated in this study. How managers balance safety and economic factors should also be explored. Use of other methods, such as surveys, might elicit more information from managers about these issues. In both areas, individual interviews of nurses and managers may elicit additional information on sensitive topics and may reduce the effect of social desirability on responses.

Beyond the exploratory and descriptive levels, intervention studies can be designed to test the effects of various strategies on increasing safety product use and practice, or Needle Safety Precautions. Several examples are listed here. First, a co-worker who had a needlestick injury can be asked to speak at a staff meeting, while measuring safety product use before and after the meeting. Second, safety product use can be measured in different groups of home care nurses who had been given either information to read about a safety product, who had been instructed to use the product by a company representative, who had been allowed to practice use of the device in a classroom setting, and who had been allowed to practice use in the home care setting under the guidance of an instructor or preceptor. Measurement of safety product use in this setting may be facilitated by the practice of many agencies to have nurses sign out for the products they use.

To determine how the Cal/OSHA BBP Standard affects safety product use, observation studies coupled with questionnaires, interviews, or focus groups should be used. The rationale for this is that many agencies do not have information on safety product use before the standard was promulgated, to be able to compare to use after it went into effect.

Information obtained from such studies would be important in future designs of educational programs as well as to further challenge or validate findings from other studies that have not shown education to be effective in

improving compliance with Universal Precautions. The design of such intervention studies should be longitudinal in nature. The rationale for this recommendation is that a gap in many of the previous studies of compliance with Universal Precautions in health care workers has been the lack of longitudinal studies to determine whether any improvement has been sustained over time (Larson & Kretzer, 1995; Wright, Turner, & Daffin, 1997). It may also provide evidence that such interventions need to be repeated at regular intervals to sustain target safety behaviors (Beekman et al., 1994; Kelen et al., 1991). The cost of such studies could be minimized by studying compliance behaviors at more frequent intervals, but for shorter time periods.

The strength of future studies can be increased by using more than one measurement method (Henry et al., 1992; Levin, 1995). Therefore, for example, when measuring safety product use, actual counting of the products used by particular nurses can be coupled with self-report of safety product use by each nurse. As another example, if measuring the needle safety precaution of not recapping needles, a self-report survey coupled with examination of contents of sharps containers to count those which have not been recapped, may be valuable.

Hospital-based Nursing

This results of this study also have implications for hospital-based nursing research. Focus groups of hospital nurses need to be conducted to validate whether similar predisposing, reinforcing, and enabling factors influencing needle safety precautions are in operation. The vast differences between the environmental conditions of home and hospital-based nursing requires exploratory study designs to describe the conditions unique to the hospital-based environment that influence use of needle safety precautions and safe product use. Strategies designed to remove those conditions identified as barriers must then be developed.

A topic identified in this study that needs further exploration is the value placed on patient safety and comfort versus nurses' safety. Future focus groups can be designed to specifically address this topic and gain a better understanding of this phenomenon and how it contributes to safe practice. Many of the suggestions for future research in home care nursing can be applied to this setting as well. These include the measurement of safe product use and compliance with needle safety precautions before and after similar interventions, as well as conducting focus groups of managers in these settings.

Alternative Occupational Health Settings

As with home care nursing and hospital-based nursing, similar implications for future research in alternative occupational settings where target safety behavior is desired apply. The use of the PPM as an organizing framework for identifying predisposing, reinforcing, and enabling factors influencing target safety behaviors (e.g., wearing hearing protection, using fall protection) may be helpful in understanding barriers to and facilitating conditions for those behaviors. Equally important is to identify specific environmental factors influencing safety behaviors in alternative occupational settings, given the apparent influence these factors exert.

The Impact of the Revised Cal/OSHA Bloodborne Pathogens Standard

A major regulatory event, the enactment of the revised Cal/OSHA Bloodborne Pathogens Standard in California, has occurred since the data collection in the study was completed. The impacts of this standard on the health care industry as a whole, and in the home health care field specifically, are areas that warrant further investigation. Universal Precautions have been a requirement of this and the federal standards since 1991. However, as evidenced by the extensive literature in this area, compliance with UP among health care workers has been inconsistent, less than optimal, and hindered by numerous

barriers. Examples of barriers have included lack of availability of personal protective equipment, health care workers not perceiving themselves to be at personal risk, inconvenience, lack of time, and interference with skillful task completion. The rich descriptions from this study of barriers to safe practice in the home care setting illustrate the challenges for compliance with this standard.

It remains to be seen whether compliance by employers with provision and evaluation of safety products, monitoring of sharps injuries, and training on use of devices will improve as a result of this standard. In preliminary data presented by the California Sharps Injury Control Program on activities related to sharps injury surveillance (Boyd, Davis, McNary, Gillen, & Cone, 1999), 653 facilities (a response rate of 23%) responded. Only 22% of skilled nursing facilities and home health agencies reported experience with testing sharps safety devices, and only 44% of all facilities record the type and brand of sharp device involved in exposures on a Sharps Injury Log. The authors conclude that many facilities need assistance to fully comply with the requirements.

The recent enactment of this standard presents an opportunity to compare injury rates and safety device availability in facilities who have routinely recorded this information, before and after the enactment. For those facilities just beginning to comply with this standard, there is a need to develop strategies to ensure that the most accurate and comprehensive data are recorded on the sharps injury logs and in selection and evaluation of safety devices. The home health care industry falls into the latter group and requires a concentrated effort by health care professionals to ensure that safety devices appropriate for this setting are provided to home care workers.

Challenges Facing the Home Health Care Industry

Provision of a safe work environment for home care nurses will face many challenges in the future. Home care agencies in California are required to comply

with the recent amendment to the Cal/OSHA BBP Standard, which was enacted in July 1999. Compliance with this standard will require financial resources for safety devices; training on these devices; and provisions for post-exposure evaluation, treatment, and follow-up for exposed health care workers. At the same time, however, home care agencies are suffering financially under the Prospective Payment System. It has been projected that the percentage of total Medicare benefits for home health agencies will drop by 50% in 1999, to only 3% (NAHC, 1999). It is evident from this study that there are many safety issues that need to be addressed in this particular work environment. It is unknown whether safety will be a priority for administrators of home care agencies, however, particularly when there is evidence that many safety issues have been identified and have yet to be addressed (Kendra, 1996; Kendra et al., 1996). Several safety risks may take precedence over blood exposure risks. The cost of a single needlestick injury that results in acquisition of hepatitis C or HIV in a home care worker, however, may cause financial ruin in a home care agency. It therefore behooves an agency to provide a safe work environment, despite financial and other constraints. A recent consensus panel (Friedman et al., 1999) outlines requirements of essential infection control activities for non-hospital settings. The goals are to protect the patient, the health care workers, visitors, and others in the health care environment in "a timely, efficient, and cost-effective manner, whenever possible" (Friedman et al., p. 423). How this will be achieved with the limited resources available to home care agencies remains to be seen.

In a recent report (Neal, 1999), a theory of home care nursing was proposed which indicated that home care nurses attain autonomy in practice after movement through three stages. Achievement of autonomy requires adaptation, creativity, innovation, and flexibility. The author proposes that administrators

should consider hiring only nurses with medical-surgical experience, and those who have achieved autonomy. An alarming trend may be forming, however. Perhaps considering the nursing shortage, many home care agencies are shortening their experience requirements for registered nurses. There is potential for increasing blood exposure risks if placing less experienced nurses in this unpredictable environment. Given the numerous environmental barriers to safe practice identified in the present study, this potential influx of inexperienced nurses into this work setting is worrisome.

Conclusion

Home health care nurses work in an environment which poses many challenges to safe practice. These include a complex relationship between predisposing, reinforcing, enabling, and environmental factors. Use of focus groups to explore home health care nurses' perceptions of circumstances surrounding blood exposures as well as perceived barriers and facilitating conditions to safe needle practices and use has been a valuable endeavor. It provided a rich description of home care nurses' experiences in the context of the home care setting. It also provided a better understanding of the challenging conditions under which home care nurses attempt to maintain safe work practices. The challenges for health care professionals interested in designing and supporting a safer work environment for home care nurses are identification of these barriers, interventions for removing or reducing them, and promotion of facilitating conditions. The economic, legislative, and technological forces challenging the home care industry have major implications for the need for promoting safe practice in this occupational setting. It is imperative that barriers be removed and facilitating conditions increased to prevent future exposure incidents. Those nurses who work in this challenging setting deserve our respect and a commitment to provision of the safest possible working environment.

REFERENCES

Adams, K. S., Zehrer, C. L., & Thomas, W. (1993). Comparison of a needleless system with conventional heparin locks. American Journal of Infection Control, 21, 263-269.

Agency for Health Care Policy and Research, Center for Cost and Financing Studies. (1997). National medical expenditure survey data.

Aiken, L. H., Sloane, D. M., & Klocinski, J. L. (1997). Hospital nurses' occupational exposure to blood: Prospective, retrospective, and institutional reports. American Journal of Public Health, 87, 103-107.

Aiken, L., West, S., Woodward, C., & Reno, R. (1994). Health beliefs and compliance with mammography-screening recommendations in asymptomatic women. Health Psychology, 13(2), 122-129.

Affonso, D. D., Mayberry, L. J., Shibuya, J., Kunimoto, J., Graham, K. Y., & Sheptak, S. (1993). Themes of stressors for childbearing women on the island of Hawaii. Family Community Health, 16(2), 9-19.

Albrecht, C. & Miller, L. (1989). Impact of AIDS on clinical laboratories. Laboratory Medicine, 20, 187-191.

Alhakami, A., & Slovic, P. (1994). A psychological study of the inverse relationship between perceived risk and perceived benefit. Risk Analysis, 14, 1085-1096.

Alteneder, R. (1992). Using the PRECEDE model to determine junior high school students' knowledge, attitudes, and beliefs about AIDS. Journal of School Health, 62, 464-470.

Alter, M. (1994). Occupational exposure to hepatitis C virus: A dilemma. Infection Control and Hospital Epidemiology, 15, 742-744.

Alter, M. J. (1997). Epidemiology of hepatitis C. Hepatology, 26, 62S-65S.

Alter, M. J., Gerety, R J., Smallwood, L., et al. (1982). Sporadic non-A, non-B hepatitis: Frequency and epidemiology in an urban United States population. Journal of Infectious Diseases, 145, 886-893.

Alter, M. J., Coleman, P. J., Alexander, W. J. et al. (1989). Importance of heterosexual activity in the transmission of hepatitis B and non-A, non-B hepatitis. Journal of the American Medical Association, 262, 1201-1205.

Anglim, A. M., Collmer, J. E., Loving, T. J., Beltran, K. A., Coyner, B. J., Adal, K., Jagger, J., Sojka, N. J., & Farr, B. M. (1995). An outbreak of needlestick injuries in hospital employees due to needles piercing infectious waste containers. Infection Control and Hospital Epidemiology, 16, 570-576.

Arai, Y., Noda, K., Enomoto, N., Arai, K., Yamada, Y., Suzuki, K., & Yoshihara, H. (1996). A prospective study of hepatitis C virus infection after needlestick accidents. Liver, 16, 331-334.

Armstrong, S. E. (1991). The cost of needlestick injuries: The impact of safer needle devices. Nursing Economics, 9, 426-430.

Arnold, L. (1996). HIV infected RN launches national campaign for safer needle technologies [interview]. Tennessee Nurse, 59(5), 17, 34.

Arnold, L. (1997). Needle stick changes nurse's life: Campaign for health care worker safety launched [interview]. Pennsylvania Nurse, 52(1), 4.

Asbury, J. (1995). Overview of focus group research. Qualitative Health Research, 5, 414-421.

Backinger, C. L., & Koustenis, G. H. (1994). Analysis of needlestick injuries to health care workers providing home care. American Journal of Infection Control, 22, 300-306.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review, 84, 191-215.

Bandura, A. (1982). Self-efficacy mechanisms in human agency. American Psychology, 37, 122-147.

Baraff, L. J., & Talan, D. A. (1989). Compliance with universal precautions in a university hospital emergency department. Annals of Emergency Medicine, 18, 654-657.

Bartlett, J. (1992). Bartlett's Familiar Quotations (16th ed.). Boston, MA: Little, Brown, and Company.

Basch, C. E. (1987). Focus group interview: An underutilized research technique for improving theory and practice in health education. Health Education Quarterly, 14, 411-448.

Bastable, S. B. (1997). Nurse as educator: Principles of teaching and learning. Boston: Jones and Bartlett.

Bauer, B. & Kenney, J. (1993). Adverse exposures and use of universal

precautions among perinatal nurses. Journal of Obstetric, Gynecologic, and Neonatal Nursing, 22, 429-435.

Bebbington, M. W., & Treissman, M. J. (1996). The use of a surgical assist device to reduce glove perforations in postdelivery vaginal repair: A randomized controlled trial. American Journal of Obstetrics and Gynecology, 175, 862-866.

Becker, M. H., Janz, N. K., Band, J., Bartley, J., Snyder, M. B. & Gaynes, R. P. (1990). Noncompliance with universal precautions: Why do physicians and nurses recap needles? American Journal of Infection Control, 18, 232-239.

Beekman, S., Vlahov, D., Koziol, D., McShalley, E., Schmidt, J., & Henderson, D. (1994). Temporal association between implementation of universal precautions and a sustained, progressive decrease in percutaneous exposures to blood. Clinical Infectious Diseases, 18, 562-569.

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.

Bennett, N. T., & Howard, R. J. (1994). Quantity of blood inoculated in a needlestick injury from suture needles. Journal of the American College of Surgeons, 178(2), 107-110.

Benson, R., & Taub, D. (1993). Using the PRECEDE model for causal analysis of bulimic tendencies among elite women swimmers. Journal of Health Education, 24, 360-368.

Berry, A. J. (1993). The use of needles in the practice of anesthesiology and the effect of a needleless intravenous administration system. Anesthesia and Analgesia, 76, 1114-1119.

Berry, A. J. (1995). Injury prevention in anesthesiology. Surgical Clinics of North America, 75, 1123-1132.

Birnbaum, D. (1993). Needlestick injuries among critical care nurses before and after adoption of universal precautions or body substance isolation. Journal of Healthcare Materiel Management, 11(8), 38, 40-42.

