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The Health Belief Model and Needle Recapping: A Replication

Rosemary M. Rackow Ham
Grand Valley State University

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THE HEALTH BELIEF MODEL AND NEEDLE RECAPPING: A REPLICATION

by

Rosemary M. Rackow Ham

A THESIS

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Thesis Committee Members:

Andrea C. Bostrom, Ph.D., R.N.

Kay Setter Kline, Ph.D., R.N.

William C. Bell, Ph.D.

ABSTRACT

THE HEALTH BELIEF MODEL AND NEEDLE RECAPPING: A REPLICATION

By

Rosemary M. Rackow Ham

The purpose of this study was to examine the knowledge of Universal Precautions, the attitudes and beliefs regarding the risk of AIDS among emergency room and critical care nurses and physicians, and the needle recapping behavior that places them at risk for acquiring HIV infection. The Health Belief Model was the conceptual model.

The sample (n=80) consisted of nurses (n=68) and physicians (n=12) who practice in the emergency room (n=19) or a critical care unit (n=61) in a community hospital. They completed a 31 item questionnaire. In addition, needle disposal boxes were opened and recapped needles were counted.

The findings revealed that health care workers believe they are susceptible to HIV and it is a serious disease. They identify the benefits of using Universal Precautions. Observed recapping behavior was 33% initially and at one month with an initial drop after the questionnaire. The findings support the need for locating equipment near the user area and further research to investigate the impact "cues to action" have on behavior.

DEDICATION

To my mother, Roberta M. Galloway Rackow, R.N.

ACKNOWLEDGEMENTS

I wish to acknowledge the support and encouragement of my thesis committee in the planning and preparing of this study. Andrea Bostrom, R.N., Ph.D, chairperson, has provided support and guidance in the preparation this thesis. Drs. Kay Setter Kline and William Bell were readily available to me and shared their expertise and moral support in the preparation of this thesis.

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CHAPTER I

INTRODUCTION

Since 1981 the Centers for Disease Control (CDC) of the U.S. Department of Health and Human Services reported 210,000 cases of acquired immunodeficiency syndrome (AIDS). Besides those persons meeting the surveillance case definition of AIDS, it is estimated that over one million persons in the United States are infected with human immunodeficiency virus (HIV) (CDC, 1989). Kelen et al. (1989) found in a recent assessment of a large urban hospital, that as many as one in 17 emergency patients may be infected with HIV infection.

It is expected that demands on health care resources will continue to increase in part because of the rising incidence of AIDS and HIV infection. In addition, survival trend analysis of persons with AIDS suggests that median survival has improved as the result of newer therapies. The CDC (1988) reports that health care workers can expect to work with an even greater proportion of infected persons in the future. In addition Gerbert, Maguire, Badner, Altman, and Stone (1988) report that unrealistic fears of HIV infections may jeopardize the quality of care provided. For these reasons health care workers need to have appropriate

perception of their risk and consistently to take appropriate precautions.

Research Problem

The purpose of this study was to determine the knowledge of precautions. Specifically the needle recapping behavior which places them at risk for acquiring HIV infection was examined. The study also examined the attitudes and beliefs regarding the risk of AIDS among emergency room and critical care nurses and physicians who have frequent exposures to blood and body fluids. This study will build on the work previously accomplished by Becker, Janz, Band, Bartley, Snyder, and Gaynes (1990). The Health Belief Model (HBM) was the theoretical framework used to assess respondents' knowledge, attitudes, and beliefs about AIDS.

Significance

Health care workers have been identified by the CDC (1982) as a group at risk for occupationally acquired infections with blood-borne pathogens. On August 21, 1987, the CDC issued a recommendation to reduce the risks of HIV and other blood-borne diseases in health care settings (CDC 1987a). This recommendation is a set of work practices termed Universal Precautions. (See Appendix A.) One of the work practices was to prevent needlestick injuries, needles shall not be recapped, purposefully bent or broken by hand, removed from disposable syringes, or otherwise manipulated

by hand. These recommendations will be referred to as "Universal Precautions/recapping" from this point forward. Universal Precautions/recapping recommendation is to be applied in all circumstances in which there is potential for contact with blood or other body fluids. The application of Universal Precautions specifically places some type of barrier, like a glove, between the health care worker and the blood or body fluid of the patient.

The Universal Precautions/recapping recommendation stemmed in part from a 1987 CDC report of three health care workers (one nurse and two laboratory workers) who became infected with HIV after patients' blood came in contact with their nonintact skin or mucous membranes (CDC 1987b). Since the actual prevalence of blood borne infection is unknown, and since mandatory testing of all patients is fraught with fiscal, ethical, social, and political issues, the CDC argued that use of Universal Precautions/recapping was the one protective mechanism that health care workers could use to protect themselves.

The next chapter will review the literature and conceptual framework for this investigation. Chapter III will define the methodology this study will use. Chapter IV will present the results while Chapter V will review and discuss the results and implications for further study.

CHAPTER II

REVIEW OF LITERATURE

Historical Development

The Centers for Disease Control (CDC) issued Universal Precautions guidelines in 1987 (CDC, 1987a). However, protection of patients and health care workers from microorganisms is not a new idea. The history of protecting health care workers and patients from microorganisms can be traced to such persons as Louis Pasteur, Lord Joseph Lister, Oliver Wendell Holmes, and Ignaz Semmelweis. Pasteur is considered responsible for the germ theory of disease. Lister (1867) developed the idea that surgical infection was of bacterial origin. Holmes (1842-3) introduced the idea that puerperal sepsis spreads from patient to patient by physician. Ignaz Semmelweis (1861) argued that childbed fever was transmitted via the hands of physician attendants who went from autopsy to delivery room without washing their hands. Semmelweis further argued that hand washing alone was not adequate and insisted the staff also rinse their hands in a chlorine compound before attending to patients.

As early as 1915 Richardson described elaborate rituals and procedures for nurses and physicians to undertake while

caring for a person who was contagious. These procedures were intended to protect patients from the spread of microorganisms via the hands and person of the health care worker and prevent patient to patient spread.

In 1970 the CDC published its first recommendations in an isolation manual. The second edition of the manual was published in 1975 with minor changes added in 1978. The publication recommended one isolation system based on categories of isolation using color-coded instruction cards. Certain procedures were described to insure microorganisms would be contained. This manual remained in use until 1983 when CDC published its latest isolation guidelines for hospital use (Garner & Simmons, 1983).

This new CDC publication contained important changes including an alternative to category-specific isolation termed "disease-specific isolation precautions." Disease-specific isolation precautions used the disease's mode of transmission as a guide to the appropriate barrier to use to prevent transmission of the microorganism. The new guidelines allowed hospitals to choose alternative systems for isolation or to design their own system. These new guidelines also stressed an idea that McCormick and Maki had first suggested in 1981. This idea was that to prevent needle-stick injuries, needles should not be recapped, bent, or broken by hand. Used needles should be placed directly into a puncture-resistant container designed specifically

for this purpose. These new CDC isolation guidelines were to prevent the spread of microorganisms from an infected source to a susceptible host.

Isolation precautions were suggested by others beside the CDC during this time. Jackson and Lynch (1984) suggested an isolation technique they called Body Substance Isolation. The premise of Body Substance Isolation is that all body substances have potential for infection so all body substances should be treated as infectious. Universal Precautions also is based on the assumption that every person is considered a reservoir of transmissible diseases. Finally, the Universal Precautions/recapping recommendation is to be used in conjunction with infection control practice such as routine hand washing.

Universal Precautions

Nurses and physicians working in emergency rooms, operating rooms, dialysis settings, and critical care units have been identified as having the most contact with patient's blood and body fluids (CDC 1985). These health care workers, hypothetically at least, are at the greatest risk of contracting diseases borne by blood and body fluids, specifically hepatitis B and HIV disease. Universal Precautions/recapping was created to minimize the risk of all health care worker exposure to the blood and body fluids of all patients and thus minimize the risk of transmission from an infected source to a susceptible host.

The transmission of HIV as purely a consequence of health care employment is extremely low in direct contrast to the higher infection rate from hepatitis B virus, another blood-borne virus. Thirty-two documented cases of HIV infection have been reported in health care workers with no other identifiable risk factors (CDC, 1992). In contrast, the CDC estimates that 12,000 health care workers contract hepatitis B annually. Approximately 200 health care workers a year will die after developing chronic hepatitis and liver cancer for a mortality rate of 2.2 percent (CDC, 1989a). Thus the CDC published this recommendation for the use by all health care workers who have contact with blood and body fluids.

The importance of using these precautions consistently is considerable. Marcus (1988) directed the CDC Cooperative Needle Stick Surveillance Group who estimated that 37% of the exposures represented in their study could have been avoided by the use of appropriate precautions such as the proper disposal of needles.

The publication of Universal Precautions/recapping by the CDC was viewed initially by hospitals simply as a recommendation. However, various union groups, at the urging of their members from the health care industry, began to bring pressure on Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor to make this recommendation a federal law. Numerous hearings

on this issue were held. The recommendation was enacted into law in December, 1991. Hospitals moved to implement Universal Precautions/recapping in spite of criticisms of added expense and concerns that this recommendation was labor intense (Stock, Gafni, & Block, 1990; Doebbeling & Wenzal, 1990).

Needle Recapping: One of the primary objectives to Universal Precautions is the cessation of needle recapping behavior. Recapping has been identified as the major risk exposure for HIV infection and hepatitis B infection among health care workers without other risk factors. The greatest risk for health care workers occupationally contracting HIV has been identified following a parenteral exposure (ie., needle-stick or cut) to blood from patients known to be HIV infected. The seroprevalence rate has been estimated to be 0.47% (CDC 1989a).