Bolyard, B., Tablan, O. C., Williams, W. W., Pearson, M. L., Shapiro, C. N., Deitchman, S. D. et al. & the Hospital Infection Control Practices Advisory Committee (HICPAC). (1998). Guideline for infection control in health care personnel. American Journal of Infection Control, 26, 289-354.

Bonner, A. (1999). Safety feature evaluation forms as tools for product

development and evaluation. Infection Control and Sterilization Technology, 4(38), 40-42.

Bowman, A. & Nicholas, T. (1990). Improving compliance with universal blood and body fluid precautions in a rural medical center. Journal of Nursing Quality Assurance, 5(1), 73-79.

Boyd, A., Davis, M., McNary, J., Gillen, M., & Cone, J. (1999). The California sharps injury control program: Results of a statewide survey of health care facilities. The 4th ICOH International Conference on Occupational Health for Health Care Workers, Abstract WP-21.

Brown, R. L. & Holmes, H. (1986). The use of a factor-analytic procedure for assessing the validity of an employee safety climate model. Accident Analysis and Prevention, 18, 455-470.

Bureau of Labor Statistics, U. S. Department of Labor. (1999, August 23). Home health care services: Injuries resulting in absence from work. Monthly Labor Review [On-line]. Available: http://stats.bls.gov/opub/fed/1999/Aug/wk3/art03.htm.

Burns, N., & Grove, S. (1993). The practice of nursing research. (2nd ed.). Philadelphia, PA: W. B. Saunders.

California Division of Occupational Safety and Health. (1996). Guide to Cal/OSHA, California Occupational Safety & Health Program. California: Department of Industrial Relations.

California Division of Occupational Safety and Health. (1998). User's guide to CAL/OSHA, California's workplace safety & health program.

California Occupational Safety and Health Administration. (1998, October 9). Proposed emergency standard to amend section 5193, bloodborne pathogens. [On-line], 1-28. Available: http://www.dir.ca.gov.

Campbell, S., Jochimsen, I., Williams, M., Alter, P., Srivatava, D., Cardo, D. and the National Surveillance System for Hospital Health Care Workers. (1999). Hepatitis C virus infections after occupational exposures among health care workers. The 4th ICOH International Conference on Occupational Health for Health Care Workers, Abstract W1-E.

Cardo, D. M., Culver, D. H., Ciesielski, C. A., Srivastava, P. U., Marcus, R., Abiteboul, D., Heptonstall, J., Ippolito, G., Lot, F., McKibben, P. S., et al. (1997). A case-control study of HIV seroconversions in health care workers after percutaneous exposure. Centers for Disease Control and Prevention Needlestick Surveillance Group. New England Journal of Medicine, 337,

1485-1490.

Carlsen, W. (1998, December 18). Safer needles save money. The San Francisco Chronicle, pp. A1, A19.

Carpenter-Mason, B. (1998). Implications for home health and hospice care under the new prospective payment system. Home Health Care Management and Practice, 10(6), 19-24.

Casadevall, A., Mukherjee, J., Yuan, R., & Perfect, J. (1994). Management of injuries caused by Cryptococcus neoformans--contaminated needles. Clinical Infectious Diseases, 19, 951-953.

Cattledge, G. H. (1996). Nonfatal occupational falls in the West Virginia construction industry. Accident Analysis and Prevention, 28, 665-663.

Cato, D., & Mulhall, B. P. (1994). Needlestick injuries in health care workers: continuing risk and under-reporting [letter; comment]. Medical Journal of Australia, 161, 285.

Centers for Disease Control. (1985). Recommendations for preventing transmission of infection with human T- lymphotropic virus type III/ lymphadenopathy-associated virus in the workplace. MMWR, 34, 681-686, 691-695.

Centers for Disease Control. (1987a). Recommendations for prevention of HIV transmission in health care settings. MMWR, 36(Suppl), 3-12.

Centers for Disease Control. (1987b). Update: Human immunodeficiency virus infections in health care workers exposed to blood of infected patients. MMWR, 36, 285-289.

Centers for Disease Control. (1988). Update: Universal precautions for prevention of transmission of human immunodeficiency virus, hepatitis B virus, and other bloodborne pathogens in health-care settings. MMWR, 37, 377-382, 387-388.

Centers for Disease Control. (1989). Guidelines for prevention of transmission of human immunodeficiency virus and hepatitis B virus to health-care and public-safety workers. MMWR, 38(Suppl), 3-37.

Centers for Disease Control and Prevention. (1991). Hepatitis B virus: A comprehensive strategy for eliminating transmission in the United States through universal childhood vaccination: Recommendations of the Immunization Practices Advisory Committee. MMWR, 40(RR-13), 1-25.

Centers for Disease Control and Prevention. (1994). Guidelines for preventing the transmission of mycobacterium tuberculosis in health care facilities. Federal Register, 59, 54242-54303.

Centers for Disease Control. (1994). Human immunodeficiency virus transmission in household settings-United States. MMWR, 43, 347, 353-356.

Centers for Disease Control and Prevention. (1995a). Case-control study of HIV seroconversion in health-care workers after percutaneous exposure to HIV-infected blood. Morbidity and Mortality Weekly Report, 44, 929-933.

Centers for Disease Control and Prevention. (1995b). Outbreak of Ebola viral hemorrhagic fever-Zaire. Morbidity and Mortality Weekly Report, 44, 468-475.

Centers for Disease Control and Prevention. (1995c). Update: Management of patients with suspected viral hemorrhagic fever- United States. Morbidity and Mortality Weekly Report, 44, 475-479.

Centers for Disease Control and Prevention. (1997a). Evaluation of blunt suture needles in preventing percutaneous injuries among health-care workers during gynecologic surgical procedures--New York City, March 1993-June 1994. Journal of the American Medical Association, 277, 451-452.

Centers for Disease Control and Prevention. (1997b). Evaluation of safety devices for preventing percutaneous injuries among health-care workers during phlebotomy procedures--Minneapolis-St Paul, New York City, and San Francisco, 1993-1995. Journal of the American Medical Association, 277, 449-450.

Centers for Disease Control and Prevention. (1998). Recommendations for prevention and control of hepatitis C virus (HCV) infection and HCV-related chronic disease. MMWR, 47,(No. RR-19), 1-40.

Centers for Disease Control and Prevention. (1999). HIV/AIDS Surveillance Report, 8, 1-39.

Chapin, K. (1999). Nurse retention in home health care: Addressing the revolving door syndrome. Home Health Care Management and Practice, 11(4), 1-9.

Charney, W. (1999). An activation study of a retractable safety syringe. The 4th ICOH International Conference on Occupational Health for Health Care Workers, Abstract W6-A.

Cheng, F. K., Ford, W. L., Cheng, S. Y., Weber, M. D., & Kerndt, P. R. (1995).

Occupational risk of acquiring HIV infection through needlestick injuries. Clinical Performance and Quality Health Care, 3(3), 147-150.

Chia, H. P., Koh, D., & Jeyaratnam, J. (1993). A study of needle stick injuries among medical undergraduates. Annals of the Academy of Medicine, Singapore, 22, 338-341.

Chiarello, L. A. (1995). Selection of needlestick prevention devices: A conceptual framework for approaching product evaluation. American Journal of Infection Control, 23, 386-395.

Choudbury, R. P. & Cleator, S. J. (1992). An examination of needlestick injury rates, hepatitis B vaccination, uptake, and instruction on 'sharps' technique among medical students. Journal of Hospital Infection, 22, 143-148.

Cockroft, A., Oakley, K., Gooch, C., & Mastin, S. (1994). Anxiety and perception of risk of HIV and hepatitis B infection among health care workers reporting accidental exposures to blood and other body fluids. AIDS Care, 6, 205-214.

Coffey, A. & Atkinson, P. (1996). Making sense of qualitative data. Thousand Oaks, CA: Sage.

Cohen, A. (1977). Factors in successful occupational safety programs. Journal of Safety Research, 9, 168-178.

Cole, F. L., & Slocumb, E. M. (1995). Factors influencing safer sexual behaviors in heterosexual late adolescent and young adult collegiate males. Image, 27, 217-223.

Corlett, M. P., England, D. W., Kidner, N. L., Attard, A. R., & Fraser, I. A. (1993). Reduction in incidence of glove perforation during laparotomy wound closure by 'no touch' technique. Annals of the Royal College of Surgeons of England, 75, 330-332.

Courington, K. R, Patterson, S. L., & Howard, R. J. (1991). Universal precautions are not universally followed. Archives of Surgery, 126(1), 93-96.

Cox, T. & Leiter, M. (1992). The health of health care organizations. Work and Stress, 6, 219-227.

Coyle, I. R., Sleeman, S. D., & Adams, N. (1995). Safety climate. Journal of Safety Research, 26, 247-254.

Crowe, H. M., & Tilton, R. C. (1994). Forum: A perspective on hepatitis. Asepsis, 16(2), 13-22.

D'Arco, S. H., & Hargreaves, M. (1995). Needlestick injuries. A multidisciplinary concern. Nursing Clinics of North America, 30(1), 61-76.

Dana, F., Becherer, P. R., & Bacon, B. R. (1994). Hepatitis C virus: What recent studies can tell us. Postgraduate Medicine, 95(6), 121-136.

Dauleh, M. I., Irving, A. D., & Townell, N. H. (1994). Needle prick injury to the surgeon-do we need sharp needles? Journal of the Royal College of Surgeons of Edinburgh, 39, 310-331.

Davis, M. S. (1994). A blunt proposal for a safer surgical environment [letter]. Southern Medical Journal, 87, 1193-1194.

Dedobbeleer, N., and Beland, F. (1991). A safety climate measure for construction sites. Journal of Safety Science, 22, 97-103.

Dedobbeleer, N., & German, P. (1987). Safety practices in a construction industry. Journal of Occupational Medicine, 29, 863-868.

DeJoy, D. M. (1996). Theoretical models of health behavior and workplace self-protective behavior. Journal of Safety Research, 27(2), 61-72.

DeJoy, D., Gershon, R., Murphy, L., & Wilson, M. (1996). A work-systems analysis of compliance with universal precautions compliance among health care workers. Health Education Quarterly, 23, 159-174.

DeLaMare, D. J. & Underwood, J. J. (1997, October). Meet the safety regulations. Nursing Homes, 49-50.

Department of Health and Human Services, National Institutes of Health, and Public Health Service. (1991). Protection of human subjects. Title 45, Code of Federal Regulations, Part 46, 1-21.

DeVries, J., Burnette, M., & Redmon, W. (1991). AIDS prevention: Improving nurses' compliance with glove wearing through performance feedback. Journal of Applied Behavioral Analysis, 24, 705-711.

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 video review. American Journal of Emergency Medicine, 15(1), 34-39.

Dilorio, C., Hockenbery-Eaton, M., Maibach, E., & Rivero, T. (1994). Focus groups: An interview method for nursing research. Journal of Neuroscience Nursing, 26, 175-180.

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

Duffy, M. E. (1987). Methodological triangulation: A vehicle for merging quantitative and qualitative research methods. Image: Journal of Nursing Scholarship, 19, 130-133.

Edmond M., Khakoo, R., McTaggart, B., & Soloman, R. (1988). Effect of bedside needle disposal units on needle recapping frequency and needlestick injury. Infection Control and Hospital Epidemiology, 9, 114-116.

Ellenbecker, C. (1995). Home health care industry growth and change: A study of one state's experience. Home Health Care Services Quarterly, 15(3), 61-81.

Engel, J. D. (1992). Introduction: Issues of methodology in qualitative inquiry. Qualitative Health Research, 2, 373-390.

English, J. F. (1992). Reported hospital needlestick injuries in relation to knowledge/skill, design, and management problems. Infection Control and Hospital Epidemiology, 13, 259-264.

Eustis, T. C., Wright, S. W., Wrenn, K. D., Fowlie, E. J., & Slovis, C. M. (1995). Compliance with recommendations for universal precautions among pre hospital providers. Annals of Emergency Medicine, 25, 512-515.

Fahey, B. J., Beekman, S. E., Schmitt, J. M., Fedio, J. M., and Henderson, D. K. (1993). Managing occupational exposures to HIV-1 in the healthcare workplace. Infection Control and Hospital Epidemiology, 14, 405-12.

Fassel, K., Coyner, B. J., & Jagger, J. (1994). Implementation of a needleless intravenous access system at the university of Virginia hospital. Orc Advisor, 10(7), 4-5.

Finkelstein, L. E., Solomon, R. T., & Mendelson, M. H. (1996). Choosing needlestick prevention devices. American Journal of Nursing, 96(10), 18-19.

Fischoff, B., Bostrom, A., & Quadrel, M. (1993). Risk perception and communication. Annual Review of Public Health, 14, 183-203.

Fishbein, M. (1980). Theory of reasoned action: Some applications and implications. In H. E. Howe (Ed.), Beliefs, attitudes, and values: Nebraska Symposium on Motivation, 1979. Lincoln NB: University of Nebraska Press.

Fishbein, M., Bandura, A., Triandis, H. C., Kanfer, F. H., Becker, M. H., & Middlestadt, S. E. (1991). "Factors influencing behavior and behavior

change". Final report from Theorist's Workshop, Washington, October 3-5, 1991.

Fisher, J. and Schmitz, J. (1992). Safety evaluation forms: Criteria for evaluating medical devices safety features to prevent exposure to bloodborne pathogens. Monograph of the American Hospital Association.

Fisher, J. (1994). Strategies for incorporating health in the design, selection and use of control technology. In W. Charney and J. Schirmer (Eds.), Essentials of Modern Hospital Safety: Volume 3. Chelsea, MI: Lewis Publishers.

Fisher, J. and the Training for the Development of Innovative Control Technology Project. (1995). [Implementation of strategies for the prevention of occupational transmission of bloodborne and related pathogens]. Unpublished raw data.

Folch-Lyon, E. & Trost, J. F. (1981). Conducting focus group sessions. Studies in Family Planning, 12, 443-449.

Fowler, F. (1984). Survey research methods. Newbury Park, CA: Sage.

Fraser, V. J. & Powderly, W. G. (1995). Risk of HIV infection in the health care setting. Annual Review of Medicine, 46, 203-211.