Thurn, Willenbring, and Crossley (1989) obtained data about needle-stick injuries and needle recapping from 750 primary care physician offices in Minnesota. Fifty-one percent were found to practice recapping behavior. Fifty-two percent of the needle-stick injuries reviewed were the result of recapping of dirty needles. They found that most of the offices did not know that recapping of needles increased the risk of a needle-stick injury. The study relied on self-reporting and was limited to office staff, some of whom were not professional health care workers.

The present study replicated a recent study in Michigan by Becker et al. (1990). Using the Health Belief Model, (HBM) Becker et al. (1990) examined recapping behavior, and the attitudes and beliefs about AIDS and HIV at four large city hospitals in a two part study. In the first part a questionnaire was administered to nurses and physicians to determine their perceived susceptibility to HIV infection from needle-stick injuries and their knowledge regarding recapping.

In the second phase of the study, dirty needle containers were opened. The number of recapped and uncapped needles were counted. The investigation found recapped needles exceeded 50% of the total number of needles. The investigator concluded that the health care workers had inadequate knowledge regarding recapping. The investigators further found that 66% of respondents perceived themselves to be susceptible to AIDS because of their work activities. The study also found that the majority of the participants felt that following Universal Precautions would be beneficial in decreasing their risk of infection. Respondents to the questionnaire agreed that the barriers to following Universal Precautions included being too busy to follow them and forgetting to follow them.

Limitations of this study include, no examination of two of the constructs of the HBM, perceived severity and motivation. The study can only be generalized to the four

large city hospitals where the study was conducted. Validity and reliability of the instruments was not established in the Becker et al. (1990) study. This present study, while replicating Becker et al. (1990), attempted to remedy these limitations.

Needle Disposal: Universal Precautions/recapping include the recommendation for the immediate disposal of used needles in a puncture-resistant container. To avoid needle-stick inoculations, this recommendation state that needles should not be bent, broken, or recapped after use. Puncture-resistant containers should be placed close to the bedside in order to decrease the incidence of recapping needles and consequently to reduce needle-stick injuries.

The use of these bedside disposal units and the impact they have had on frequency of recapping were examined by Edmond, Khakoo, McTaggart, and Solomon (1988) in an observational study at a 435 bed hospital. The recapping frequency prior to installation of the bedside disposal units was found to be 93.9%. The hospital installed the units and instituted an educational program to stop recapping behavior. A second observational study was conducted six months after these interventions and the frequency of recapping behavior remained at 94%. The conclusion drawn by this study is that the installation of the bedside units and the educational program were ineffective in changing recapping behavior. In a similar

study Ribner, Landry, Gholson, and Linden (1987) concluded that the bedside disposal system did not change the recapping-related injuries per full-time equivalent employee. Neither of these studies examined the workers knowledge of Universal Precautions/recapping.

Knowledge of Universal Precautions: Knowledge of Universal Precautions/recapping by health care providers has been examined in a limited number of studies. Gruber et al. (1989) examined knowledge of AIDS and Universal Precautions using 400 registered nurses (RNs) engaged in direct patient care at a medical center. This study examined the correlation of HIV/hepatitis B knowledge and knowledge of Universal Precautions. A total of 213 RN's (53%) completed and returned the questionnaires. Results indicated no relationship between knowledge about AIDS and knowledge of Universal Precautions. Knowledge of Universal Precautions ranged from 75% to 93% on selected items. Results from this study seem to indicate that knowledge of AIDS and Universal Precautions does not appear to influence practice behaviors. This study did not examine the health care workers' attitudes and beliefs regarding HIV infections nor did it examine recapping behavior .

In another recent study, Smyser, Bryce, and Joseph (1990) examined AIDS-related knowledge, attitudes and precautionary behaviors taken by a group of emergency medical professionals (EMT). This study reported that while

the EMTs could correctly identify modes of transmission of HIV, only 36.7% of those treating bleeding patients reported taking precautionary actions including gloves. Twenty-two percent of the EMTs reported they did not recap dirty needles. While the EMT is at-risk for occupationally transmitted HIV and hepatitis B infections, this risk of transmission did not translate into increased compliance with Universal Precautions/recapping.

The efficacy of the use of Universal Precautions and recapping recommendations remains undefined. Because Universal Precautions/recapping is a recent phenomenon, the extent of compliance by nurses and other health care workers is just beginning to be described in the literature.

Compliance with Universal Precautions: The research on compliance with Universal Precautions/recapping has shown that the health care workers have resisted the implementation of this recommendation. A recent nation-wide anonymous survey was conducted consisting of all 2,963 members of the American College of Nurse-Midwives (Lowen, Dhillon, Willy, Wesley, & Henderson, 1989). They wanted to assess the frequency and type of occupational exposure to blood and body fluids by certified nurse-midwives (CNMs). In addition to examining occupational exposure, these investigators requested information on the extent to which Universal Precautions were used by CNM's. A total of 1,784 CNM's responded to the questionnaire. Of the 1,784 CNM's

who responded only 55% of them reported routinely practicing Universal Precautions/recapping. The survey also found evidence of an association between the practice of needle recapping and the occurrence of needle-stick injuries. This study was limited as it depended on self-reporting about the use of Universal Precautions/recapping and only surveyed CNMs. The results can not be generalized to other health care providers.

The compliance with Universal Precautions/recapping was also inconsistently practiced in two observational studies conducted in Emergency Departments. Baraff and Talen (1989) in a West coast hospital, and Kelen (1990), in a hospital on the East coast, conducted observational studies in Emergency Department on the appropriate use of Universal Precautions/recapping during patient interventions. In these two studies researchers found that the appropriate use of Universal Precautions/recapping ranged from 44% to 75%. In addition Kelen (1990) found that the rate of compliance fell to 19.5% when profuse bleeding occurred. These studies relied on direct observations and the number of workers observed was small. These two studies looked at only one hospital on each coast. Thus, the findings studies are limited and cannot be generalized beyond the two institutions.

These findings on compliance with Universal Precautions/recapping were supported in a third

observational study conducted hospital-wide in New Haven by Mazon, McGeer, and Hierholzer (1990). In this study the investigators also concluded that appropriate barrier precautions were being used only 62-65% of the time. They concluded that there is a need for ongoing education and ongoing monitoring of specific departments for compliance with Universal Precautions/recapping. This study also relied on direct observation and the numbers of workers observed was small. None of these studies tested workers' knowledge of Universal Precautions/recapping or their beliefs and attitudes regarding AIDS or HIV.

A prospective cohort study, reported by Gerberding et al. (1987), examined the risks of occupational transmission of HIV, hepatitis B and cytomegalovirus in extensively exposed health care workers at San Francisco General Hospital. This study revealed that 56% of these health care workers took inadequate infection control precautions while performing procedures with potential risk of exposure to HIV. One individual in this study sustained eleven accidental needle-stick injuries from persons with AIDS.

The studies on the appropriate use of Universal Precautions/recapping and the use of bedside disposal, while limited in number, all reached similar conclusions. The use of Universal Precautions/recapping since CDC recommended their implementation has been less than optimal. The use of bedside disposal units has not changed the recapping

behaviors of the health care worker.

There have been a number of studies that have examined the behavior of individuals who may be at-risk for developing diseases, as in the case of health care providers exposed to HIV. These studies have used the HBM to try to understand people's decisions about the use of preventive health behavior.

Health Belief Model

The concern with health behavior developed in the early 1950's. Behavioral scientists and health care workers were seeing an increasing need to understand why and under what conditions people will take action to prevent, detect, or treat diseases. The HBM is a psychosocial formulation that was developed to explain health-related behavior at the level of individual decision making.

The model, as described by Rosenstock (1974), was developed by a group of social psychologists. They were working for the U.S. Public Health Service and were interested in why some people used health services or complied with a health regime while other people did not. They were also interested in what factors prevented or interfered with a person following health care recommendations.

Health-related behavior was seen as an important issue for those who provided health care. The term health-related behavior refers to a group of behaviors namely health

behavior, illness behavior, sick role behavior, chronic illness behavior, and at-risk behavior as described by Janz and Becker (1984). Although the model was designed originally to explain preventive health behavior, several investigators including Kasl and Cobb (1966), Rosenstock (1974), and Kirscht (1974) have suggested its use to explain other health-related behavior including at-risk behavior.

This study was most interested in examining the at-risk health care worker. Baric (1969), one of the earlier investigators described people at-risk as "those who are engaged in certain activities which increase their risk to a much higher degree than the rest of the population" (p.27). For example, an Emergency Department nurse who recaps the needle just used to give an injection to an HIV positive person is at increased risk of a needle-stick injury and to HIV infection.

Baric (1969) contrasts the at-risk role with the sick role in the individual. The sick role has certain rights and duties or obligations. In contrast the person in an at-risk role has only duties. The at-risk individual has no overt rights such as exemption from social responsibility. The at-risk role is not formally recognized by society and does not have a time limit. The individual is expected to follow the required behavior continuously. The at-risk role is not constantly reinforced by either the medical profession or the social environment. The individual in the

at-risk role is held responsible for the role taken on, whereas in a sick role, the person is not held responsible for it. The "at-risk" role appears more difficult in some ways and is without much reward. Universal Precautions/recapping was recommended for health care workers who are at-risk for acquiring infections during work activities.

Rosenstock's (1974) original description of the HBM had four beliefs that rely on an individual's motivation and perception. A fifth belief was added later to the model. The HBM has been influenced by prior work of Kurt Lewin that holds that it is "the world of the perceiver that determines what he will do..." (Rosenstock, 1974, p. 2). The HBM has several assumptions.

Assumptions of the Health Belief Model: The HBM as described by Rosenstock (1974) assumes that in order for the individual to take action to avoid a disease the individual would need to believe

- (1) that he was personally susceptible to it, (2) that the occurrence of the disease would have at least moderate severity on some component of his life, and (3) that taking a particular action would in fact be beneficial by reducing his susceptibility to the condition, or if the disease occurred, by reducing its severity, and that it would not entail overcoming important psychological barriers such as cost,

convenience, pain, embarrassment (p. 3)."

The HBM also assumes that as a requirement the individual must believe that the disease or condition can be present even in the absence of symptoms.

Constructs of the Health Belief Model: The social scientists working on this HBM developed four constructs from these assumptions. These constructs include "perceived susceptibility," "perceived severity," "perceived benefits," and "perceived barriers" (Rosenstock, 1974).

The first construct of the HBM is "perceived susceptibility." Perceived susceptibility refers to the individual's subjective perception of the risk of contracting a disease or condition.

The second construct of the HBM is "perceived severity." With perceived severity the construct assumes that the individual perceives illness as an undesirable state and, furthermore, the individual prefers an illness-free state. This may not be true for all individuals, since the illness role also provides benefits which may be attractive to some individuals.

The third construct of the HBM is "perceived benefits." Within the construct of perceived benefits, the individual is expected to perceive the illness and accept the recommended health action as feasible and efficacious. Kasl and Cobb (1966) note that "successful treatment almost always depends on the initiative of the patient seeking

diagnosis and treatment" (p.5). The construct of the perceived benefits expects that the individual is rational when seeking health care. While some individuals are rational, some are consistently not rational or may be intermittently rational. Baric (1969) supports this assumption, stating, "the decision on whether to undertake action or not depends not only on the kind of information, but also on the state in which the recipient of the information finds himself at that time" (p. 30).

"Perceived barriers" is the fourth construct of the HBM. Any potential negative aspects of a health action may act as an impediment to taking the recommended behavior. The individual weighs the action's effectiveness against the perception that it may be expensive, have side effects, be unpleasant, inconvenient, time-consuming, and so forth.

The HBM originally consisted of these four constructs. Rosenstock (1974) notes that in addition to the four constructs of this model some stimulus was necessary to trigger a decision-making process. It appears that this "cue to action" is necessary for an individual to seek health care or to avoid the activity that places the person in a "at-risk" role. The construct, "motivation," was later added to the Model (Becker, Drachman, & Kirscht, 1972). Motivation refers to a generalized intent that results in behaviors to maintain or improve health (See figure 1).

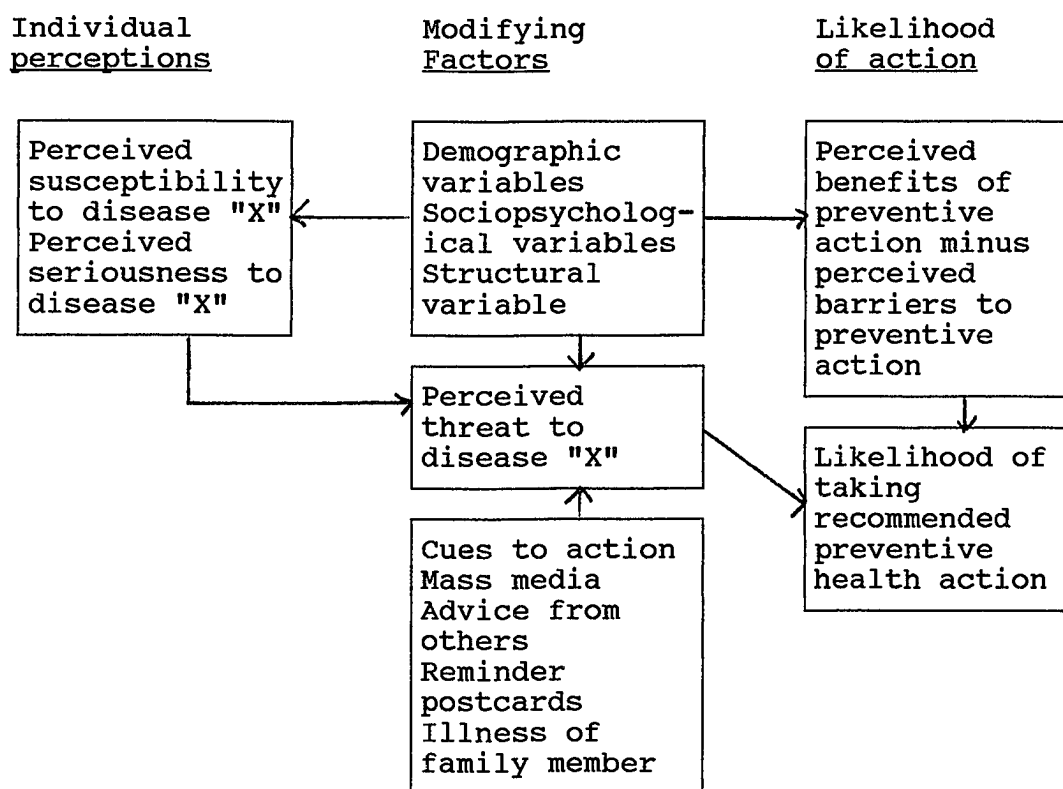


Fig. 1. The "Health Belief Model" as predictor of preventive health behavior (Becker, Drachman, & Kirsch 1974).

Hochbaum (1956) completed the first major study using concepts of the HBM. The study tried to identify the factors related to the decision by 1200 subjects to have chest x-rays for the detection of tuberculosis. The results from this study suggested that susceptibility and benefits were related to voluntary chest x-ray. The validity and reliability of the instrument were not tested. This lack of validity and reliability resulted in much criticism regarding the conclusions.

Kegelas (1963) used the HBM to study the relationship

of belief and attitudinal variables to preventative dental visits. This study measured the four beliefs of the HBM with a sample size of 430 individuals. Conclusions from this study seemed to suggest that the largest number of preventive visits were made by persons exhibiting all four beliefs. This study generated criticism centering around retrospective data gathering.

Damrosch, Abbey, Warner, and Guy (1990) also used the HBM with two critical care nursing units. They compared their perceived susceptibility to HIV infection and their knowledge regarding AIDS. Each group perceived their risk of acquiring AIDS from patients at one chance in 10,000. Knowledge of AIDS was high, with the mean score for each group exceeding 14 out of 16 possible points. This study was limited in that the behavior of these groups was not measured nor was the use of Universal Precautions/recapping examined.

Erler, Jurich, Lansinger, and Rupp (1990) used the HBM as their theoretical framework for assessing respondent's knowledge, attitudes, and beliefs about AIDS. In this study the researchers investigated the determinants of condom use among young sexually active adults whose behavior placed them at risk for acquiring HIV infection. Results of this study suggested that these young adults were very knowledgeable about AIDS and the behaviors which increase the risk of HIV infection. These young adults did not

perceive themselves to be at risk of acquiring HIV infection. In spite of being knowledgeable about AIDS and the behaviors that increase their risk of acquiring the infection, the study group reported engaging in behaviors that did increase their risk of acquiring HIV infection including not using condoms. The results from this study appear to indicate that students did not perceive risk of susceptibility and did not take precautions to reduce susceptibility. This study relied on self-reporting and no behavior was observed or recorded. This study also did not report content validity or reliability of the instrument.

This current study attempted to determine the extent to which health care workers' who are at risk for HIV or AIDS have knowledge of Universal Precautions. In addition, these workers beliefs and attitudes about AIDS and HIV that might contribute to the problem of not using Universal Precautions was examined. Recapping of dirty needles has been identified as a major risk of exposure for health care workers for HIV and hepatitis B infections. Universal Precautions has as a major objective the cessation of recapping behavior. This study focused on the recapping behavior. Recapping behavior was considered, for the study, as evidence of not following Universal Precautions. This study built on the prior work of Becker et al. (1990) and in addition examined "perceived severity" and "motivation". The Becker et al. (1990) study did not test validity nor

reliability which this current study has.

Hypotheses

The following hypotheses were examined:

Health care workers with higher scores on questions of "perceived susceptibility" will have higher scores on questions on knowledge of Universal Precautions.

Health care workers with higher scores on questions of "perceived benefits" will have higher scores on questions on knowledge of Universal Precautions.

Health care workers with higher knowledge scores of Universal Precautions are associated with greater "perceived severity" scores.

Greater knowledge of Universal Precautions is associated with greater compliance with Universal Precaution recommendations to not recap needles.

In the next chapter the methodology for this study will be examined. Chapter IV will present the results that were obtained from this study. Chapter V will review and discuss the results and implications for further study.

CHAPTER III

METHODOLOGY

This research design is descriptive correlational using the survey method. This design was used to measure the knowledge of health care workers regarding Universal Precautions. In addition, the attitudes and beliefs of health care workers regarding HIV and AIDS were examined. The behavior of these health care workers was examined by counting recapped versus not recapped needles.

The study institution is a 250-bed community hospital in south central Michigan. The hospital is located in a county that reported a total of 25 cases of AIDS as of January, 1992. The public health department had estimated another 900-1,000 cases of HIV positive persons for the county (Michigan Department of Public Health, 1992).

The hospital adopted Universal Precautions/recapping in August, 1987. The plastic sharp containers were installed between January and June 1988. All the staff were notified by memorandum and inservice education that used, dirty needles and syringes were to be placed, uncapped, in the nearest needle box. Employees attend a yearly inservice education that includes instructions on placing uncapped

dirty needles in the plastic containers. These yearly inservices are offered on a monthly basis with a mixture of units represented by nurses who attend one session a year.

Sample

The sample consisted of registered nurses and physicians who worked in the Intensive Care Unit or the Emergency Department at the time of the study. The study site has two acute care facilities that are located across the street from each other. Each building has an Emergency Department and an Intensive Care Unit.

The four units have assigned nursing personnel with some nurses working in more than one of these units. The nurses in all four of these units are registered nurses.

The Emergency physicians number ten who provide 24-hour coverage to the Emergency Department. Approximately 15 other physicians routinely admit to the two Intensive Care Units and have privileges to provide care to those patients.