Freeman, S. W. & Chambers, C. V. (1992). Compliance with universal precautions in a medical practice with a high rate of HIV infection. Journal of the American Board of Family Practice, 5, 313-318.

Fried, M. W. and Hoofnagle, J. H. (1995). Therapy of hepatitis C. Seminars in liver disease, 15(1), 82-89.

Friedland, L., Joffe, M., Wiley, J., Schapire, A., & Moore, D. (1992). Effect of educational program on compliance with glove use in a pediatric emergency department. American Journal of Diseases of Children, 146, 1355-1358.

Friedman, C., Barnette, M., Buck, A. S., Ham, R. Harris, J-A., Hoffman, P., Johnson, D., Manian, F., Nicolle, L., Pearson, M. L., Perl, T. M., and Solomon, S. L. (1999). Requirements for infrastructure and essential activities of infection control and epidemiology in out-of-hospital settings: A Consensus Panel Report. American Journal of Infection Control, 27, 418-430.

Friedman, L., Nelson, D., Webb, J., Hoffman, L., & Baer, P. (1994). Dispositional optimism, self-efficacy, and health beliefs as predictors of breast self-examination. American Journal of Preventive Medicine, 10(3), 130-135.

Fry, D. E. (1998). Blood-borne diseases in 1998: An overview. Bulletin of the

American College of Surgeons, 83(10), 13-18, 35.

Garofalo, K. (1996). Home health. In R. Olmstead (Ed.) Infection Control and Applied Epidemiology: Principles and Practices (pp. 90:1-90:22). St. Louis, MO: Mosby.

Gartner, K. (1992). Impact of a needleless intravenous system in a university hospital. American Journal of Infection Control, 20, 75-79.

Garvin, M. (1996). Innovative new equipment lowers risks of needlesticks. Health Facilities Management, 9(10), 68, 70, 72.

Gauch, R., Feeney, K., & Brown, J. (1990). Fear of AIDS and attrition among medical technologists. Journal of Public Health, 80, 1264-1265.

George, V. (1996). Field-workers' sense of coherence and perception of risk when making home visits. Public Health Nursing, 13, 244-252.

Gerberding, J. L, Littell, C., Tarkington, A. et al. (1990). Risk of exposure of surgical personnel to patients' blood during surgery at San Francisco General Hospital. New England Journal of Medicine, 322, 1788-1793.

Gerberding, J., Lewis, F., & Schecter, W. (1995). Are universal precautions realistic? Surgical Clinics of North America, 75, 1091-1094.

Gershon, R. R., Karkashian, C., & Felknor, S. (1994). Universal precautions: An update. Heart and Lung , 23, 352-358.

Gershon, R., Felknor, S. & Delclos, G. (1993). Compliance factors related to universal precautions (Abstract). First National Conference on Human Retroviruses and Related Infections, December 1993, Washington, DC.

Gershon, R., Vlahov, D., Felknor, S., Vesley, D., Johnson, P., Declos, G., & Murphy, L. (1995). Compliance with universal precautions among health care workers at three regional hospitals. American Journal of Infection Control, 23, 225-236.

Gershon, R.M., Karkashian, C. D., Vlahov, D. et al. (1999). Compliance with universal precautions in correctional health facilities. Journal of Occupational and Environmental Medicine, 41, 181-189.

Glaser, B. & Strauss, A. (1967). The discovery of grounded theory. New York: Cambridge University Press.

Glenn, L., & Ramsey, P. (1995). Universal precautions compliance and exposure frequency to patient body fluids in nurses employed by urban and rural

health care agencies. Journal of Rural Health, 11, 158-168.

Goldsmith, Connie and Rogers, Janet S. (1997, November 24). High tech in home care: More options, better services, part I. Nurseweek, 18-19.

Goldsmith, Connie and Rogers, Janet S. (1997, December 8). High tech in home care: More options, better services, part II. Nurseweek, 18-19.

Gooch, B., Cardo, D., Marcus, R., McKibben, P., Cleveland, J., Srivastava, P., Culver, D, & Bell, D. (1995). Percutaneous exposures to HIV-infected blood among dental workers enrolled in the CDC needlestick study. Journal of the American Dental Association, 126, 1237-42.

Grady, M. M., Shortbridge, L., Davis, L., & Klinger, C. (1993). Occupational exposure to bloodborne diseases and universal precautions: Measurement of health care workers' self reported attitudes. AAOHN Journal, 41, 533-540.

Greco, R. J., Wheatley, M., & McKenna, P. (1993). Risk of blood contact through surgical gloves in aesthetic procedures. Aesthetic Plastic Surgery, 17, 167-168.

Green, L. W. (1984). Health education models. In J. D. Matarrazo, S. M. Weiss, J. A. Herd, & N. E. Miller (Eds.), Behavioral health: A handbook of health enhancement and disease prevention (pp. 181-198). New York: John Wiley.

Green, L. W., & Kreuter, M. W. (1991). Health promotion planning: An educational and environmental approach. Mountain View, CA: Mayfield.

Greene, E. S., Berry, A. J., Arnold, W. P., & Jagger, J. (1996). Percutaneous injuries in anesthesia personnel. Anesthesia and Analgesia, 83, 273-278.

Haiduven, D. & Allo, M. (1994). Evaluation of a one-handed surgical suturing device to decrease intraoperative needlestick injuries and glove perforations. (Abstract). Infection Control and Hospital Epidemiology, 15, 344 and 15, 20 (Suppl).

Haiduven, D. (1998). Infecton control challenges in home health care. Infection Control & Sterilization Technology, 4(10), 40-45, 50.

Haiduven, D. J., DeMaio, T. M., & Stevens, D. A. (1992). A five year study of needlestick injuries: Significant reduction associated with communication, education, and convenient placement of sharps containers. Infection Control and Hospital Epidemiology, 13, 265-271.

Haiduven, D. J., Phillips, E., Clemons, K. & Stevens, D. A. (1995). Percutaneous injury analysis: Consistent categorization, effective reduction methods, and future strategies. Infection Control and Hospital Epidemiology, 16, 582-589.

Haiduven, D. J., Simpkins, S. M., Phillips, E. S., & Stevens, D. A. (1999). A survey of percutaneous/mucocutaneous injury reporting in a public teaching hospital. Journal of Hospital Infection, 41, 151-154.

Haiduven, D., Askari, E., Gross, R. & Fisher, J. (1997). Bloodborne exposures in the home care setting: A multi-center analysis. (Abstract). American Journal of Infection Control, 25, 134.

Hainey, J. L. & Krantz, S. (1999). Healthcare workers' beliefs regarding occupational exposures to blood and body fluids. Journal of the Association of Occupational Health Professionals in Healthcare, 19(2), 36-44.

Hammond, J. S., Eckes, J. M., Gomez, G. A., & Cunningham, D. N. (1990). HIV, trauma, and infection control: Universal precautions are universally ignored. Journal of Trauma, 30, 555-561.

Hamory, B. H. (1983). Underreporting of needlestick injuries in a university hospital. American Journal of Infection Control, 11, 174-177.

Hanrahan, A., & Reutter, L. (1997). A critical review of the literature on sharps injuries: Epidemiology, management of exposures and prevention. Journal of Advanced Nursing, 25, 144-154.

Hansen, M. E., Miller, G. L., Redman, H. C., & McIntire, D. D. (1993). Needle-stick injuries and blood contacts during invasive radiologic procedures: Frequency and risk factors. American Journal of Roentgenology, 160, 1119-1122.

Hartley, J. E., Ahmed, S., Milkins, R., Naylor, G., Monson, J. R., & Lee, P. W. (1996). Randomized trial of blunt-tipped versus cutting needles to reduce glove puncture during mass closure of the abdomen. British Journal of Surgery, 83, 1156-1157.

Haupt, B. J. and the National Center for Health Statistics. (1998, April 16). An overview of home health and hospice care patients: 1996 national home and hospice care survey. Advance Data, 297.

Haworth, F. L., & Cook, G. C. (1995). Needlestick malaria [letter]. Lancet, 346, 1361.

Health Care Financing Administration. "Managed care in Medicare and Medicaid." Fact sheet (February 20, 1998).

Heeg, J. M., & Coleman, D. A. (1992). Hepatitis kills. RN, 54(4), 60-66.

Heintges, T. and Wands, J. R. (1997). Hepatitis C virus: Epidemiology and transmission. Hepatology, 26, 521-526.

Henry, G. T. (1990). Practical sampling. Newbury Park, CA: Sage.

Henry, K., & Campbell, S. (1995). Needlestick/sharps injuries and HIV exposure among health care workers: National estimates based on a survey of U. S. hospitals. Minnesota Medicine, 78(11), 41-44.

Henry, K., Campbell, S., & Maki, M. (1992). A comparison of observed and self-reported compliance with universal precautions among emergency department personnel at a Minnesota public teaching hospital: Implications for assessing infection control programs. Annals of Emergency Medicine, 21, 940-946.

Henry, K., Campbell, S., Collier, P., & Williams, C. (1994). Compliance with universal precautions and needle handling and disposal practices among emergency department staff at two community hospitals. American Journal of Infection Control, 22, 129-137.

Hersey, J. & Martin, L. (1994). Use of infection control guidelines by workers in healthcare facilities to prevent occupational transmission of HBV and HIV: Results from a national survey. Infection Control and Hospital Epidemiology, 15, 243-252.

Hibberd, P. L. (1995). Patients, needles, and healthcare workers: understanding the epidemiology, pathophysiology, and transmission of the human immunodeficiency virus, hepatitis B and C, and cytomegalovirus. Journal of Intravenous Nursing, 18(6 Suppl), S22-31.

Howard, J. (1997). Medical center occupational health. In J. LaDou (Ed.), Occupational Medicine (pp. 428-444). Stamford, CT: Appleton & Lange.

Huber, K., Summer, W. (1987). Recapping the accidental needlestick problem. American Journal of Infection Control, 15, 127-130.

Hulley, S. & Cummings, S. (1988). Designing clinical research. Baltimore, MD: Williams & Wilkins.

Hyman, R., Baker, S., Ephraim, R., Moadel, A., & Philip, J. (1994). Health belief model variables as predictors of screening mammography utilization. Journal of Behavioral Medicine, 17, 391-406.

Ihrig, M., Cookson, S. T., Campbell, K., Hartstein, A. I., & Jarvis, W. R. (1997). Evaluation of the accessibility of a needleless vascular-access system by nurses. American Journal of Infection Control, 25, 434-438.

Ippolito, G., De Carli, G., Puro, V., Petrosillo, N., Arici, C., Bertucci, R., Bianciardi, L., Bonazzi, L., Cestrone, A., & Daglio, M. (1994). Device-specific risk of needlestick injury in Italian health care workers. Journal of the American Medical Association, 272, 607-610.

Ippolito, G., Petrosillo, N., Puro, V., Arici, C., & Jagger, J. (1995). The risk of occupational exposure to blood and body fluids for health care workers in the dialysis setting. Italian Multicenter Study on Nosocomial and Occupational Risk of Infections in Dialysis. Nephron, 70, 180-184.

Ippolito, G., Puro, V., Petrosillo, N., De Carli, G. and the Studio Italiano Occupazionale da HIV. (1999). Surveillance of occupational exposure to bloodborne pathogens in health care workers. Eurosurveillance, 4(3), 33-36.

Ippolito, G., Puro, V., Petrosillo, N., Pugliese, G., Wispelwey, B., Bentley, M., Tereskerz, P. M., & Jagger, J. (1997). Prevention, management and chemoprophylaxis of occupational exposure to HIV. University of VA: International Healthcare Worker Safety Center.

Jackson, M. A., Williams, K., Olson-Burgess, C., Kinney, J., Olson, L. C., & Burry, V. F. (1994). Needlestick injuries in a pediatric hospital. Pediatric Infectious Disease Journal, 13, 318-320.

Jagger, J. (1996). Reducing occupational exposure to bloodborne pathogens: Where do we stand a decade later? Infection Control and Hospital Epidemiology, 17, 573-575.

Jagger, J. and Bentley, M. (1995). EPINet Report: Clinical laboratories : Reducing exposures to bloodborne pathogens. Advances in Exposure Prevention, Mar/Apr, 2(3), 1, 2, 6-8.

Jagger, J., Cohen, M., & Blackwell, B. (1994). EPINet: A tool for surveillance and prevention of blood exposures in health care settings. In W. Charney (Ed.), Essentials of Modern Hospital Safety (3rd ed.). Ann Arbor, MI: Lewis Publishers/CRC Press.

Jagger, J., Hunt, E. H., Brand-Elnagger, J., & Pearson, R. D. (1988). Rates of needlestick injury caused by various devices in a university hospital. New England Journal of Medicine, 319, 284-288.

Janz, N. K., & Becker, M. H. (1984). The health belief model: A decade later. Health Education Quarterly, 11(1), 1-19.

Jee, H. G., Chung, M. H., Lee, S. G., Kim, I. S., & Chang, W. H. (1996). Transmission of scrub typhus by needlestick from a patient receiving

pefloxacin. Scandinavian Journal of Infectious Diseases, 28, 411-412.

Jenner, R. K., & Bourke, M. K. (1993). Needlesticks, infection control and nurse liability. National Medical-Legal Journal, 4(1), 6-7.

Joint Commission for the Accreditation of Healthcare Organizations. (1998). Safety management and infection control. Standards for the accreditation of home care. Chicago: Joint Commission.

Jurf, J. B. (1994). Evaluating needleless products. Medsurg Nursing, 3, 176-180.

Kaczmarek, R., Moore, R., McCrohan, J., Arrowsmith-Lowe, J., Caquelin, C., Reynolds, C., & Israel, E. (1991). Glove use by health care workers: Results of a tristate investigation. American Journal of Infection Control, 19, 228-232.

Kelen et al. (1990). Adherence to universal precautions during interventions on critically ill and injured patients. Journal of Acquired Immune Deficiency Syndrome, 3, 987-994.

Kelen, G., Green, G., Hexter, D., Fortenberry, D., Taylor, E., Fleetwood, D., & Sivertson, K. (1991). Substantial improvement in compliance with universal precautions in an emergency department following institution of policy. Archives of Internal Medicine, 151, 2051-2056.

Kendra, M. A. (1996). Perception of risk by home health care administrators and field workers. Public Health Nursing, 13, 386-393.