Eighty-two persons completed the questionnaire from these areas. Two questionnaires were eliminated as they were from nurses or physicians who did not work in either sample area. The sample then consisted of 80 respondents. The majority of the respondents were from the Intensive Care Units (n=61) and were nurses (n=68). Table 1 shows the respondents by occupation, either nurse or physician, and location of their practice or work unit.

Table 1

Respondents by occupation and work unit

Unit	RNs (85%) n	Physicians (15%) n	Total n
Emergency Department	14	5	19
Intensive Care Unit	54	7	61
Total	68	12	80

Most (n=34) of the participants were between the ages of 31-40 years of age. Another 44 respondents were evenly divided between 20-30 years of age and 41-50 years of age. Table 2 shows the respondents by each age group.

Table 2

Respondents by age groups (n=80)

Age group	n	%
20-30 years old	22	27.5
31-40 years old	34	42.5
41-50 years old	22	27.5
51-60 years old	2	2.5

Fifty-three (66%) of the respondents had been in health-care for greater than 10 years. Nineteen respondents (24%) had been in health care between 6-10 years. Table 3 illustrates the respondents by number of

years they have worked in the health care field.

Table 3

Respondents by years worked in health care industry (n=80)

Years worked	n	%
worked less than 2 years	4	5
3-5 years worked	4	5
6-10 years worked	19	24
+10 years worked	53	66

Instrument

The "Infection Control Survey", modified from the study by Becker et al. (1990), was used. This tool examines the knowledge of Universal Precautions, and the attitudes and the health beliefs regarding HIV and AIDS infection by health care workers who care for acutely ill and/or injured clients. (See Appendix B.)

The Infection Control survey is a self-administered questionnaire. Each item is in the form of a statement. The health care worker is asked to respond on a 7-point scale, from "strongly agree" to "strongly disagree". The questionnaire was used with permission of the authors (See Appendix C.) Permission was granted to add additional questions. These questions were added to try to assess the fourth dimension of the model, perceived severity, and the fifth dimension of the model, motivation. The additional questions were developed with the assistance of an article

on instrument development for the HBM constructs by Champion (1984).

The modified questionnaire consisted of a total 31 items. Nine questions examined the respondent's belief of perceived susceptibility to infection from blood borne pathogens. Six questions tested the respondent's perception of the perceived severity of infection from blood borne pathogens. Six questions on the survey examined the respondent's belief regarding perceived benefits of using Universal Precautions. The respondents were asked three questions regarding the perceived barriers in following Universal Precautions. Five knowledge questions regarding Universal Precautions/recapping were included. In addition the questionnaire contained two questions that needed a short answer concerning the respondent's motivation to follow Universal Precautions.

Four additional questions were added to provide some demographic questions. The demographic tool requested the following information: age range, professional title, number of years as a health care provider, and the department in which the health care provider was employed at the time of the investigation.

Validity: Content validity for the Infection Control Survey tool was done in part by a method first described by Lynn (1986) and modified by Deets and George (1990). In this method the instrument is quantified and judged by a

group of experts. Ten Master's prepared nurses were used as a group of experts. The assumption was that Master's prepared nurses would have been exposed to theories and constructs of the HBM model. A packet containing a cover letter (Appendix D), the questionnaire, and conceptual definitions of each construct on the HBM was sent to these ten nurses. Each nurse was requested: 1) to review the questionnaire and the definitions of the constructs and 2) mark each question as to which construct on the model it represented. The definitions were taken from the HBM. (See Appendix E.)

Three weeks later, six instruments had been returned. The reply envelopes had been coded so returned packets could be checked against a list of participants. The questionnaire itself was not coded. A second packet with a second cover letter was mailed to the four outstanding participants. These two mailings resulted in a return of nine questionnaires or 90% participation.

The data from these Masters nurses were analyzed for frequency of response. Of the 31 items, six questions did not meet a 60% agreement criterion. Of these six, two were questions added by the investigator to test for "perceived severity" and four had been written by the original investigator. Of these latter four items, two items were to test for "perceived benefits" and two were to test for "perceived barriers." Two sources of error for these six

questions were considered: 1) the question, and 2) the definitions of the constructs. If the question did not clearly represent the theoretical construct the panel may not have judged the question correctly. Second, if the construct definition was not clearly stated then the judge may not have identified the question correctly.

The Masters nurses who did respond had written comments that suggested the definitions were not clear. From their comments another concern emerged. Their personal beliefs may have influenced their selection of a construct rather than the construct definition. Because four of these questions were from the original questionnaire these questions were left by the investigator. Two questions, added by the investigator were also left with the understanding that reliability of these questions would be examined more closely. These items may need to be rewritten in the future.

Reliability: Reliability for this instrument was determined by the test-retest approach. The instrument was offered to RN's working at the same test site but in a different unit. Fourteen registered nurses volunteered to complete the questionnaire. This small group was retested a month later. The correlation coefficient for the full scale, which included all the items from time one compared to time two, was $r=.8591$. The individual scales were then examined separately. In addition to looking at the

correlation coefficient for each scale each question was examined to see if the individual answered the question the same the second time. If they answered the question the same the second time this was considered a "strict" agreement from time one to time two. When it was not a strict agreement from time one to time two then the question was examined to see if the respondent answered within one point, either higher or lower from their previous questionnaire. This was considered a "lenient" agreement from time one to time two. The questions constituting the scales of knowledge, severity, susceptibility, barriers, and benefits were calculated within each to determine a percent of agreement for both strict and lenient agreement. Table 4 displays the test/retest correlation, the percent of strict agreement, and the percent of lenient agreement.

The questions regarding perceived severity were created for this study. Because there were two questions identified with validity as being marginal, then these two were examined more closely for test/retest reliability. One question, "If I got AIDS today I would probably live long enough for a cure to be found" had all participants agree from time one to time two or 100% agreement. The second question, "If I had AIDS I could still live a normal life with proper treatment" showed agreement at 83% from time one to time two. These two questions were then removed from the "perceived severity" scale and the test/retest

correlation coefficient was recalculated without these questions. The test/retest correlation coefficient for "perceived severity" with these two items was $\underline{r}=.6725$ and without these two items was $\underline{r}=.5942$. Based on this information it was decided to leave the two questions in the survey.

At the completion of the study a reliability analyses of the five subscales, severity, benefits, susceptibility, knowledge, and barriers produced a standardized alpha of each subscale. They are as follows: severity, 0.6984 ; benefits, 0.7372 ; susceptibility, 0.6645; knowledge 0.3027; and barriers, 0.6283 .

The reliability for this instrument was considered satisfactory. The reliability may have been improved if the time period between test-retest could have been reduced from one month to one week.

Table 4

Test/Retest reliability

Scales	Total number of responses	Correlation coefficient	Strict	Lenient
Knowledge (5 items)	70	$r=.9238$	91%	93%
Severity (6 items)	84	$r=.6725$	69%	85%
Susceptibility (9 items)	126	$r=.6770$	57%	88%
Barriers (3 items)	42	$r=.9584$	67%	94%
Benefits (6 items)	84	$r=.5688$	73%	82%
Total scale (29 items)	406	$r=.8591$	67%	85%

Procedures

Data Collection: The questionnaire was distributed to physicians and nurses attending various scheduled meetings at the hospital over a two-month period of time. The group was asked to complete only one copy of the questionnaire if they attended more than one meeting.

An oral explanation of the study was made to the study participants. Participants were given directions on how to complete the questionnaire. Written consent was not sought.

A cover letter on the questionnaire included a statement to the effect that the returning of the questionnaire signified consent to participate. The cover letter also included statements that the proposal had been

approved by the Human Research Review Committee of Grand Valley State University, and the hospital administration. (See Appendix F.)

Participants were given an opportunity to ask questions. The investigator left the room following the question and answer period so participants could finish in private.

Needle Counting Procedure: All four of the units dispose of dirty needles and syringes in rigid plastic containers. The containers are in each patient room or next to each patient unit. When the containers are full, the top opening is closed with a plastic snap and the box is transported to a central disposal area.

For this study needle disposal boxes were carefully opened, the contents were spread on a flat surface using long metal tongs. The examiner wore protective eye covering, a mask, heavy latex gloves, and a gown to protect from accidental spills and aerosolization of any body fluid in the container. The examiner had received the hepatitis B vaccination series. Needles were evaluated for the presence or absence of a cap. Needles were further subdivided according to whether they were attached to a syringe. Following this inspection, and using metal tongs, the needles were returned to disposal boxes, sealed and disposed of in the usual fashion.

The needle boxes were opened and examined before the

administration of the questionnaire. Following the questionnaire three more counts were done on a random schedule until all four units' boxes were counted a total of four times each. A random number table was used to determine timing of the counts.

The next chapter will present the results of this research. Chapter V will review and discuss the results and implications for further study.

CHAPTER IV

PRESENTATION OF FINDINGS

Health Belief Model

The purpose of this research study was to measure the knowledge of health care workers regarding Universal Precautions. In addition, the attitudes and beliefs of health care workers regarding HIV and AIDS were examined. The behavior of these workers were examined by counting recapped versus not capped needles. The Health Belief Model was used as the theoretical model for assessing their beliefs and attitudes. Each construct from the model was examined separately as well as each question. For the purposes of illustration the answers were collapsed down from a seven point scale of "strongly agree" to "strongly disagree" to a three point scale of "agree", "neither agree nor disagree", and "disagree."

Knowledge: The first construct to be examined was the knowledge scale of Universal Precautions. Subscale scores were determined by adding all items scored after recoding the negatively stated items. The range of scores for this scale was 7 to 17. Some questions were not answered by all respondents. The knowledge scale items for Universal

Precautions (UP) are displayed in Table 5 with the percent of respondents for each.

Table 5

Item responses of Universal Precautions (UP) knowledge scale

Item	Agree %	Neither agree nor disagree %	Disagree %
Recapping provides protection for me against infections.	13	15	73
Most of my colleagues recap needles	23	30	47
I am very familiar with contents of UP policy	81	3	17
The UP policy recommends recapping of needles.	4	1	90

From this table it appears that the respondents have knowledge of the Universal Precaution recommendation regarding recapping of needles. In addition the majority (58%) strongly disagreed with the statement that "Universal Precautions recommends recapping of needles."

Severity: How the respondents view the severity of some blood borne infections was examined next. There were six questions that looked at the construct of perceived severity. The range of scores for the severity scale was 16 to 41. The perceived severity items are listed by percent of responses in Table 6.

Table 6

Item responses for perceived severity scale

Item	Agree %	Neither agree nor disagree %	Disagree %
If I had AIDS my future would be ruined.	90	5	5
I would rather have any disease besides AIDS	65	15	20
If I got AIDS today I would probably live long enough for a cure to be found	18	25	56
If I had AIDS I could still live a normal life with proper treatment	15	20	64
If I got AIDS my present and future sexual relations would be destroyed.	75	5	19
If I had AIDS I would probably die soon.	35	21	44

The respondents (68%) clearly agree with the statement on the future being ruined if they contract this disease. They seem a little less sure on the issue of how soon they would die if they had this disease or the impact this disease would have on living a normal life with proper treatment.

Susceptibility: This study was intended to examine the beliefs of health-care workers who were identified "at-risk" for hospital-acquired infections from blood borne pathogens. The questionnaire had nine questions that were intended to determine how the health-care worker perceived

herself/himself vulnerable or susceptible to infection.
The range of scores for the susceptibility scale was 17 to
50. Table 7 illustrates the items from the perceived
susceptibility scale and the percent of responses for each.

Table 7

Item responses for perceived susceptibility scale

Item	Agree %	Neither agree nor disagree %	Disagree %
I have extensive contact with patients who have blood borne infections.	63	26	11
I worry that my work activities put me at risk of contracting hospital infections.	75	14	11
I worry that my work activities put me at risk of contracting AIDS.	68	16	15
I am the kind of person who gets sick often	4	14	82
I'm not the kind of person who is likely to get AIDS	50	25	25
If I am stuck by a needle, it is likely that I would acquire AIDS.	24	24	52
In general, I am not as likely to get sick as most of my coworkers or friends.	50	28	22
My chance of getting AIDS sometime in my career are high.	33	34	33
Working at XXXX decreases my chance of getting AIDS	14	34	52

Sixty-eight percent of the respondents agreed they have contact with patients who have blood borne infections that put them at risk. It also appears they are unsure of the chances of occupationally acquiring AIDS during their careers.

Benefits: The construct of perceived benefits to using Universal Precautions was tested with six items. The range of scores for this scale was 22 to 42. The items from the perceived benefits scale with the percent of responses are listed in Table 8.

Respondents to the questions regarding perceived benefits appear to agree that recapping of needles does not provide protection from AIDS. The majority (65%) indicated they strongly agreed that Universal Precautions should be applied to everyone.

Table 8

Item responses for perceived benefits scale

Item	Agree %	Neither agree nor disagree %	Disagree %
Recapping of needles provides protection for me against contracting AIDS	11	10	79
If I recap needles it provides protection for my colleagues.	20	13	67
I would recap a needle if I know the patient has AIDS	11	8	81
I think the UP policy should be applied to everyone	89	4	3
Following the UP policy would significantly decrease the chances of my contracting hospital-acquired infection	89	3	6
Following the UP policy would significantly decrease the chances of my contracting AIDS.	85	6	6

Barriers: Three questions examined the construct of perceived barriers to using Universal Precautions. The range of scores for this scale was 3 to 21. The items regarding perceived barrier with the percent of response for each are shown in Table 9.

Table 9

Item responses for perceived barriers scale

Item	Agree %	Neither agree nor disagree %	Disagree %
I prefer recapping a needle to taking an uncapped needle to a disposal box	30	4	66
Sometimes I'm too busy to carry out the UP policy in cases where I should	36	23	40
Sometimes I forget to carry out the UP policy in cases where I should	40	13	44

Respondents to questions of perceived barriers seem to prefer taking an uncapped needle to a disposal box. Thirty-six percent responded that "sometimes they are too busy or they forget to carry out the Universal Precaution Policies when they should."

Motivation: The fifth construct of "motivation" was tested using two questions that allowed the participant to give short answers. Forty-nine participants answered the question "what would help you not to recap needles?" Table 10 illustrates the statements respondents provided to this question. The number of the respondents for each statement, and percent of the total number of responses is also listed.

Table 10

Motivation to stop recapping

Motivator	Number Responding	Percent
Containers in a more convenient location	23	43%
I don't currently recap contaminated needles	12	21%
We need more reminders and education	3	5%
I need to break the habit	3	5%
I don't know what will help	5	9%
Safer to recap then walk around with exposed needle	2	3%
Will stop recapping when someone I know gets stuck with HIV contaminate needle	1	2%

The majority (n=23) of the respondents felt that having the disposal boxes in a more convenient location would help. Another 21% (n=12) said they currently do not recap needles.

The second question regarding motivation asked: "what would help you to follow Universal Precautions?" Fifty-two people responded to this question. Table 11 shows the response to this question.

Table 11

Motivation to follow Universal Precautions

Motivator	Number Responding	Percent
Equipment in a handier location for the user	17	28%
More education, reminders, and reviews	11	18%
Making it a new habit	9	15%
I am currently using it all the time	7	12%
If staffing were better, I would use it	3	5%
If there were more role models who would use them consistently	2	3%
Having someone I knew have a blood borne pathogen infection	2	3%
Money!! Lots of it!	1	2%

Respondents (n=17) to this question also believed they would follow the Universal Precaution Policy if equipment was in more convenient locations. Seven (12%) say they currently use Universal Precautions/recapping all the time. It appears from these answers that locating the equipment closer to the user site and some reminder or cue to take precautions are the two most frequently cited actions for the consistent use of Universal Precautions and to the cessation of recapping behavior.

Hypotheses

Knowledge and Attitudes: To further examine these results the hypothesis, "Health care workers with higher scores on questions of perceived susceptibility would score higher on questions relative to knowledge of Universal Precautions," was examined. The correlation coefficient of knowledge to susceptibility was $r=.0395$ ($p=.746$).

The second hypothesis, "health care workers with higher scores on questions of perceived benefits will have higher scores on questions on knowledge of Universal Precaution" was examined. The correlation coefficient of knowledge and perceived benefits was found to be $r=.6245$ ($p=.000$).

The third hypothesis is, "Health care workers with higher knowledge scores of Universal Precautions are associated with greater perceived severity scores." Knowledge and perceived severity had a correlation of $r=.0809$ ($p=.502$).

It appears then that knowledge is not related to perceived susceptibility or perceived severity. A moderately strong positive relationship exists between the variables of knowledge and perceived benefits with $r=.6245$.

Knowledge and Behavior: The fourth hypothesis was "greater knowledge of Universal Precautions is associated with greater compliance with Universal Precaution recommendations to not recap needles." Subgroups consisting of the Emergency Department and the Intensive Care Unit were

examined for knowledge of Universal Precautions. The mean score for the Emergency Department was 12.4706 (SD=2.267). The Intensive Care Unit had a mean score of 13.3036 (SD=2.131). These two mean scores were then examined further to determine if the differences in mean scores was significant. The calculated pooled t was .169 (71 df)($p=.702$) indicating statistically there was no significant difference in the two groups' scores.

Unannounced counts of capped and uncapped needles were done on four different occasions in both Emergency Departments and the two Intensive Care Units. The initial count was done before the questionnaire was presented and then was repeated three more times in each area. The dates of the next three counts were done using a random number chart and a calendar of the researcher's scheduled work days. The second count was done on the sixth day following the questionnaire. The third count occurred during the second week and the fourth count occurred one month after the presentation of the questionnaire. Table 12 shows each unit with the initial percent of recapped needles and syringes found in the container. In addition, Table 12 illustrates the counts taken on day 6, week 2 and at one month of recapped needles and syringes.

Table 12.

Percent of recapped needles and syringes by each unit

Unit	Initial	6 days	Week 2	1 Month
ICU A	28%	21%	18%	30%
ICU B	33%	21%	20%	32%
ER Dept A	31%	19%	18%	33%
ER Dept B	33%	6%	14%	38%
Total	32%	15%	17%	34%

A chi-square test was used to examine the proportion of capped versus not capped needles for each unit, and for each time frame. There was a statistically significant change only in Emergency Department B (chi-square 65.75, $p < 0.01$ with df 3) across the four times of collection. The collections on Day 6 and Week 2 appear to have contributed to this change. It appeared that the questionnaire may have had some effect on the number of recapped needles that were found on the count at six days and Week 2.

Hypothesis number four was not tested on an individual basis for beliefs or behaviors. Only group behavior was examined with this study. The groups showed no statistically significant differences in the number of capped versus not capped needles from the initial count to the count at one month. There was no difference in the groups' beliefs or knowledge but it appears there was some inconsistent behavior in recapping of needles following the

questionnaire. The questionnaire may have acted as a "cue to action." This was demonstrated by the temporary reduction in the number of recapped needles found after the administration of the questionnaire. The next chapter will review and discuss the results and implications for further study.

Chapter V

DISCUSSION AND IMPLICATIONS

The purpose of this study was to determine the knowledge of precautions for AIDS and the attitudes and beliefs regarding the risk of AIDS among emergency room and critical care nurses and physicians who have frequent exposure to blood and body fluids. In addition, the needle recapping behavior which places them at risk for acquiring HIV infection was examined.