Kendra, M. A., Weiker, A., Simin, S., Grant, A., & Shullick, D. (1996). Safety concerns affecting delivery of home health care. Public Health Nursing, 13, 83-89.

Kingry, M. J., Tiedje, L. B., & Friedman, L. L. (1990). Focus groups: A research technique for nursing. Nursing Research, 39, 124-125.

Kirkpatrick, B. L., Ricketts, V. E., Reeves, D. S., & MacGowan, A. P. (1993). Needlestick injuries among medical students. Journal of Hospital Infection, 23, 315-317.

Kiyosawa, K., Sodeyama, T., Tanaka, E., Yoshiyuki, N., Furuta, S., Nishioka, K., Purcell, R. H., & Alter, H. J. (1991). Hepatitis C in hospital employees with needlestick injuries. Annals of Internal Medicine, 115, 367-369.

Kramer, F., Sasse, S. A., Simms, J. C., & Leedom, J. M. (1993). Primary cutaneous tuberculosis after a needlestick injury from a patient with AIDS and undiagnosed tuberculosis. Annals of Internal Medicine, 119(7 Pt 1), 594-595.

Krause, J. F., Gardner, L., Collins, J., Sorock, G. & Volinn, E. (1997). Design factors in epidemiologic cohort studies of work-related low back injury or pain. American Journal of Industrial Medicine, 32, 153-163.

Krippendorff, K. (1980). Content analysis: An introduction to its methodology. Beverly Hills, CA: Sage.

Kroc, K., & Pugliese, G. (1993). How to purchase safer needle devices. Materials Management in Health Care, 2(4), 20-23.

Krueger, R. A. (1998). Analyzing and reporting focus group reports. In D. L. Morgan & R. A. Krueger (Eds.). The focus group kit . Thousand Oaks, CA: Sage.

Krueger, Richard A. (1988). Focus groups: A practical guide for applied research. Newbury Park, CA: Sage.

L'Ecuyer, P. B., Schwab, E. O., Iademarco, E., Barr, N., Aton, E. A., & Fraser, V. J. (1996). Randomized prospective study of the impact of three needleless intravenous systems on needlestick injury rates. Infection Control and Hospital Epidemiology, 17, 803-808.

Lanphear, B. P., Linneman, C. C., Canon, C. G., DeRonde, M. M. Pendy, L., and Kerley, L. M. (1994). Hepatitis C infection in healthcare workers: Risk of exposure and infection. Infection Control and Hospital Epidemiology, 15, 745-750.

Larson, E., & Kretzer, E. (1995). Compliance with handwashing and barrier precautions. Journal of Hospital Infection, 30, 88-106.

Larson, E., & Maciorowski, L. (1986). Rational product evaluation. Journal of Nursing Administration, 16(7-8), 31-36.

Larson, E., McGreer, A., Quairishi, Z., Krenzischek, D., Parsons, B., Holdford, J., & Hierholzer, W. (1991). Effect of automated sink on handwashing practices and attitudes in high-risk units. Infection Control and Hospital Epidemiology, 12, 422-427.

Laufer, F. N., & Chiarello, L. A. (1994). Application of cost-effectiveness methodology to the consideration of needlestick prevention technology. American Journal of Infection Control, 22, 75-82.

Leslie, L. F., Woods, J. A., Thacker, J. G., Morgan, R. F., McGregor, W., & Edlich, R. F. (1996). Needle puncture resistance of surgical gloves, finger guards, and glove liners. Journal of Biomedical Materials Research, 33(1), 41-46.

Levin, P. (1995). Improving compliance with universal precautions: Effectiveness of interventions. AAOHN Journal, 43, 362-370.

Levit, K. R., Lazenby, H. C., & Braden, B. R. (January/February 1998). National Health Spending Trends in 1996. Health Affairs, 17(1), 35-51.

Levy, B. S. and Wegman, D. H. (Eds.). (1995). Occupational health: Recognizing and preventing work-related disease. (3rd ed.). Boston, MA: Little, Brown & Co.

Lewis, F. R., Jr., Short, L. J., Howard, R. J., Jacobs, A. J., & Roche, N. E. (1995). Epidemiology of injuries by needles and other sharp instruments. Minimizing sharp injuries in gynecologic and obstetric operations. Surgical Clinics of North America, 75, 1105-1121.

Lincoln, Y. S., & Guba, E. G. (1985). Naturalistic Inquiry. Newbury Park, CA: Sage.

Linneman, C. C., Cannon, C., DeRonde, M., & Lanphear, B. (1991). Effect of educational programs, rigid sharps containers, and universal precautions on reported needlestick injuries in healthcare workers. Infection Control and Hospital Epidemiology, 12, 214-219.

Lipinickey, S. (1986). "Application of the PRECEDE model to a school-based program on drug, alcohol, and tobacco prevention". Paper presented at the Annual Meeting of the American Public Health Assocation, Las Vegas, NV.

Lipscomb, J. & Askari, E. (1994). [Impact of safer devices on workers' attitudes and injuries]. Unpublished raw data.

Loewen, N., Dhillon, G., Wiley, M., Wesley, R., & Henderson, D. (1989). Use of precautions by nurse-midwives to prevent occupational infections with HIV and other bloodborne diseases. Journal of Nurse-Midwifery, 34, 309-317.

Lohrmann, D., & Fors, S. (1986). Can school-based educational programs really be expected to solve the adolsecent drug abuse problem? Journal of Drug Education, 16, 327-339.

Lusk, S., & Kelemen, M. (1993). Predicting use of hearing protection: A preliminary study. Public Health Nursing, 10, 189-196.

Lusk, S. L., Kerr, M. J., Ronis, D. L., and Eakin, B. L. (1999). Applying the health promotion model to development of a worksite intervention. American Journal of Health Promotion, 13, 219-227.

Lusk, S., Ronis, D. L., & Baer, L. M. (1995). A comparison of multiple indicators-

observations, supervisor report, and self-report as measures of workers' hearing protection use. Evaluation and the Health Professions, 18(1), 51-63.

Lusk, S., Ronis, D., & Hogan, M. (1997). Test of the health promotion model as a causal model of construction workers' use of hearing protection. Research in Nursing & Health, 20, 183-194.

Lusk, S., Ronis, D., & Kerr, M. (1995). Predictors of hearing protection use among workers: Implications for training programs. Human Factors, 37, 635-640.

Lusk, S., Ronis, D., Kerr, M., & Atwood, J. (1994). Test of the health promotion model as a causal model of workers' use of hearing protection. Nursing Research, 43, 151-157.

Lynch, P, & White, M. C. (1993). Perioperative blood contact and exposures: A comparison of incident reports and focused studies. American Journal of Infection Control, 21, 357-363.

MacDonald, M., Crofts, N., and Kaldor, J. (1996). Transmission of hepatitis C virus: Rates, routes, and cofactors. Epidemiologic Reviews, 18(2), 137-148.

Magruder, C. & Hamilton, G. (1998). Management of tuberculosis in home health care. Home Health Care Management and Practice, 10(3), 9-20.

Makofsky, D., & Cone, J. E. (1993). Installing needle disposal boxes closer to the bedside reduces needle-recapping rates in hospital units. Infection Control and Hospital Epidemiology, 14, 140-144.

Mangan, K. S (1999, March 12). Nursing schools perplexed by falling enrollment. The Chronicle of Higher Education, A43.

Marcus, R. and the Ceneters for Disease Control Cooperative Needlestick Surveillance Group. (1988). Surveillance of health care workers exposed to patients infected with the human immunodeficiency virus. New England Journal of Medicine, 391, 1118-1123.

Marcus, R., Srivastava, P., Bell, D., McKibben, P., Culver, D., Mendelson, M., Zalenski, R., & Kelen, G. (1995). Occupational blood contact among prehospital l providers. Annals of Emergency Medicine, 25, 776-779.

Marsh, D., Sheikh, A., Kamil, S., Jaffer-uz-Zaman, Qureshi, I., Siraj, Y., Luby, S., & Effendi, S. (1996). Epidemiology of adults hospitalized with burns in Karachi, Pakistan. Burns, 22, 225-229.

Mast, S. T., Woolwine, J. D., & Gerberding, J. L. (1993). Efficacy of gloves in reducing blood volumes transferred during simulated needlestick injury.

Journal of Infectious Diseases, 168, 1589-1592.

McCormick, R. D., Meisch, M. G., Ircink, F. G., & Maki, D. G. (1991). Epidemiology of hospital sharps injuries: A 14 year prospective in the pre-AIDS and AIDS eras. American Journal of Medicine, 91(Suppl 3B), 301S-307S.

McFarren-Grady, M., Shortbridge, L. A., Davis, L. S., & Klinger, C. S. (1993). Occupational exposure to bloodborne diseases and universal precautions: Measurement of health care workers' self-reported attitudes. AAOHN Journal, 41, 533-540.

McKay, G. (1992). Comparing perceived and observed infection control practices among anesthesia providers. Journal of the American Association of Nurse Anesthetists, 60, 360.

Merton, R. K. (1987). The focused interview and focus groups: Continuities and discontinuities. Public Opinion Quarterly, 51, 550-556.

Michalsen, A., Declos, G., Felknor, S., Davidson, A., Johnson, P., Vesley, D., Murphy, L., Kelen, G., & Gershon, R. (1997). Compliance with universal precautions among physicians. Journal of Occupational and Environmental Medicine, 39, 130-137.

Miles, M. B., & Huberman, A. M. (1994). Qualitative data analysis. Thousand Oaks, CA: Sage.

Miller, K., Krol, R., & Losh, D. (1992). Universal precautions in the family physician's office. Journal of Family Practice, 35, 163-168.

Mingoli, A., Sapienza, P., Sgarzini, G., Luciani, G., De Angelis, G., Modini, C., Ciccarone, F., & Feldhaus, R. J. (1996). Influence of blunt needles on surgical glove perforation and safety for the surgeon. American Journal of Surgery, 172, 512-6; discussion 516-7.

Morgan, D. L. & Kreuger, R. A. (1998). The focus group kit. Thousand Oaks, California: Sage.

Morgan, D. L. (1995). Why things (sometimes) go wrong in focus groups. Qualitative Health Research, 5, 516-531.

Morgan, David L. (1988). Focus groups as qualitative research. Newbury Park, CA: Sage.

Morgan, David L. (1993). Qualitative content analysis: A guide to paths not taken. Qualitative Health Research, 3,112-121.

Mulherin, S., Rickman, L., & Jackson, M. (1996). Initial worker evaluation of a new safety syringe. Infection Control and Hospital Epidemiology, 17, 593-594.

Mullen, P. , Hersey, J., & Iverson, D. (1987). Health behavior models compared. Social Science & Medicine, 24, 973-981.

Munchus, G., Roberts, V., Rivers, P. A. & Gingerich, B. S. (1999). The U. S. home health care industry: Past, present, and future. Home Health Care Management and Practice, 11(4), 21-30.

Munz, N. (1993). Evaluating needleless i.v. tubing. American Journal of Nursing, 93(2), 74-75.

National Association of Home Care. (1999, September 1). Basic statistics about home care. 1999 Home Care Stats [On-line], 1-19. Available: www. nahc. org/Consumer/hcstats. html.

National Institute of Allergy and Infectious Disease, & National Institutes of Health. (1998). Chronic hepatitis C: Current disease management. February, 1998, no page numbers assigned.

National Institutes of Health. (1997). Consensus development conference statement : Management of hepatitis C. (Draft). March 24-26, 1-26.

National Institute for Occupational Safety and Health. (1999). Alert: Preventing Needlestick Injuries in Health Care Settings. Publication # 2000-108; 1-23.

Neal, L. J. (1999). Neal theory of home health nursing practice. (Abstract). Image: Journal of Nursing Scholarship, 31, 251.

Neufeldt, V. & Guralnik, D. (Eds.) 1991. Webster's new world dictionary. New York: Webster's New World Dictionary.

Nyamathi, A. & Shuler, P. (1990). Focus group interview: A research technique for informed nursing practice. Journal of Advanced Nursing, 15, 1281-1288.

O'Connor, R. E., Krall, S. P., Megargel, R. E., Tan, L. E., & Bouzoukis, J. K. (1996). Reducing the rate of paramedic needlesticks in emergency medical services: The role of self-capping intravenous catheters. Academic Emergency Medicine, 3, 668-674.

Occupational Safety and Health Administration. (1991). Occupational exposure to bloodborne pathogens: Final rule. Federal Register, 56, 64004-64182.

Occupational Safety and Health Administration. (1995). Special report:

Needlestick study. Briefings on Hospital Safety.

Occupational Safety and Health Administration. (1999, November 5). Enforcement procedures for the occupational exposure to bloodborne pathogens. CPL2-2.44D [On-line], 1-79. Available: http//www.osha-slc.gov/OshDoc/Directive_data/CPL_2-2_44D.html.

Oda, D. & Askari, E. (1994). [Injuries and anti-needlestick devices in home healthcare]. Unpublished raw data.

Orenstein, R., Reynolds, L., Karabaic, M., Lamb, A., Markowitz, S. M., & Wong, E. S. (1995). Do protective devices prevent needlestick injuries among health care workers? American Journal of Infection Control, 23, 344-351.

Owens, D., & Nease, R. (1992). Occupational exposure to human immunodeficiency virus and hepatitis B virus: A comparative analysis of risk. American Journal of Medicine, 92, 503-512.

Owens-Schwab, E., & Fraser, V. J. (1993). Needleless and needle protection devices: A second look at efficacy and selection. Infection Control and Hospital Epidemiology, 14, 657-660.

Panlilio, A., Foy, D., Edwards, J., Bell, D., Welch, B., Parrish, C., Culver, D., Lowry, P., Jarvis, W., & Perlino, C. (1991). Blood contacts during surgical procedures. Journal of the American Medical Association, 265, 1533-1537.

Patel, N. & Tignor, G. H. (1997). Device-specific sharps injury and usage rates: An analysis by hospital department. American Journal of Infection Control, 25, 77-84.

Patterson, W. et al. (1985). Occupational hazards to hospital personnel. Annals of Internal Medicine, 102, 658-680.

Pender, N. (1996). Health promotion in nursing practice (3rd ed.). Norwalk, CT: Appleton & Lange.

Pender, N. (1987). A proposed model for health-promoting behavior. In N. Pender (Ed.), Health promotion in nursing practice (pp. 57-72). Los Altos, CA: Appleton-Lange.

Peters, R. H. (1991). Strategies for encouraging self-protective employee behavior. Journal of Safety Research, 22(2), 53-70.

Peterson, C. (1997). Home health care continues to grow. Managed Healthcare, 7(4), 28-30.

Peterson, C. & Stunkard, A. (1989). Personal control and health promotion. Social Science and Medicine, 28, 819-828.

Plog, B. A., Niland, J. & Quinlan, P. J. (1996). Fundamentals of industrial hygiene (4th ed.). Itasca, IL: National Safety Council.

Polit, D. & Hungler, B. (1978). Nursing research: Principles and methods. Philadelphia, PA: J. B. Lippincott.

Prochaska, J. O., & DiClemente, C. C. (1984). The transtheoretical approach: Crossing the traditional boundaries of change. Homewood, IL: J. Irwin.

Pugliese, G. (1997). Reducing the risk of needlestick injuries: How far have we come? Infection Control Today, 1(1), 16-25.

Pugliese, G., & Kroc, K. (1993). Staff input key to evaluate safer needle devices. Health Facilities Management, 6(6), 52, 54-56, 58.

Ragsdale, J. A. (1994). Needle safety in an endoscopy unit. Gastroenterology Nursing, 17(2), 68-70.

Ramsey, P., McConnell, P., Palmer, B. & Glenn, L. (1996). Nurses' compliance with universal precautions before and after implementation of OSHA regulations. Clinical Nurse Specialist, 10, 243-249.

Rannie, K. & Craig, D. (1997). Adolescent females' attitudes, subjective norms, perceived behavioral control, and intentions to use latex condoms. Public Health Nursing, 14, 51-57.

Rice, J. J., McCabe, J. P., & McManus, F. (1996). Needle stick injury. Reducing the risk. International Orthopaedics, 20(3), 132-133.

Ridzon, R., Gallagher, K., Ciesielski, C., Ginsberg, M. B., Robertson, B. J., Luo, C. C., & DeMaria, A., Jr. (1997). Simultaneous transmission of human immunodeficiency virus and hepatitis C virus from a needle-stick injury. New England Journal of Medicine, 336, 919-922.

Roane, C. (1993). Registered nurses' use of universal precautions in the pediatric emergency room. Pediatric Nursing, 19, 453-455.

Roberston, L., Kelley, A., O'Neill, B., Wixom, C., Eiswirth, R., & Haddon, W. (1974). A controlled study of the effect of television messages on safety belt use. American Journal of Public Health, 64, 1071-1080.

Robert, L., & Bell, D. (1994). HIV transmission in the health-care setting. Infectious Disease Clinics of North America, 8, 319-329.

Rogers, B. (1994). Occupational health nursing: Concepts and practice. Philadelphia, PA: W. B. Saunders.

Ronk, L. & Girard, N. (1994). Risk perception, universal precautions compliance: A descriptive study of nurses who circulate. AORN Journal, 59, 253-266.

Rose, M. A., & Alexander, K. J. (1992). Implementation issues in home healthcare universal precautions. Journal of Nursing Administration, 22(12), 51-56.

Rosenberg, A. D., Bernstein, D. B., Bernstein, R. L., Skovron, M. L., Ramanathan, S., & Turndorf, H. (1995). Accidental needlesticks: Do anesthesiologists practice proper infection control precautions? American Journal of Anesthesiology, 22(3), 125-132.

Rosenstock, I. M. (1974). Historical origins of the health belief model. Health Education Monographs, 2, 328-335.

Roy, E. & Robillard, P. (1995). Underreporting of accidental exposures to blood and other body fluids in healthcare settings = An alarming situation. Advances in Exposure Prevention, 1(4), 11.

Rubinson, L., & Baillie, L. (1981). Planning school-based sexuality programs utilizing the PRECEDE model. Journal of School Health, 51, 282-287.

Sass, J., Bertolene, K., Denton, D., & Logsdon, M.C. (1995). Exposure to blood and body fluid: Factors associated with non-compliance in follow-up HIV testing among health care workers. AAOHN Journal, 43, 507-513.

Salazar, M. K. (1991). Comparison of four behavioral theories: A literature review. AAOHN Journal, 39, 128-135.

Schillo, B. & Reischl, T. (1993). HIV-related knowledge and precautions among Michigan nurses. American Journal of Public Health, 83, 1438-1442.

Schwartz, R., Jacobs, L., & Juda, R. (1992). Evaluating the compliance of universal precautions by aeromedical personnel before and after an educational seminar on infectious diseases. Connecticut Medicine, 56(1), 3-5.

Schurman, S. J. (1996). Making the "new american workplace" safe and healthy: A joint labor-manager-researcher approach. American Journal of Industrial Medicine, 29, 373-377.

Sechrist, K. R., Lewis, E. M., & Rutledge, D. N. (1999). Planning for California's nursing work force: Phase II final report. Sacramento, CA: Association of California Nurse Leaders.

Service Employees International Union (SEIU). (1997). The HIV/AIDS book: Information for workers. Washington, DC: SEIU Education and Support Fund.

Seto, W. H., Ching, T. Y., & Chu, Y. B. (1990). Reduction in the frequency of needle recapping by effective education: A need for conceptual alteration. Infection Control and Hospital Epidemiology, 11, 194-196.

Shalom, A., Ribak, J., & Froom, P. (1995). Needlesticks in medical students in university hospitals. Journal of Occupational and Environmental Medicine, 37, 845-9.

Shapiro, C. N. (1995). Occupational risk of infection with hepatitis B and hepatitis C virus. Surgical Clinics of North America, 75, 1047-56.

Shen, C., Jagger, J., Pearson, R. D. (1999). Risk of needle stick and sharp object injuries among medical students. American Journal of Infection Control, 27, 435-437.

Shields, N. A. (1994). Prevention of injury from needlesticks and sharps: An important issue for endoscopy personnel. Gastroenterology Nursing, 16, 181-183.

Shott, S. (1990). Statistics for health professionals. Philadelphia: W. B. Saunders.

Simmons,B., Trusler, M. Roccaforte, J., Smith, P., and Scott, R. (1990). Infection control for home health. Infection Control and Hospital Epidemiology, 11, 362-370.

Simpkins, S., Haiduven, D. J., & Stevens, D. A. (1995). Safety product evaluation: Six years of experience. American Journal of Infection Control, 23, 317-322.

Skolnick, R., LaRocca, J., Barba, D., & Paicius, L. (1993). Evaluation and implementation of a needleless intravenous system: Making needlesticks a needless problem. American Journal of Infection Control, 21, 39-41.

Slovic, P. (1987). Perception of risk. Science, 236, 280-285.

Slovic, P., Fischoff, B., & Lichtenstein, S. (1977). Behavioral decision theory. Annual Review of Psychology, 28, 1-39.

Smith, W. (1995). Occupational Risk Perception in home health care workers. Doctoral dissertation, University of California, San Francisco.

Smith, Wendy A., and White, Mary C. (1993). Home health care: Occupational

health issues. American Association of Occupational Health Nurses Journal, 41, 180-185.

Smyser, M. S., Bryce, J., Joseph, J. G. (1990). AIDS-related knowledge, attitudes, and precautionary behaviors among emergency medical professionals. Public Health Report, 105, 496-504.

Spear, R., & Askari, E. (1994). Compliance with universal precautions in homecare. Unpublished manuscript, University of California at Berkeley.

Stephany, T. M. (1992). The needlestick. American Journal of Nursing, 92(11), 104.

Stevens, C., Mentis, S., & Downs, J. (1991). The human immunodeficiency virus: Knowledge and precautions among anesthesiology personnel. Journal of Clinical Anesthesiology, 3, 266-275.

Stotka, J. L., Wong, E. S., Williams, D. S., Stuart, C. G., Markowitz, S. M. (1991). An analysis of blood and body fluid exposures sustained by house officers, medical students, and nursing personnel on acute-care general medical wards. Infection Control and Hospital Epidemiology, 12, 583-590.

Stringer, B. (1993). A deadly design. The Canadian Nurse, 89(10), 34-36.

Stycos, J. M. (1981). A critique of focus group and survey research: The machismo case. Studies in Family Planning, 12, 450-456.

Sussman, S., Burton, D., Dent, C. W., Stacy, A.W., & Flay, B. R. (1991). Use of focus groups in developing an adolescent tobacco use cessation program: Collective norm effects. Journal of Applied Social Psychology, 21, 1772-1782.

Talan, D. & Baraff, L. (1990). Effect of education on the use of universal precautions in a university hospital emergency department. Annals of Emergency Medicine, 19, 1322-1366.

Tamez, E., & Vacalis, T. (1989). Health beliefs, the significant other, and compliance with regimens among mexican american diabetics. Health Education, 20(6), 24-31.

Tammelleo, A. D. (1994). Nurse exposed to AIDS pt.'s blood sues: Peer privilege. Case in point: Willits v. Superior Court 24 CAL. Rptr. 2d 348--CA (1993). Regan Report on Nursing Law, 34(8), 4.

Tandberg, D., Stewart, K. K., & Doezema, D. (1991). Under-reporting of contaminated needlestick injuries in emergency health care workers. Annals of Emergency Medicine, 20, 66-70.

Taylor, J. R. & McNiel, P. (1998a). Infection control in home healthcare. Part I. Infection Control & Sterilization Technology, 4(9), 36-44, 46.

Taylor, J. R. & McNiel, P. (1998b). Infection control in home healthcare. Part II. Infection Control & Sterilization Technology, 4(10), 46-50.

Taylor, V., Taplin, S., Urban, N., Mahloch, J., Majer, K. (1994). Medical community involvement in a breast cancer screening promotional project. Public Health Reports, 109, 491-499.

Tereskerz, P. M. & Jagger, J. (1997). Occupationally acquired HIV: The vulnerability of health care workers' compensation laws. American Journal of Public Health, 87, 1558-1562.

Tereskerz, P., Bentley, M., & Jagger, J. (1997). The International Healthcare Worker Safety Center: An overview. Journal of Healthcare Safety, Compliance & Infection Control, 1(11), 5-10.

Terrell, F., & Williams, B. (1993). Implementation of a customized needleless intravenous delivery system. Journal of Intravenous Nursing, 16, 339-344.

Thomas, C. (Ed.). (1993). Taber's cyclopedic medical dictionary. (17th ed.). Philadelphia: F. A. Davis.

Tokars, J. I., Marcus, R., Culver, D. H., Schable, C. A., McKibben, P. S., Bandea, C. I., & Bell , D. M. (1993). Surveillance of HIV infection and zidovudine use among health care workers after occupational exposure to HIV-infected blood: The CDC Cooperative Needlestick Surveillance Group. Annals of Internal Medicine, 118, 913-919.

Tokars, J. L., Bell, D. M., Culver, D. H. , et al. (1992). Percutaneous injuries during surgical procedures. Journal of the American Medical Association, 267, 2899-2904.

Triandis, H. C. (1980). Values, attitudes, and interpersonal behavior. In H. E. Howe (Ed.), Beliefs, attitudes, and values: Nebraska symposium on motivation, 1979 (pp. 195-259). Lincoln, NB: University of Nebraska Press.

U. S. Bipartisan Commission on Comprehensive Health Care. (1990). The Pepper commission final report: A call to action. S. Prt.,110-114. Washington DC: Government Printing Office.

U. S. Department of Education, National Institute on Disability and Rehabilitation Research, Disability Statistics Rehabilitation Research and Training Center, University of California, San Francisco. "Disability Statistics

Abstract," Number 17, November 1996.

U. S. Department of Labor/OSHA (1992). Occupational exposure to bloodborne pathogens: Final rule. Federal Register, 56, 64004-64182.

U. S. Department of Labor/OSHA. (1994). Model exposure control plan for home care: A guide for hospice/home agencies on the bloodborne pathogens standard.

U. S. Department of Health and Human Services. (1998). Public health service health care worker exposures to HIV and recommendations for postexposure prophylaxis. MMWR, 47(RR-7), 1-35.

Valenti, W. (1995). Infection control, human immunodeficiency virus, and home health care: II. risk to the caregiver. American Journal of Infection Control, 23, 78-81.

VanderMeer, J. (1993). The cost of home-based care for dependent elders: Who pays? Nursing Economics, 11, 350-357.

Vason, B. (1999). Sharps safety: Steps to implementing safety devices. Infection Control Today, 3(2), 44-48.

Waltz, C., Strickland, O., & Lenz, E. (1991). Measurement in nursing research (2nd ed.). Philadelphia: F. A. Davis Company.

Waterman, J., Jankowski, R., & Madan, I. (1994). Under-reporting of needlestick injuries by medical students. Journal of Hospital Infection, 26, 149-150.

Watters, J., MacCallum, R., Maurice, S., & Robertson, C. (1995). Safelon--a new device to reduce needle-stick injuries during intravenous cannulation. Anaesthesia, 50, 529-531.

Whitby , M., Stead, P., & Najman, J. M. (1991). Needlestick injury: Impact of a recapping device and an associated education program. Infection Control and Hospital Epidemiology, 12, 220-225.

White, C. & Berger, M. (1992). Using force field analysis to promote use of personal protective equipment. Infection Control and Hospital Epidemiology, 13, 752-755.

White, M. C., & Lynch, P. (1993). Blood contact and exposures among operating room personnel: A multi-center study. American Journal of Infection Control, 21, 243- 248.

Williams, I. "New issues on hepatitis C for health care workers." Presented at the

Fourth International Conference on Occupational Health for Health Care Workers, Montreal Canada, September 29, 1999.

Williams, C. O., Campbell, S., Henry, K., & Collier, P. (1994). Variables influencing worker compliance with universal precautions in the emergency department. American Journal of Infection Control, 22, 138-148.

Williams, N. R. (1993). Needlestick and sharps injuries in hygiene service engineers. Occupational Medicine, 43, 132-134.

Williamson, A. M., Feyer, A., Cairns, D. & Biancotti, D. (1997). The development of a measure of safety climate: The role of safety perceptions and attitudes. Safety Science, 25, 15-27.