The researcher had four hypotheses. Hypothesis #1 was, "Health care workers with higher scores on questions of 'perceived susceptibility' will have higher scores on questions of knowledge of Universal Precautions." Hypothesis #2 was, "Health care workers with higher scores on questions of 'perceived benefits' will have higher scores on question on knowledge of Universal Precautions." Hypothesis #3 was, "Health care workers with higher knowledge scores of Universal Precautions are associated with greater 'perceived severity' scores." Hypothesis #4 was, "Greater knowledge of Universal Precautions is associated with greater compliance with Universal Precaution recommendations to not recap needles." The researcher used

the Health Belief Model as a theoretical framework for assessing respondents' knowledge, attitudes, and beliefs about AIDS.

Knowledge: The data do not support hypothesis #1 that health care workers with higher scores on "perceived susceptibility" will have higher scores on questions about knowledge of Universal Precautions. The data do support hypothesis #2 that health care workers with higher scores on questions of "perceived benefits" will have higher scores on questions of knowledge of Universal. Hypothesis #3 that health care workers with higher scores on Universal Precautions are associated with greater "perceived severity" scores was not supported. The data suggest that the majority (58%) of the respondents knew about Universal Precaution policy recommendation not to recap needles. However, the behavior showed almost one-third of the needles were recapped prior to the questionnaire and again at one month after the questionnaire.

Hypothesis #4 stated that greater knowledge of Universal Precautions is associated with compliance with the Universal Precaution not to recap needles. The fourth hypothesis can not be evaluated for individual behavior or knowledge. This study did look at groups of people, nurses and physicians, who worked in Emergency Departments and Intensive Care Units. The study did compare the groups and the data suggests that there was no difference in knowledge

between the groups. The groups all demonstrated the same behaviors in recapping needles.

Conclusions of the Health Belief Model

Severity: The original study by Becker et al. (1990) did not examine the construct of "perceived severity" on the assumption that all respondents would view contracting AIDS as serious. The data from this study suggest that while the majority (n=55) of the respondents did perceive that threat of contracting AIDS as "very serious" not all of the respondents viewed it as "very serious" as Becker et al. (1990) believed. The data indicated that the respondents were very divided on the question of "If I had AIDS I would probably die soon." Thirty-five respondents (44%) disagreed, moderately disagreed or strongly disagreed with this statement.

Susceptibility: From this data it appears the study respondents strongly agreed, moderately agreed or agreed they were susceptible to infection (63%) and worry about this risk (74%). This compares to the Becker et al. (1990) study which found 78% who strongly agreed, moderately agreed or agreed they worried about their contact and their risk.

Benefits: The majority (89%) of the respondents believed that following the Universal Precaution policy "would significantly decrease the chances of contracting a hospital-acquired infection," while 85% of the respondents believed a Universal Precautions policy would also decrease

the chances of contracting AIDS. This compared with Becker et al. (1990) who found that 82% of the respondents believed that following the Universal Precautions policy would "significantly decrease the chances of contracting a hospital-acquired infection." Becker et al. (1990) also found 81% who believed Universal Precautions policy would decrease the chances of contracting AIDS.

Barriers: Only 26% of the respondents agreed with the statement, "Sometimes I'm too busy to carry out the Universal Precautions policy in cases where I should." Also 26% of the respondents reported they "forgot" to carry them out in the cases where they should. This compares to the Becker et al. (1990) study where they found 51% who agreed with the statement, "Sometimes I'm too busy to carry out precautions where I should," and 44% reported they "forgot" to carry them out sometimes. This decrease may be explained by the fact that this current study was done at least two more years into the epidemic and health care workers have had more education on the use of Universal Precautions and see fewer barriers to their use.

Motivation: The respondents (n=23) expressed a belief that they would be more likely to stop recapping needles if the containers were in more convenient locations. Seventeen (28%) respondents also expressed they would be more likely to follow Universal Precautions if the equipment was handier for the user. Fourteen respondents (29%) listed education,

reminders, and reviews of Universal Precautions as means to stop recapping behavior. The fact that following the administration of the questionnaire the number of recapped needles and syringes dropped would appear to support that reminders or cues may help stop recapping behavior. Some means need to be found to provide frequent reminders to staff not to recap. This construct of motivation was not examined in the Becker et al. (1990) study.

Summary of Findings

With the increasing number of cases of HIV infections and other blood borne infections health care workers will need to continue to take action to protect themselves. Currently the consistent use of Universal Precautions seems to be the health care worker's greatest means of protection.

This study has supported that health care workers do feel they are susceptible to hospital-acquired infections including HIV and hepatitis B. In addition, the study has supported that health care workers believe that the use of Universal Precautions is their best defense against hospital-acquired infections.

The location of the equipment so that it is readily available would have a greater positive effect on the use of Universal Precautions. Future studies should look at what types of "cues to action" are best.

Recommendations for Further Study

Limitations of research: The research study was limited by a number of factors. This was a single study using only one sample. The use of a single study institution and a volunteer sample versus a random sample were limitations. The study can only be generalized to this group.

The participants from the emergency department and the critical care unit work and interact with each other daily. They could have shared information about the questionnaire or the needle counting activities thus influencing the findings.

Two other historical incidents occurred at the time of data collection that may have influenced the results. The first was the release of the blood borne pathogen recommendations by OSHA one month prior to data collection. The second incident also occurred around the time data were being collected and also may have played a role in the number of recapped needles. The popular press reported the death of an individual who had been very vocal about acquiring the HIV virus from a health care provider. This individual had lobbied in the United States Congress for mandatory testing of health care workers. Her death had generated much discussion at the study site about the acquisition of HIV by health care workers and the issue of mandatory testing. The discussion at the time of the study regarding her death and the release of the OSHA blood borne

pathogen standards may have influenced the results of this study.

A limitation to this study is that the results of the study can only be compared to a similar-type study. The study requires replication for substantiation of results.

Recommendations: Should this study be replicated, it is recommended that validity and reliability of the instrument "Infection Control Survey" be determined with a larger sample. Furthermore the validity and the reliability of the questions regarding "perceived severity" added by the researcher need to be examined more closely.

The researcher would also recommend further investigation into the statements the respondents made when asked to write short answers regarding a motivator to stop recapping and to use Universal Precautions. The statements made by the respondents may provide areas for further study and research.

It also appears that the questionnaire may have served as a cue and influenced the recapping behavior. It would be interesting to discover whether or not the effect of the questionnaire or some other variable or cue caused this phenomenon. Research studies could be designed to look at which factors serve as a cue, or a trigger, to appropriate action. The researcher would like to see at what emotional level or how intense does a cue need to be to trigger the desired behavior.

In this research it appeared that the reduction in recapped needles lasted about one week. Frequency of cues necessary to elicit the desired action could also be examined in future studies.

It is recommended that this study be replicated in smaller and larger institutions. A sample of a larger number of participants is also recommended. Another recommendation would be to select the sample randomly.

Implications for Nursing

Significance to Nursing Education: As a result of this study it is recommended that the use of Universal Precautions be included in nursing education. Nursing programs should review how Universal Precautions/recapping are being taught to ensure the content is both complete and accurate. Cessation of recapping behavior is essential. If this behavior is still being taught in any nursing program this behavior needs to cease. Instructors need to demonstrate the consistent use of Universal Precautions/recapping as barriers to body fluids. Instructors need to act as role models for their use. When the use of visual media is needed it should be reviewed and updated to include the use of Universal Precaution recommendation where appropriate. Where media cannot be updated then the students should be made aware of these deficiencies and made to understand how to correct them. Nursing programs need to include more information on all the

blood borne diseases and not just HIV and Hepatitis B.

Significance to Nursing Practice: The consistent use of Universal Precautions and the cessation of recapping behavior is significant to the practice of nursing. The use of Universal Precautions/recapping provides barriers to body fluids that may be infected. Health care workers believe the use of Universal Precautions/recapping can reduce the risk of exposure to infections.

Significance to Nursing Administration: Nursing administration in health care facilities may wish to evaluate the location and availability of equipment for the use of Universal Precautions/recapping. It can be incorporated into the orientation of new employees. In addition it should be part of continuing education for staff education. Perhaps some kind of reminders around the unit could be developed to act as "cues to action" and they could be changed or modified on a regular basis.

Summary

The results of this investigation demonstrated that the majority of the respondents knew about Universal Precaution recommendation and not to recap needles. However, the behavior revealed that almost one-third of the needles were recapped. Respondents to this study did perceive themselves as susceptible to infection from blood borne pathogens. The respondents noted that they did perceive that if they acquired AIDS it was severe but they were less sure if they

would die soon from it. Respondents to the questionnaire agreed that following Universal Precautions would significantly reduce the chances of contracting hospital-acquired infections and AIDS. Finally respondents felt that locating equipment and disposal boxes in more convenient locations would motivate them to use the equipment.

APPENDICES

APPENDIX A
UNIVERSAL PRECAUTIONS

Appendix A

Universal Precautions

Universal Precautions should be used in the care of all patients in which the risk of blood exposure is increased and the infection status of the patient is unknown. All health care workers should routinely use appropriate barrier precautions to prevent skin and mucous-membrane exposure when contact with blood and other body fluids is anticipated.

1. Gloves shall be worn by staff when carrying out procedures in which there will be contact with blood or moist body secretions.

2. Gloves shall be changed after single patient use and not washed or reused.

3. Hands will be washed between patient contacts and immediately if soiled with blood or body fluids. Hands shall be washed immediately after gloves are removed. Handwashing may be the only precaution necessary for many patient contacts.

4. Gowns will be worn when soiling with blood or body fluids is likely.

5. Masks and goggles shall be worn when splattering or aerosolization of blood or body fluids is likely.

6. Health care worker should handle needles/sharps with care to prevent injuries from these or other sharp devices during procedures.

7. To prevent needlestick injuries, needles shall not be recapped, purposefully bent or broken by hand, removed from disposable syringes, or otherwise manipulated by hand.