Williamson, K. M., Sellck, C. S., Turner, J. G., Brown, K. C., Newman, K. D., & Sirles, A. T. (1988). Occupational health hazards for nurses: Infection. Image: Journal of Nursing Scholarship, 20(1), 48-53.

Wilson, A. A. (1998). Policy trends and outcomes in oasis. Home Health Care Management and Practice, 10(6), 38-43.

Wolcott, H. F. (1994). Transforming qualitative data: Description, analysis, and interpretation. Thousand Oaks, CA: Sage.

Wong, S., Stotka, J., & Chinchilli, V., Williams, D., Stuart, G., & Markowitz. (1991). Are universal precautions effective in reducing the numbers of occupational exposures among healthcare workers? Journal of the American Medical Association, 265, 1123-1128.

Wood, E. A. (1995). Emergency needlestick injury. Accident and Emergency Nursing, 3(3), 118-121.

Worthington, K. (1993). Computer software available for tracking needlestick injuries. American Nurse, 25(3), 10.

Wright, G. & Farrer, J. A. (1993). Needle covers reduce needlestick injuries. Accident Analysis & Prevention, 25, 153-159.

Wright, K. U., Moran, C. G., & Briggs, P. J. (1993). Glove perforation during hip arthroplasty: A randomised prospective study of a new taperpoint needle. Journal of Bone and Joint Surgery British Volume, 75, 918-920.

Wright, B. J., Turner, J. G., & Daffin, P. (1997). Effectiveness of computer-assisted instruction in increasing the rate of universal precautions-related behaviors. American Journal of Infection Control, 25, 426-429.

Wugofski, L. (1992). Needlestick prevention devices: A pointed discussion. Infection Control and Hospital Epidemiology, 13, 295-298.

Wulfert, E., Wan, C., & Backus, C. (1996). Gay men's safer sex behavior: An integration of three models. Journal of Behavioral Medicine, 19, 345-366.

Yassi, A., McGill, M. L., & Khokhar, J. B. (1995). Efficacy and cost-effectiveness of a needleless intravenous access system. American Journal of Infection Control, 23, 57-64.

Zimmerman, R. S. & Vernberg, D. (1994). Models of preventive health behavior: Comparisons, critique, and meta-analysis. Advances in Medical Sociology, 4, 45-67.

Zohar, D. (1980). Safety climate in industrial organizations: Theoretical and applied implications. Journal of Applied Psychology, 65(1), 96-102.

APPENDIX A:

MATERIALS FROM PRELIMINARY STUDY

NEEDLESTICK INJURY WORKSHEET USED IN PRELIMNARY STUDY

OCCUPATION	LOCATION	REASON									TOTAL
		Improper Disposal	Miscellaneous	Before/During/ After Needle Disposal	Pt. Moved during injection / blood draw / IV manip.	Manip. IVs/ Access Ports	During / After blood draw	During / After starting IV	During/ After Injection	Recapping	

APPENDIX B:

MATERIALS FROM PHASE ONE

COPY OF APPROVAL FROM COMMITTEE FOR PROTECTION OF HUMAN SUBJECTS

BERKELEY: COMMITTEE FOR PROTECTION
OF HUMAN SUBJECTS
THE A & E BUILDING #1340
642-7461 • FAX: 643-6272
e-mail:subjects@uclink3.berkeley.edu

September 12, 1996

PROFESSOR ROBERT SPEAR
School of Public Health
Labor Occupational Health Program
2515 Channing Way, #5120

RE: "Implementation of Strategies for the Prevention of Occupational Transmission of Bloodborne Pathogens - Research funded through Trauma Foundation-U60/CCU912178-01-09/98 - School of Public Health, Labor Occupational Health Program

Thank you for sending your revised materials relating to the protocol referred to above. They satisfy the conditions in our e-mail to you of August 29, 1996, and we are pleased to grant full approval.

The number of this project remains 96-8-114. Please continue to refer to this number in all future correspondence about the project.

The expiration date of this approval is August 15, 1997. Approximately six weeks before the expiration date, we will send you a continuation/renewal request form. Please fill out the form and return it to the Committee, according to the instructions.

Attached is a copy of the consent materials reviewed by the Committee; the expiration date of the Committee's review of this form is noted in the bottom right hand corner. Please copy and use this stamped consent form for the coming year and destroy any unsigned, out of date consent forms in your file.

Please note that even though the Committee has approved your project, you must bring promptly to our attention any changes in the design or conduct of your research that affect human subjects.

If you have any questions about this matter, please be in touch with the CPHS staff at 642-7461; FAX 643-6272; Email subjects@uclink3.berkeley.edu.

John S. Watson
Professor in the Graduate School
Department of Psychology
Chair, CPHS

JSW:nan
Attachment
cc: Sponsored Projects Office, 96-2738

COPY OF APPROVED CONSENT FORM

UNIVERSITY OF CALIFORNIA, BERKELEY

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO

SANTA BARBARA • SANTA CRUZ

LABOR OCCUPATIONAL HEALTH PROGRAM
SCHOOL OF PUBLIC HEALTH
2515 Channing Way, 2nd Floor
(510) 642-5507
(510) 643-5698 FAX

BERKELEY, CALIFORNIA 94720-5120

CONSENT FORM

Product Design for the Home Healthcare Setting
Labor Occupational Health Program
School of Public Health
University of California, Berkeley

Dear Home Healthcare Nurse,

I am conducting a study on behalf of Dr. Robert Spear, PhD, at the University of California, Berkeley, in cooperation with the Trauma Foundation of San Francisco, to assess the risk of exposure to bloodborne diseases and the need for improved safety devices in the home healthcare setting. This research is funded by the National Institute for Occupational Safety and Health. The purpose of this letter is to describe the project and ask you to participate in a focus group. The study will include three focus groups, each consisting of six to eight home healthcare nurses. The focus group to which you are being invited will be conducted at your agency on paid work time and will last for one and one-half hours. A series of open-ended questions relating to experiences in home healthcare will be directed to the group. An interviewer will moderate, listen, and observe the discussion. Two co-moderators will observe the discussion, take notes, and ask questions to clarify certain issues.

The session will be tape recorded, but only first names will be mentioned on the tapes. All of the information I obtain from you during the session will be kept confidential. The tapes and discussion notes will be stored in a locked cabinet. Only the study investigators will have access to them. No names will be used on the focus group transcriptions.

After the focus groups one of the investigators will listen to the tapes and extract common themes and attitudes expressed. This information will be used to help the researchers redesign a prototype of a new safety device to prevent bloodborne diseases in home healthcare. The information that is obtained from the focus groups will be used to create a second iteration of the safety device.

Your participation in this study is completely voluntary. You are free to participate or decline. If

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you participate, you may also decline to answer any question or may end your participation at any time. Whether or not you participate will have no effect on your employment.

Although you may not receive any direct benefit from this research, the information that is obtained from the focus groups will used to develop a device that will help nurses perform their jobs in a safer way. Healthcare workers in similar focus groups have found sharing their experiences with co-workers enjoyable and productive.

The only potential risk to you is some loss of privacy by participating in a group discussion of your attitudes and opinions. However, I reiterate that the confidentiality of the information we obtain will be strictly protected by limiting access to the focus group tapes and notes.

All participants will be asked, in a group setting, about their personal work experience and opinions about the prototype. Your individual responses will be heard by others who are present in the group. This might pose some risk to you if your responses are shared by others outside of the focus group. Therefore, please do not disclose anything during the focus group discussion that is personal and/or confidential. Please don't discuss what was said during the discussion outside of the focus group. My goal is to preserve everyone's confidentiality.

If you have any questions, comments, or concerns about your participation in this study you can speak with me. I can be reached at (510) 642-5507, between 9:00am and 5:00pm, Monday through Friday.

Please bring this consent form with you to the focus group meeting.

Sincerely,

Elaine Askari, MPH

My signature below indicates that I consent to participate in this focus group, that I have been given a copy of this consent from, and that I have read and understood it.

Signature:_____

Date:_____

[8/25/97]CONSENT.FOR

SAMPLE OF MODERATOR INTRODUCTION
FOR PHASE ONE FOCUS GROUPS

PRODUCT DESIGN FOR THE HOME HEALTHCARE SETTING PROJECT

Moderator Introduction

Good afternoon and welcome to the session today. Thank you for taking the time to discuss safety devices. My name is Elaine Askari and I am the researcher who is conducting the focus groups for this project. I work at the Labor Occupational Health Program, which is part of the School of Public Health at the University of California at Berkeley. I am interested in hearing your viewpoints and opinions on issues relating to bloodborne diseases and safer medical devices in the home healthcare setting. I will be asking a variety of questions for the group to discuss.

I will be reading this introduction and the discussion questions. I plan to meet with two other groups, and I want to be sure to say the same thing to each group.

The purpose of these focus groups is to get input on what safety products or devices you would like to see modified or developed to protect workers in home health care. This research is being conducted jointly with the Trauma Foundation in San Francisco, and is funded by the National Institute for Occupational Safety and Health (NIOSH). NIOSH conducts research on various health and safety problems at the workplace. Much of the research that NIOSH sponsors is used by the federal Occupational Safety and Health Administration, or OSHA, to set job safety regulations.

I am not employed by your agency and I do not receive funding from it or any other manufacturer of safety devices. This is an independent project funded by the federal government.

There are no right or wrong answers to any of the questions I will ask today. However, people may have different points of view. Please feel free to share your point of view, even if it differs from what others have said.

My role in this focus group is to serve as facilitator. I will ask questions for the group to discuss. I will be accompanied by two of my colleagues who are also working on this study. Robert Gross is a product design engineer, and Donna Haiduven is an infection control nurse. Robert and Donna will help clarify any issues they think are unclear. Donna will also take notes.

Before we begin, let me remind you of some ground rules. Because this is a research project, I will be tape recording this session. Therefore, you will need to speak up, and only one person should speak at a time. I don't want to miss any of your comments.

Please do not disclose anything during the discussion that is personal and/or confidential. Please don't discuss what was said during the discussion outside of the focus group. During the discussion, please don't refer to anyone's name. My goal is to preserve your confidentiality. As stated in the consent form that you signed, the tapes will be held by the researchers in a locked cabinet.

This session will last one hour and 30 minutes, and we will not take a formal break. Feel free to get up at any time if you need to, but please do so quietly.

Any questions?

Let's begin.

SAMPLE OF DEMOGRAPHIC DATA SHEET USED IN PHASE ONE FOCUS GROUPS

Demographic Information

We want the demographic characteristics of participants to ensure diverse representation in our study. We would greatly appreciate a few moments of your time to complete this brief survey. As with all portions of this study, this information will not be used to identify particular participants. Please do not put your name on this.

1. **Age:** ___ 18-22 ___ 23-27 ___ 28-32 ___ 33-37 ___ 38-42
   ___ 43-47 ___ 48-52 ___ 53-57 ___ 58-62 ___ 63-65
   ___ Over 65

2. **Marital status:** ___ Single ___ Living with partner
   ___ Separated ___ Married ___ Divorced ___ Never Married

3. **Sex:** ____ Female ____ Male

4. **Ethnic background:** _____

5. **Nursing Education Received:** ____ Diploma ____ Baccalaureate
   ____ 2-year (Associate Degree) ____ Other (please specify): _____

6. **Number of years of nursing experience:** _____

7. **Number of years working in home healthcare:** _____

8. **Are you currently working in an acute care setting in addition to home care?**
   ____ Yes ____ No

9. **If not, have you ever worked in an acute care setting?** ____ Yes ___ No

10. **(a) During an average week, how many hours do you work?:** _____
    (b) What are the typical number of hours worked per shift in this agency? _____

THANK YOU.

PHASE ONE FOCUS GROUP QUESTIONS

Product Design for the Home Healthcare Setting Project

1. Please state your first name only, your job title, and how long you have worked in home care. Indicate whether you are currently working in acute care.

[Turn on tape recorder here]

2. What circumstances or procedures can contribute to exposure to bloodborne diseases in the home?

3. Describe what the words "safety product" or "safety device" mean to nurses in home healthcare.

4. Describe any recent exposure incidents involving bloodborne pathogens that could have been prevented with a safety device.

5. What safety devices does this agency make available for nurses to use? [How do nurses find out about these devices in this agency?]

6. How are nurses in home healthcare made aware of a safety device?

7. What influences a nurse's decision to use or not use a safety device?

8. Describe safety devices that are difficult to use or that have failed nurses in the home?

9. How do nurses in this agency communicate about difficulties with devices or devices that have failed?

10. Describe the training that this agency gives about safety devices. [How effective is the training? What is good about the training? What could be improved?]

11. What existing safety product or device would you nurses like to see modified for use in the home healthcare setting? What new devices would they like to see developed?

12. Any other comments?

SUMMARY RESPONSES TO PHASE ONE FOCUS GROUP QUESTIONS

1. What circumstances or procedures can contribute to exposure to bloodborne exposures in the home care setting?

Drawing blood, injections, wound care, colostomy care, urine and wound containment, removing port needles, not having the sharps container available when a needle needs to be disposed of, conditions in the home (See "Themes Expressed"), changing dressings, taking care of active gastrointestinal bleeders, removing umbilical cords clamps, gastrostomy tube care, and blood in the sputum.

2. What do the words "safety product" or "safety device" mean to nurses in the home healthcare setting?

Barrier, something to protect you from splashes- especially eyes, sharps boxes, needleless systems, policies & procedures to protect us, something that has been developed to protect you- to help you- use Universal Precautions, something to help me stay safer and work under, something that protects the patient's environment, butterfly safety needles, "chux" (absorbent and plastic-lined sheets to place under patients when inserting catheters or changing dressings), one-way CPR masks, and bottled wound cleansers to avoid using needles to irrigate wounds that causes splashing.

3. Describe any recent exposure incidents involving bloodborne pathogens that could have been prevented with a safety device.

Heel sticks on babies, accessing and de-accessing ports, inserting picc (peripherally inserted central venous catheters) lines, veni-punctures, patients moving when a nurse does a procedure with a needle, not having the needle disposal container at the home and having to somehow dispose of the needle, drawing blood, forgetting to take the top off of the sharps container when it's time to dispose of the needle, using butterfly needles to draw blood due to the difficulty of disposing of them in sharps containers because they can recoil, blood-glucose monitoring devices hard to maneuver, re- sheathing needles that are problematic to utilize with difficult blood draws, doing an unscheduled blood draw (so did not have sharps container available and wrapped syringe in glove, placed in back of car, and was stuck when placing it in needle disposal container, blood dripping onto nurse's clothes, getting splashed with urine, getting clothes splashed when irrigating a wound, and "Huber" exposures when removing needle from patient's port.