8. Needles/sharps shall be placed into puncture-resistant containers for disposal.

9. Needle/sharps containers, at the time of discard, should be sealed to prevent access by non-medical personnel.

10. Mouth-to-mouth resuscitation bags, and other ventilation devices should be used when possible. (CDC, 1987a)

APPENDIX B
INFECTION CONTROL SURVEY

Infection Control Survey

USED WITH PERMISSION FROM THE UNIVERSITY OF MICHIGAN

Please indicate your agreement or disagreement with the following statements:

1. I have extensive contact with patients who have disease/infections transmitted by the blood-borne route (e.g., hepatitis B or AIDS).

Strongly agree

Strongly disagree

1 2 3 4 5 6 7

2. I worry that my work activities put me at risk of contracting hospital-acquired infections.

Strongly agree

Strongly disagree

1 2 3 4 5 6 7

3. I worry that my work activities put me at risk of contracting AIDS.

Strongly agree

Strongly disagree

1 2 3 4 5 6 7

4. Recapping of needles provides protection for me against contracting hospital-acquired infections.

Strongly agree

Strongly disagree

1 2 3 4 5 6 7

5. Recapping of needles provides protection for me against contracting AIDS.

Strongly agree				Strongly disagree		
1	2	3	4	5	6	7

6. If I had AIDS my future would be ruined.

Strongly agree				Strongly disagree		
1	2	3	4	5	6	7

7. I would rather have any disease besides AIDS.

Strongly agree				Strongly disagree		
1	2	3	4	5	6	7

8. If I got AIDS today I would probably live long enough for a cure to be found.

Strongly agree				Strongly disagree		
1	2	3	4	5	6	7

9. If I had AIDS I could still live a normal life with proper treatment.

Strongly agree				Strongly disagree		
1	2	3	4	5	6	7

10. If I recap needles, it provides protection for my colleagues.

Strongly agree				Strongly disagree		
1	2	3	4	5	6	7

11. Most of my colleagues recap needles.

Strongly agree				Strongly disagree		
1	2	3	4	5	6	7

12. I prefer recapping a needle to taking an uncapped needle to a disposal box.

Strongly agree				Strongly disagree		
1	2	3	4	5	6	7

13. I would recap a needle if I knew the patient had AIDS.

Strongly agree				Strongly disagree		
1	2	3	4	5	6	7

14. If I got AIDS my present and future sexual relations would be destroyed.

Strongly agree				Strongly disagree		
1	2	3	4	5	6	7

15. I am the kind of person who gets sick often.

Strongly agree				Strongly disagree		
1	2	3	4	5	6	7

16. I am not the kind of person who is likely to get AIDS.

Strongly agree				Strongly disagree		
1	2	3	4	5	6	7

17. If I had AIDS I would probably die soon.

Strongly agree				Strongly disagree		
1	2	3	4	5	6	7

18. Are you aware of the hospital's Universal Precautions policy?

() YES () NO (if NO skip to question #26).

How much do you agree or disagree with the following statements about the Universal Precaution policy.

19. I am very familiar with the contents of the Universal Precautions policy.

Strongly agree

Strongly disagree

1 2 3 4 5 6 7

20. I think that the Universal Precautions Policy should be applied to the treatment of every patient.

Strongly agree

Strongly disagree

1 2 3 4 5 6 7

21. The Universal Precautions Policy recommends recapping of needles.

Strongly agree

Strongly disagree

1 2 3 4 5 6 7

22. Sometimes I'm too busy to carry out the Universal Precautions Policy in cases where I should.

Strongly agree

Strongly disagree

1 2 3 4 5 6 7

23. Sometimes I forget to carry out the Universal Precautions Policy in cases where I should.

Strongly agree

Strongly disagree

1 2 3 4 5 6 7

24. Following the Universal Precautions Policy would significantly decrease the chances of my contracting a hospital-acquired infection.

Strongly agree

Strongly disagree

1 2 3 4 5 6 7

25. Following the Universal Precautions Policy would significantly decrease the chance of my contracting AIDS.

Strongly agree

Strongly disagree

1 2 3 4 5 6 7

26. If I am stuck by a needle, it is likely that I would acquire AIDS.

Strongly agree

Strongly disagree

1 2 3 4 5 6 7

27. In general, I am not as likely to get sick as most of my coworkers or friends.

Strongly agree

Strongly disagree

1 2 3 4 5 6 7

28. My chances of getting AIDS sometime in my career are high.

Strongly agree

Strongly disagree

1 2 3 4 5 6 7

29. Working at Battle Creek Health System decreases my chances of getting AIDS.

Strongly agree

Strongly disagree

1 2 3 4 5 6 7

30. I have had hepatitis B vaccine.

() Yes () No If answer is No please answer question 30A.

30A. I would be willing to receive hepatitis B vaccine if it were free of charge to me. () Yes () No

31. What would help you not to recap needles?

32. What would help you to follow Universal Precautions?

I am a:

Nurse ()

Physician ()

Other () Please specify

I am:

() 20-30 years of age

() 31-40 years of age

() 41-50 years of age

() 51-60 years of age

() 61 + years of age

I have worked in the health field:

() 2 years or less

() 3 years to 5 years

() 6 years to 10 years

() Greater than 10 years.

THANK YOU VERY MUCH FOR YOUR HELP

If you would like a copy of the results please include your name on a separate sheet of paper.

APPENDIX C
PERMISSION TO USE QUESTIONNAIRE



The University of Michigan

SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF HEALTH BEHAVIOR
AND HEALTH EDUCATION

1420 WASHINGTON HEIGHTS
ANN ARBOR, MI 48109-2029

(313) 764-9494

August 9, 1990

Rosemary M. Ham
17081 20 Mile Road
Marshall, MI 49068

Dear Ms. Ham:

Enclosed is the instrument used in our paper, "Noncompliance with Universal Precaution Policy: Why Do Physicians and Nurses Recap Needles?" The paper is now in press so you are welcome to use the instrument as long as you credit the University of Michigan. If you have any questions regarding the instrument or its use, please call me at (313) 763-9939. Dr. Becker will not be available to talk with you about this for a month or two.

Sincerely,

Nancy K. Janz, Ph.D.
Assistant Research Scientist

Enclosure

APPENDIX D

LETTERS TO MASTER'S PREPARED NURSES

Appendix D

Letter A to Masters' prepared nurses

Dear,

Research in the field of nursing is becoming increasingly important both for the solution of clinical problems and for the establishment of nursing as a discipline. While much of nursing research has been done in institutions of higher learning, it is essential that nursing research now focus on the clinical setting and the clinically-employed nurse.

You, because of your position and area of practice, have a unique expertise that will assist in the field of nursing research. Your response will help me to judge a questionnaire that I will be using to do nursing research in the Battle Creek area. In order for me to get as accurate an assessment of this questionnaire as possible, it is important that the questionnaire with your score be completed and returned. I have enclosed a self-addressed stamped envelope to assist you.

You may be assured of complete confidentiality. The envelope has an identification number for mailing purposes only. This is so I may check your name off the mailing list

when your questionnaire is returned. Your name will never be placed on the questionnaire.

The results of this judgement by individuals, such as yourself, will be to validate the content of the questionnaire I will use in my clinical nursing research. My research will explore health care providers knowledge of needle precautions and their beliefs about their susceptibility to occupationally acquired AIDS.

I am using a model that tests our health beliefs and our motivation to seek health care. It is called the Health Belief Model. Perhaps you have heard of it or have used it yourself in your own practice.

I would appreciate your taking a little time to review the definitions of the concepts that I have enclosed. Then using the definitions and the questionnaire please mark each questions as to which concept you think it represents. If you think a questions is a knowledge question mark it as such.

If you would like a copy of the results when I finish, please indicate that on a separate sheet of paper and include your name. DO NOT put this information on the questionnaire itself.

Thank you for your help on this project. I would be most happy to answer any questions you might have. Please call me collect at 616-781-3744 after 5 p.m. on week days or any time on the week-ends.

Letter B to Masters' prepared nurses

Dear _____,

Three weeks ago I sent you a packet of material and requested your help in evaluating a questionnaire. I plan to use this questionnaire in my research for my Masters Degree in Nursing. I have not heard from you as of this date.

I sent this over the holidays and I know how rushed that time is. I am sending you another copy of the material. Now that the holiday rush is over I hope you will have time to complete it. In the event that your questionnaire is in the mail please except my apology.

Thank you for your help with this.

Sincerely,

APPENDIX E
HEALTH BELIEF MODEL DEFINITIONS

Appendix E

Health Belief Model Definitions

Perceived Susceptibility Refers to a person's belief that he or she is in danger of contracting the condition. Susceptibility refers to the subjective risks of contracting a condition.

If you believe the question is a "perceived susceptibility" question please mark it with the letter "A."

Perceived Severity Refers to a person's convictions concerning the seriousness of a given health problem.

If you believe the question is a "perceived severity" question please mark it with the letter "B."

Perceived Benefits Refers to a person's belief that a given action will be effective in reducing the threat of disease.

If you believe the question is a "perceived benefits" question please mark it with the letter "C."

Perceived Barriers Refers to the person's belief that a given action itself may be inconvenient, expensive, unpleasant, painful or upsetting.

If you believe the question is a "perceived barrier" question please mark it with the letter "D."

Motivation Refers to a factor that serves as a cue or trigger to appropriate action.

If you believe the question is a "motivation" question please mark it with the letter "E."

Knowledge Refers to knowledge of precautions.

If you believe the question is a "knowledge" question please mark it with the letter "K." (Rosenstock, 1974)

APPENDIX F
INFECTION CONTROL SURVEY/COVER LETTER

Appendix F

Infection Control Survey/Cover letter

Hello,

My name is Rosemary M. Ham. I am currently completing my Master's degree in nursing at Grand Valley State University. As part of that program I am doing research on nurses and physicians who work either in the Intensive Care Unit or the Emergency Department. I am looking at their attitudes and beliefs on their risk of occupationally acquired blood borne infections. In addition I am also looking at their knowledge of Universal Precautions and behavior in disposing of contaminated needles and syringes with needles.