4. What safety devices does this agency make available for nurses to use?

Needleless intravenous systems, aprons, gowns, gloves, masks, handwashing agents that don't require water for their use, chemotherapy gloves and gowns, safety lancet (blood-glucose drawing) devices, safety syringes, hazardous waste bags, sharps containers, vacutainers for drawing blood, tuberculosis masks, and footwear that is closed-toe and closed-heel.

5. How are nurses in this agency made aware of safety devices?

Inservices, new employee orientation, on-the-job training, conferences, sales representatives, part of standard supplies, the DeMedici computer (interactive) program, literature that comes with subscriptions to professional journals, regular meetings between nurses and pharmacy companies to discuss supplies, they are introduced in a meeting, new policy, getting a patient whose supplies have been issued by another agency with which the nurse is not familiar, working in an emergency room in an acute care facility and seeing what others use, in a new protocol, and through nursing journals like the Journal of Intravenous Nursing, RN magazine, Nurse week.

6. What influences a nurse's decision to use a safety device?

Time, fear, the hassle factor or convenience, relationship between fear and hassle, past experience with a needlestick injury, learning by mistakes, policy, how easy it is to use, what's available, infection risk to patient, communication to the nurse about how often sticks occur, perceived threat, inexperience with a device, feeling of invulnerability, nursing experience, having had a needlestick injury influences one towards using a safety product in the future.

7. Describe safety devices that are difficult to use or that have failed nurses in the home.

Safety syringes with retractable sheaths, needleless systems are more complicated- involve more steps and parts, involve more time to use, needleless systems which had a connector piece that could use either end- not clear, pieces from needleless system that have more than one use, equipment that nurse is not familiar with, goggles-too big, heavy & cumbersome, aprons that don't provide full coverage to the wearer, masks are hot, regular gloves not fitting as well or being as sturdy as sterile gloves, self-sheathing needle that activated before being used, sharps containers, butterfly needles where the plastic cover slip comes loose from the needle, blood splashes when drawing blood with "safety clicks", still not having a safety intravenous catheter available, splashes when inserting picc catheters, not having well-lit work area, "Huber" needles when removing them from ports.

8. How do nurses in this agency communicate about difficulties with devices or devices that have failed?

Don't, no time, low priority, groups are divided and specialized- so information received not consistent, poor communication, it's discussed if a nurse asks someone a question, calling the pharmacy that provides supplies and drugs for the clients, in the bathroom, on the phone with each other at night, weekly case conferences, passing in the halls, one agency has a complaint form to be filled out if a there is a problem with equipment, contacting supervisors at the agency, and ultimately contacting the company that makes the problematic product.

9. Describe the training that this agency gives about safety devices.

New employee orientation, posted memoranda about e.g. sharps, hauling sharps, use of bleach for cleaning, checking protocol books, getting "checked off" on use of safety devices, packet of literature that comes with product, written instructions, classes which require certification, e.g. venous blood draw, circulation of written materials, having meetings where product representatives do training on a new product, classes with post-tests, and education coordinator teaches a course.

10. What existing safety product or device would nurses like to see modified for use in the home healthcare setting? What new devices would they like to see developed?

A single item sharps container (criteria: small, safe, easy to use, with a substance in it that can harden over the needle, with hinges, biodegradable, and with a handle or that can fit in a pocket), a protective device over needles that can be activated with one hand, a device for doing heel sticks on babies that has a tube attached for collecting a blood specimen that seals around the puncture, so that there is no blood leakage, a device to hold the patient's port when removing "Huber" needles, that is sterile and will not contaminate the patient, safer butterfly needles for blood draws on difficult / small veins, a sharps container (large enough to handle scalpels, with a handle, made of puncture-resistant material, that doesn't tip, without the flanged top), a sharps container with a little piece on the outside that, in case of emergency, a needle can be stuck to the side of temporarily (with opening that has temporary and permanent options, a screw-on lid, easily opened with one hand, with a deodorizer and absorbent material in it, gallon-sized for in-home and smaller for carrying around) and a safer "Huber" needle that would not retract when removed.

APPENDIX C:

MATERIALS FROM PHASE TWO

COPY OF APPROVAL FROM COMMITTEE ON HUMAN RESEARCH

University of California, San Francisco

COMMITTEE ON HUMAN RESEARCH
OFFICE OF RESEARCH AFFAIRS, Box 0962
UNIVERSITY OF CALIFORNIA, SAN FRANCISCO
http://www.ucsf.edu/ora

CHR APPROVAL LETTER

TO: Marion Gillen, PhD, MPH, RN
Box 0608

Donna J. Haiduven, R.N., M.S.N.
Box 0608

RE: Barriers to and Facilitating Conditions for Nurses' Use of Needle Safety Devices and Practices in the Home Care Setting

The Committee on Human Research (CHR), the UCSF Institutional Review Board (IRB) holding Department of Health and Human Services Multiple Project Assurance #M-1169, has reviewed and approved this application to involve humans as research subjects. This included a review of all documents attached to the original copy of this letter.

COMMENT: The members wished to compliment you on the well prepared application.

APPROVAL NUMBER: H8668-15967-01.This number is a UCSF CHR number and should be used on all correspondence, consent forms and patient charts as appropriate.

APPROVAL DATE: January 28, 1999. **Expedited Review**

EXPIRATION DATE: January 28, 2000. If the project is to continue, it must be renewed *by the expiration date*. See reverse side for details.

ADVERSE EVENT REPORTING: All problems having to do with subject safety must be reported to the CHR within ten working days. All deaths, whether or not they are directly related to study procedures, must be reported. Please review Appendix A of the CHR *Guidelines* for additional examples of adverse events or incidents which must be reported.

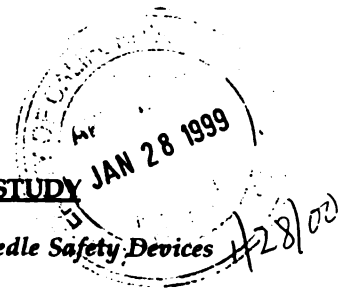
MODIFICATIONS: Prior CHR approval is required before implementing any changes in the consent documents or any changes in the protocol which affect subjects.

QUESTIONS: Please contact the office of the Committee on Human Research at (415) 476-1814 or campus mail stop,

Sincerely,

Arthur R. Ablin, M.D.
Chairman
Committee on Human Research

COPY OF APPROVED CONSENT FORM



PROPOSED CONSENT FORM

University Of California, San Francisco

CONSENT TO PARTICIPATE IN A RESEARCH STUDY

Barriers to and Facilitating Conditions for Nurses' Use of Needle Safety Devices and Practices in the Home Care Setting

A. PURPOSE AND BACKGROUND

Donna Haiduven is a candidate for a PhD degree at the University of California, San Francisco, in the Department of Community Health Systems. Dr. Marion Gillen is her advisor. In partial fulfillment of the degree requirements, she is conducting a study among registered nurses in home care. The purpose of this study is to gain an understanding of the circumstances surrounding blood exposures in the home care setting, as well as factors which contribute to or hinder the use of newer devices designed for safety. This research is partially funded by the National Institutes of Health. The information gained in this study may help others in developing safer work environments. You are being asked to participate in this study because you are a registered nurse who works in the home care setting.

B. PROCEDURES

If you agree to participate, the following will occur:

1. You will participate in a two hour discussion (focus group session) regarding safety practices in home care. The focus group to which you are being invited will be conducted at your agency outside of regular working hours and will last for approximately two hours. A series of open-ended questions relating to experiences in home healthcare will be directed to the group. An interviewer will moderate, listen, and observe the discussion. One or two research assistants will observe the discussion, take notes, and ask questions to clarify certain issues.

2. You will receive a letter from Donna Haiduven notifying you of the time and place of the focus group session.

3. During the focus group session, an audio tape will be made of the discussion.

4. Before the session starts, you will be asked to complete a short questionnaire (9 questions) about your education and work experience.

C. RISKS/DISCOMFORTS

1. Some of the focus group questions may touch on personal or sensitive experiences, such as a blood exposure in yourself or a co-worker. You may choose **not** to discuss anything that you do not want to talk about.

2. If you choose, you can leave the focus group session at any time.

3. **Confidentiality:** Participation in research may mean a loss of privacy. Therefore, a potential risk to you is some loss of privacy by participating in a group discussion of your attitudes and opinions. All participants will be asked, in a group setting, about their personal work experience and opinions. The researchers will ask you and the other people in the group to use only first names during the session. Your individual responses will be heard by others who are present in the group. This might pose some risk to you if your responses are shared by others outside of the focus group. Therefore, please do not disclose anything during the focus group discussion that is personal and/or confidential. Please don't discuss what was said during the discussion outside of the focus group. The goal is to preserve everyone's confidentiality. However, the researchers cannot guarantee that everyone will keep the discussions private.

The session will be tape recorded, but no individual names will be mentioned on the tapes. All of the information obtained from you during the session will be kept confidential. The tapes and discussion notes will be stored in a locked cabinet. Only the study investigators will have access to them.

After the focus groups, the tapes will be transcribed into written form. In addition, the researchers will listen to the tapes and extract common themes and attitudes expressed.

Your responses will remain confidential. There will be no identifying information retained on the written transcripts of the focus group session. No attempts will be made to link information on the transcripts to individual subjects. The results of the focus groups will be reported in summary form, not individual responses. Your employer will only see a summary report and will not be able to identify individuals involved in the focus groups. No information by which you can be identified will be released or published.

D. BENEFITS

Although you may not receive any direct benefit from this research, the information that is obtained from the focus groups may be used to help nurses perform their jobs in a safer way. These potential benefits to you cannot be guaranteed.

E. COSTS

There will be no costs to you as a result of taking part in this study.

F. REIMBURSEMENT

You will be paid $50.00 for your participation in a focus group. This payment will be made to you by check sent through the U. S. mail within 6 weeks after the focus group session.

G. QUESTIONS

You have talked to Donna Haiduven about this study and had your questions answered. If you have further questions, you can call her at 408-723-4719.

If you have any questions, comments, or concerns about your participation in this study, you should first talk with Donna Haiduven. If for some reason you do not wish to do this, you may contact the Committee on Human Research, which is concerned with the protection of volunteers in research projects. You may reach this committee's office between 8:00 and 5:00, Monday through Friday, by calling (415) 476-1814 or by writing: Committee on Human Research, Box 0962, University of California, San Francisco/ San Francisco, CA, 94143.

H. CONSENT

You will be given a copy of this consent form to keep.

PARTICIPATION IN RESEARCH IS VOLUNTARY. You are free to decline to participate in this study. If you participate, you may also decline to answer any question or may end your participation at any time. Whether or not you participate will have no influence on your present or future employment status.

If you agree to participate, you should sign below

_____ _____

Date Signature of Study Participant

_____ _____

Date Signature of Person Obtaining Consent

SAMPLE OF MODERATOR INTRODUCTION

Barriers to and Facilitating Conditions for Nurses' Use of Needle Safety Devices and Practices in the Home Care Setting

Good afternoon and welcome to the session today. Thank you for taking the time to discuss circumstances in the home care setting related to blood exposures and use of safer devices. My name is Donna Haiduven and I am the researcher who is conducting the focus groups for this project. I am an RN who has worked for 15 years in infection control and am a student in the doctoral nursing program at the University of California, San Francisco. I would also like to introduce the other members of the research team, (TO BE ARRANGED) ,who will be serving as recorders in today's session.

I am interested in hearing your viewpoints and opinions on issues related to blood exposures and safer medical device use in the home health care setting. I will be asking a variety of questions for the group to discuss.

I will be reading this introduction and the discussion questions. I plan to meet with at least one other group, maybe more, and want to be sure to say the same thing to each group.

The purpose of these focus groups is to gain an understanding of the circumstances surrounding blood exposures in this setting, as well as the factors which might contribute to or hinder the use of newer devices designed for safety. This research is part of the study for my doctoral dissertation. It is being conducted at the University of California, Berkeley, and is funded partly by the National Institutes of Health.

I am not employed by your agency and I do not receive funding from it or from any manufacturer of safety devices. This is a study that is serving as my doctoral dissertation from the University of California, San Francisco, School of Nursing.

There are no right or wrong answers to any of the questions I will ask today. However, people may have different points of view. Please feel free to share your point of view even if it differs from what others have said. Please feel free to expand on what others have said.

My role in this focus group is to act as a facilitator. I will ask questions for the group to discuss. As I mentioned earlier, my assistants may assist me by taking notes and helping to clarify any issues they think are unclear.
Before we begin, let me remind you of some ground rules. Because this is a research project, we will be tape recording this session. Therefore, you will need to speak up, and only one person should speak at a time. I do not want to miss any of your comments.

Please do not disclose anything during this session that is personal and/or confidential. Please don't discuss what was said during this discussion outside of the focus group. During the discussion, try to avoid referring to a person by name. My goal is to preserve your confidentiality. As stated in the consent form that you signed, all identifying information will be removed from the transcripts, which will be held with the tapes in a locked cabinet by the researchers. Any summary reports from these groups will not have identifying information either.

This session will last approximately 2 hours, and we will not take a formal break. Feel free to get up at any time if you need to, but please do so quietly.

We will start by going around the table and having you introduce yourselves. The tape will not be started until after these introductions..

Any questions?

Let's begin.

SAMPLE OF DEMOGRAPHIC DATA SHEET USED IN PHASE TWO FOCUS GROUPS

Demographic Information

Dear Participant:

We are interested in the demographic characteristics of participants and would greatly appreciate a few moments of your time to complete this brief survey. For each question you answer, please check all choices that apply, when applicable.

1. **Age in years at next birthday:** _____

2. **Sex:** ____ Female ____ Male

3. **Nursing Education Received:**

   ____ Diploma ____ Baccalaureate ____ 2-year Associate

   ____ Master's ____ Other (please specify): _____

4. **Number of years of nursing experience:** _____

5. **Type of home care agency:** (Check all that apply)

   _____ For-profit _____ Not for profit

   _____ Hospital-based _____ Community-based

   _____ Urban _____ Rural _____ Suburban

6. **During an average day, how many home visits do you make?** _____

7. **During an average week, how many hours do you work?** _____

8. **Are you currently working in an acute care setting in addition to home care?**

   ____ Yes ____ No

9. **If not, have you ever worked in an acute care setting?** ____ Yes ____ No

NOTE: As with all portions of this study, this information will not be used to identify particular participants and identities will be kept anonymous.

THANK YOU.

PHASE TWO FOCUS GROUP QUESTIONS

I. Introduction (10 minutes)
Moderator reads opening statement, participants read and sign consent forms and fill out demographic data sheets.

II. Opening Question (2 minutes)
Purpose- to make subjects feel comfortable by identifying characteristics they may have in common.

Question 1: "Please tell us your name and a place you would like to go for a future vacation"

Moderator: "Thank you. We will now start the audio tape."

[Turn on tape recorder here]

II. Introductory Question (10 minutes)

Moderator Lead-in and Question #2: "Before we get into specific questions about blood exposures and practices or products to prevent or decrease such exposures in the home care setting, we'd like to get a better understanding of the conditions under which you work every day. Please describe conditions or circumstances that are unique to the home care work environment".

(Potential follow-ups:)

-Describe the physical set-up (e.g. lighting, beds, electrical outlets, handwashing facilities)

-Tell us about how you bring supplies into the home and what some of those supplies might be

-Tell us about other persons who may be present in the home when you make your visits. What about pets?

III. Transition Statement (3 minutes)

Moderator: "As I mentioned in the introduction, the purpose of this study is to gain an understanding of the circumstances surrounding blood exposures in the home care setting, as well as factors which contribute to or hinder the use of devices designed for safety. Devices we are specifically referring to include sharps disposal containers, injectable syringes with safety features such as retractable shields, needleless devices for entering i.v. lines, and safer devices for drawing blood. Examples of safety practices we are interested in include immediate disposal of sharp objects in sharps containers, not recapping used needles. There may be other devices or practices you would like to share information on, and we encourage you to do so in this next set of questions".

IV. Key Questions
Purpose-to drive the study and require the greatest attention in the analysis

Question #3 (10 minutes): "What factors or circumstances in the home care setting make it easy for you to dispose of needles safely?"

Question #4 (10 minutes): "What factors or circumstances make it difficult for you to dispose of needles safely?"

(Possible follow-ups for both questions, to include predisposing, reinforcing and enabling factors):

-What do you believe to be a definition of safe needle disposal?
-What policies does your agency have regarding needle disposal?
-What is your opinion of your agency's policy on needle disposal?
-What about the availability of sharps containers?
-Describe what influence your co-workers' needle disposal practices have had on you

Question #6 (10 minutes): "What factors or circumstances make it easy for you to use needle safety devices in this setting?"

Question #7 (10 minutes): "What factors or circumstances make it difficult for you to use needle safety devices in this setting?"

(Possible follow-ups for both questions): (To include predisposing, reinforcing, and enabling factors; to validate themes from Phase 2 regarding safety, training on devices, communication within the agencies)

-Describe devices your agency makes available for you to use in the home
-Describe what happens if the patient has a device that you have not been trained on?
-What is your agency's policy regarding the use of such devices?
-What are your attitudes or beliefs regarding the effectiveness of such devices in decreasing blood exposures?
-How safe are these devices for nurses, patients, family members?

Question #8 (5 minutes): "Think back to a time when you may have had to recap a needle or place a used needle in something other than a sharps container. What particular circumstances do you think influenced this action?"

V. Ending Question
Purposes- (a) to bring closure to the discussion, and (b)To enable participants to reflect on previous comments

Question # 9 (5 minutes): "Of all the factors we discussed today, please write down the one which makes it easiest for you to use safe devices or practices in this setting and the one which makes it most difficult for you. Now let's go around the table- please each of you read your answer."

VI. Summary by Moderator (2 minutes)
Purposes- (a) to list most important findings, (b) to tie in discussion results with purpose of study, and (c) to give opportunity for clarification or additional important information

Moderator will provide a 2 minute summary at this point.

VII. Final Question
Purpose- To ensure that critical aspects have not been missed

Question # 10 (5 minutes): "Please think back on the discussion today and the summary I have just presented. Please add anything that you think was missed" OR "Please add anything that you think should be included in future focus groups about this topic"

FORM USED FOR FOCUS GROUP FIELD NOTES

Information About the Focus Group

Date of Focus Group: _____ **Location:** _____

Number of Participants: _____

Moderator Name: _____

Assistant Name: _____

Time started: _____ **Time ended:** _____

Responses to Questions

Q2* (Question 1 was not on tape as it contained names of participants). Please describe conditions or circumstances that are unique to the home care work environment.

Brief Summary/ Key Points:

Notable Quotes:

Comments/Observations

Q3 What factors or circumstances in the home care setting make it easy for you to dispose of needles safely?

Brief Summary/ Key Points:

Notable Quotes:

Comments/Observations

Q4 What factors or circumstances make it difficult for you to dispose of needles safely?

Brief Summary/ Key Points:

Notable Quotes:

Comments/Observations

Q5 What makes it easy for you to use needle safety devices in this setting?

Brief Summary/ Key Points:

Notable Quotes:

Comments/Observations

Q6 What makes it difficult for you to use needle safety devices in this setting?

Brief Summary/ Key Points:

Notable Quotes:

Comments/Observations

Q7 Think back to a time when you may have had to recap a needle or place a used needle in something other than a sharps container. Tell us what happened. (And add , What particular circumstances do you think influenced this action?)

Brief Summary/ Key Points:

Notable Quotes:

Comments/Observations

Q8 Of all the factors we discussed today, please write down the one which makes it easiest for you to use safe devices or practices in this setting and the one which makes it most difficult for you. Now let's go around the table- please read your answer.

Brief Summary/ Key Points:

Notable Quotes:

Comments/Observations

Q9 If you were the needlestick prevention coordinator at your agency, what is the most important thing you would do to assure that work is done safely or that people use safety devices?

Brief Summary/ Key Points:

Notable Quotes:

Comments/Observations

Q10 Please think back on the discussion today and the summary I have just presented. Please add anything that you think was missed OR Please add anything that you think should be included in future focus groups about this topic.

Brief Summary/ Key Points:

Notable Quotes:

Comments/Observations

ARE ANY MODIFICATIONS IN QUESTIONS NEEDED FOR NEXT FOCUS GROUP?

RESPONSES TO PHASE TWO FOCUS GROUP SUMMARY QUESTIONS

1. "Before we get into specific questions about blood exposures and practices or products to prevent or decrease such exposures in the home care setting, we'd like to get a better understanding of the conditions under which you work every day. Please describe conditions or circumstances that are unique to the home care work environment".

Not a controlled environment, temperature extremes, smoke, gas ovens used to heat home, pets, distractions, beds are low or no beds at all, not safe access entering homes when poor lighting

7. "Of all the factors we discussed today, please write down the one which makes it easiest for you to use safe devices or practices in this setting and the one which makes it most difficult for you. Now let's go around the table- please each of you read your answer."

Easiest: Availability of devices; when they are easily accessible in the supply room; ease of use of devices; familiarity with device; ease of manipulation within the context of a given procedure; if I can use the device with one hand; having all the supplies ready and a big enough space to put all the supplies together and not have to move away throughout the procedure; availability of sharps containers; sharps container in the home that is not full and can be reached; bringing sharps container and portable light into the home for safe blood draws; the small sharps container which I carry in my bag; lighting; having enough safe equipment and enough planning time; consistent practice of safety techniques in devices we have; lack of clutter, well-lighted home and cooperative patients and relatives; if it can be manipulated with ease and not cumbersome; available options for use; support-the agency is very safety conscious; a closed IV access system in which I never have to touch blood; when you have all supplies available at patient's home and minimal disruptions from other factors such as many visitors and pets; the butterfly; proper equipment in the home with a competent infusion company and realistic assignment to complete in an eight hour day

Most Difficult: Not having devices available; not having sharps containers available; having families devise their own sharps containers; sudden changes in equipment, situation or patient; infrequent use of equipment or being unfamiliar with equipment; dark cluttered home, uncooperative patient, hard blood draw, full sharps container, people watching and disturbing, and new devices; if two hands are needed to make the safety device work; sharps containers are too small; sharps container not in a convenient area;not being comfortable with new device; can be out in the field and not have the needed supplies; an open-ended system in which there is direct exposure to blood; if the sharps container is not

safe or sturdy; children running around and having the television on; use of this agency's sharps container (the top can open up and sharps may fall out); increased responsibilities and expectations (e.g. to do a three hour infusion in 15 minutes); size of object, inability to manipulate with one hand or two simple steps at once; de-accessing Huber needles from Medport or similar device- no available safety sheath; the light plastic blood draw needles that can recoil when putting in sharps containers and the "Shamrocks" that it's safety shield comes down during the procedure; drawing blood with very poor light; not having enough place to sit or stand and not enough lighting; we have competency exams on IV management; distractions

8. "If you were the needlestick prevention coordinator at your agency, what is the most important thing you would do to assure that work is done safely or that people use safety devices?"

Education (of staff , managers, policy makers and persons who do the staffing) that covers the right supplies and is timely; having practice on devices; have staff go into homes with others to learn new devices; updated policy and procedure manual; company policy in writing; having a "safety-device check-off" like yearly CPR training; making sure products are available; teaching staff how to use the devices; having enough time for education; making it policy that all supplies are available; have one good quality system; we can't keep teaching patients different things

9. "Please think back on the discussion today and the summary I have just presented. Please add anything that you think was missed"

Education for policy makers and management; try to find resources like insurance companies that can cover supplies; having a hands-on session, having input into what devices are purchased, doing research to compare devices; having specialty focus groups e.g. for wound care; other sharps in the environment that can stick you, e.g. urine specimen containers that you can get stuck from when getting a urine specimen; thought we were going to be observed while performing blood-access devices; thought we would be asked what the protocol is if we have a needlestick.

SAMPLE COVER LETTER USED FOR MEMBER CHECKS

Date:

Dear participant,

As a result of your participation in the original set of focus group sessions for this study, you are being requested to give your opinions on the study's preliminary findings. This will be done in a one-hour discussion between you and Donna Haiduven. You will be asked to give written and verbal feedback to some written materials from the study.

This procedure is called "member checking" and its purpose is to measure the trustworthiness of the findings. The purpose of this discussion is to review the findings for factual and interpretative accuracy.

Thank you very much for agreeing to participate in this member check. Should you have any questions, please call Donna at 408-723-4719.

Donna Haiduven, BSN, MSN, CIC
Principal Investigator

SAMPLE OF MATERIALS USED FOR MEMBER CHECKS

Instructions for Review of Findings

1. After reading this summary of findings, please give your judgment of the overall credibility of these findings. (Are they believable to you as representing what make it easy or difficult for you to use safe devices and practices in the home care setting?) _____

_____

_____

_____

_____

2. Please go back through to each of the six components and write in the spaces provided (or state to the principal investigator) :

a. major concerns or issues that have occurred to you

b. factual or interpretative errors you have detected

3. Is there anything you think was missed? If so, please add here:

_____

_____

_____

_____

4. Is there anything you would like to add? If so, please do so here.

_____

_____

_____

_____

Preliminary Study Findings

In summary, the facilitating conditions for and barriers to safe needle use and practice for registered nurses in the home care setting can be organized into categorization schema with these six components. These components are defined and further subdivided as follows:

1. safety devices- specific needle safety devices and specific qualities of these devices. _____

_____

_____

2. environmental factors- characteristics within the environment that impact safe practices of the nurses (e.g., lighting, temperature, sanitation, electrical outlets, handwashing facilities, refrigeration, access to patients in beds, chairs, other, lack of space to perform necessary procedures, clutter).

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3. organizational factors- characteristics of the home health agency that influence the ability of the nurses to practice safely (e.g., safety device availability, accessibility, options for use of equipment, safety climate of the agency, policies/procedures, work assignments, planning time, education, and increased job responsibilities).

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4. control factors- conditions or situations in the home care setting not under the control of the nurse, which may influence the performance of safe practice (e.g. distractions [noise, pets, presence of others]), interference with care vs. assistance with care, turf issues (patient's vs. nurse's), work space, and differences between home and hospital).

5. personal R. N. factors- characteristics of the nurses which influence their ability to perform safe practice (e.g., experience with specific devices, familiarity with devices, flexibility, attitudes towards patient comfort and safety, personal safety, and recapping, and effect of past blood exposure on safe practice).

6. patient/situational factors- characteristics or conditions of the patient or situation that impact safe practice (e.g., unpredictability of patient status, uncooperative patients, patients moving during procedures) and particular procedures that are difficult to perform safely.

THANK YOU FOR YOUR THOUGHTFUL COMMENTS!

SAMPLE OF COVER SHEET AND QUESTIONS USED FOR EXPERT VERIFICATION

Date:

Dear Expert,

Thank you very much for agreeing to do this review. I really appreciate it.

Enclosed are:

1. Figures "A", "B", "C" & "D" of the PRECEDE/PROCEED Model and the changes made to it in course of the study. You don't need to know the whole model- just follow the figures as you read.

2. Chapters 7 & 8-results and discussion- from my dissertation

3. A copy of the 10 focus group questions used in the study

I conducted 4 focus groups (of home care RNs) of 4-9 members each, resulting in 6 hours of tape and 150 pages of written transcripts, and that is what I have assimilated into the categories in chapter 7.

Your job, as a home care expert, is to give substantive verification- that is- do these findings make sense and represent your assessment of the home care work setting?. Please answer these questions:

1. What is your judgment of the overall credibility of these findings? (Are they believable to you as representing what makes it easy or difficult for nurses to use needle safety devices and practices in this setting?

2. What major concerns or issues do you have with either the findings or the interpretation?

3. Are there any factual or interpretive errors?

4. Is there anything you believe was missed? or Is there anything you would add?

My phone number is 408-723-4719; work is 408-885-5762. Please call me when you are finished or before that if you have any questions. Thanks again.

Donna Haiduven