The survey offers you 35 questions. Most of the questions ask you to agree or disagree with the statement. There are two questions that ask you to provide a short answer. Then there are three questions that identify your occupation, your approximate age, and how many years you have been in the health-care industry. It will take you about 10 minutes to complete the form.

This proposal for this survey and study was approved by Grand Valley State University committee on human subject

research. The proposal was also approved by the Administration of this hospital.

The data that is collected will be reported in aggregate form. Your supervisor will not see the form once you have completed it. Your participation is voluntary. Participating in this survey will not effect your employment.

I will answer any of your questions. If you have any questions after I leave the room you may contact me at my extension 4425. When you have completed the form please place it in the brown envelope. I will return after the meeting is completed to pick up the forms. If you would like a copy of the results when I have finished please indicate that by including your name on a separate sheet of paper.

Completing and returning the survey will indicate that you wish to participate in this study.

Thank you for your help.

REFERENCES

REFERENCES

- Baraff, I.J., & Talen, D.A. (1989). Compliance with universal precautions in a university hospital emergency department. Annals of Emergency Medicine, 18, 654-657.
- Baric, L. (1969). Recognition of the "at risk" role: A means to influence health behavior. International Journal of Health Education, 12, 30.
- Becker, M.H., Drachman, R.H., & Kirscht, J.P. (1972). Motivations as predictors of health behavior. Health Services Reports, 87, 852-862.
- Becker, M.H., Janz, N.K., Band, J., Bartley, J., Snyder, M.B., & Gaynes, R.P. (1990). Noncompliance with universal precautions policy? Why do physicians and nurses recap needles? American Journal of Infection Control, 18, 232-239.
- Centers for Disease Control (1970). Isolation techniques for use in hospitals. (1st ed.). Atlanta, Georgia: Centers for Disease Control.
- Centers for Disease Control (1975). Isolation techniques for use in hospitals. (2nd ed.). Atlanta, Georgia: Centers for Disease Control.

Centers for Disease Control (1978). Isolation techniques for use in hospitals. 3rd ed.). Atlanta, Georgia: Centers for Disease Control.

Centers for Disease Control (1982). Acquired immune deficiency syndrome (AIDS): Precautions for clinical laboratory staffs. Morbidity and Mortality reports, 43, 577-582.

Centers for Disease Control (1985). Recommendations for preventing transmission of infection with human T-lymphotropic virus type III/lymphadenopathy associated virus during invasive procedures. Morbidity and Mortality Weekly Report, 35, 221-223.

Centers for Disease Control (1987a). Recommendations for prevention of HIV transmission in health-care settings (Supplement no. 2s). Morbidity and Mortality Weekly Report, 36, 1s-18s.

Centers for Disease Control (1987b). Update: Human immunodeficiency virus infections in health-care workers exposed to blood of infected patients. Morbidity and Mortality Weekly Report, 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. Morbidity and Mortality Weekly Report, 37, 377-387.

- 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 (Supplement no. S-6). Morbidity and Mortality Weekly Report, 38, 423-434.
- Centers for Disease Control (1992). Surveillance for occupational acquired HIV infection-United States, 1981-1992. Morbidity and Mortality Weekly Report, 41, 823-825.
- Champion, V.L., (1984). Instrument development for health belief model constructs. Advances in Nursing Science, 6, 73-85.
- Damrosh, S., Abbey, S., Warner, A., & Guy, S. (1990). Critical care nurse's attitudes toward, concerns about, and knowledge of the acquired immunodeficiency syndrome. Heart and Lung, 19, 395-400.
- Deets, C., & George, S. (1990). Measurement of power: A content validity study. MAIN Journal, 2,6-9.
- Doebbeling, B., & Wenzal, R. (1990). The direct cost of UP in a teaching hospital. Journal of American Medical Association, 264, 2063-2067.
- Edmond, M., Khakoo,R., McTaggart, B., & Solomon, R. (1988). Effect of bedside needle disposal units on needle recapping frequency and needlestick injury. Infection Control Hospital Epidemiology, 9, 114-116.

- Erler, C., Jurich, J., Lansinger, T., & Rupp, M. (1990, April). Condom use to prevent HIV infection: An application of the Health Belief Model. Paper presented at the Kalamazoo Nursing Research Collective Kalamazoo, Michigan.
- Garner, J.S., & Simmons, B.P. (1983). Centers for Disease Control Guidelines for isolation precautions in hospitals. In Guidelines for the prevention and control of nosocomial infections (pp. 1-81). Atlanta, Georgia; Centers for Disease Control.
- Gerberding, J.L., Bryant-LeBlanc, C. E., Nelson, K., Moss, A.R., Osmond, D., Chambers, H. F., Carlson, J.R., Drew, W.L., Levy, J.A., & Sande, M.A. (1987). Risk of transmitting human immunodeficiency virus, cytomegalovirus, and hepatitis B virus to health-care workers exposed to patients with AIDS and AIDS-related conditions. Journal of Infectious Diseases, 156, 1-8.
- Gerbert, B., Maguire, B., Badner, V., Altman, D., & Stone, G. (1988). Why fear persists: Health care professionals and AIDS (Commentary). Journal of the American Medical Association, 260, 3481-3483.
- Gruber, M., Beavers, F.E., Johnson, B., Brackett, M., Lopez, T., Feldman, J.J., & Ventura, M. (1989). The relationship between knowledge about acquired immunodeficiency syndrome and the implementation of

- universal precautions by registered nurse. Clinical Nurse Specialist, 3, 182-185.
- Hochbaum, G. (1956). Why people seek diagnostic x-rays. Public Health Report, 71, 337-380.
- Holmes, O.W (1842-3). The contagiousness of puerperal fever. New England Quarterly Journal Medicine Surgery, 1, 503-530.
- Jackson, M.M., & Lynch, P. (1980). Infection prevention and control in the era of the AIDS/HIV epidemic. Seminars in Oncology Nursing, 5, 236-243.
- Janz, N.K., & Becker, M.H., (1984). The health belief model: A decade later. Health Education Quarterly, 11 (1), 1-47.
- Kasl, S.V., & Cobb, S. (1966). Health behavior, illness behavior, and sick role behavior. Archives Environmental Health, 12, 246-257.
- Kegelas, S. (1963). Why people seek dental care: A test of a conceptual formulation. Journal of Health and Human Behavior, 4, 166-173.
- Kelen, G.D. (1990). Human immunodeficiency virus and the emergency department: Risk and risk protection for health care providers. Annals of Emergency Medicine, 19, 242-248.
- Kelen, G.D., DiGiovanna, T., Bisson, L., Kalainov, D., Siverston, K.T., & Quinn, T.C. (1989). Human immunodeficiency virus infection in emergency

- department patients. Journal of American Medical Association, 262, 516-522.
- Kirscht, J.P., (1974). The health belief model and illness behavior. Health Education Monographs, 2, 387-408.
- Lister, J. (1867). On the effects of the antiseptic system of treatment upon the salubrity of a surgical hospital. Lancet, 1(40), 400. In Collected Papers, Oxford, (1909) republished Classics of Medicine Library, Birmingham, 1979.
- Lowen, N.L., Dhillon, G.L., Willy, M.E., Wesley, R. A., & Henderson, D.K. (1989). Use of precautions by nurse-midwives to prevent occupational infections with HIV and other blood-borne diseases. Journal of Nurse-Midwifery, 34, 309-317.
- Lynn, M.R. (1986). Determination and quantification of content validity. Nursing Research, 35, 382-385.
- Marcus, R. (1989). Surveillance of health care workers exposed to blood from patients infected with the human immunodeficiency virus. The New England Journal of Medicine, 319, 1118-1123.
- Mazon, D., McGeer, A.M., & Hierholzer, W.J. (1990. May). Assessing compliance with universal precautions. Paper presented at meeting of Association for Practitioners of Infection Control, Washington, DC.

- McCormick, R.D., & Maki, D.G. (1981). Epidemiology of needlestick injuries in hospital personnel. American Journal of Medicine, 70, 928-932.
- Michigan Department of Public Health (1992, January). Circulation: Official information from the Michigan Department of Public Health to local health department, 53:(1).
- Occupational Safety and Health Administration, (1991). Occupational exposure to bloodborne pathogens. OSHA Act;29 CFR Part 1910.1030. Federal Register, 56,(235), 63861-64186.
- Ribner, B.S., Landry, M.N., Gholson, G.L., & Linden, L.A. (1987). Impact of rigid, puncture resistant container system upon needlestick injuries. Infection Control, 8, 63-66.
- Richardson, D.L. (1915). Aseptic fever nursing. American Journal of Nursing, 15, 1082-1093.
- Rosenstock, I.M. (1974). Historical origins of the health belief model. Health Education Monographs Winter, 2, 328-335.
- Semmelweis, I.F. (1861). The etiology, the concept and the prophylaxis of childbed fever. Pest, C.A. Hartleben's Verlag-Expedition. Translated by F. Murphy republished, Classics of Medicine Library, Birmingham, 1981.

- Smyser, M., Bryce, J., & Joseph, J.G. (1990). AIDS-related knowledge, attitudes, and precautionary behaviors among emergency medical professionals. Public Health Reports, 105, 496-504.
- Stock, S., Ganfi, A., & Block, R. (1990). UP to prevent HIV transmission to health care workers: An economic analysis. Canadian Medical Association Journal, 142, 937-945.
- Thurn, J., Willenbring, K., & Crossley, K. (1989). Needlestick injuries and needle disposal in Minnesota physician's offices. The American Journal of Medicine, 86, 577-579.