1990

The effect of shift length on the number of needlestick injuries in an acute private hospital

J. McMahon

Edith Cowan University

Recommended Citation


This Thesis is posted at Research Online.
You may print or download ONE copy of this document for the purpose of your own research or study.

The University does not authorize you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site.

You are reminded of the following:

- Copyright owners are entitled to take legal action against persons who infringe their copyright.

- A reproduction of material that is protected by copyright may be a copyright infringement. Where the reproduction of such material is done without attribution of authorship, with false attribution of authorship or the authorship is treated in a derogatory manner, this may be a breach of the author’s moral rights contained in Part IX of the Copyright Act 1968 (Cth).

- Courts have the power to impose a wide range of civil and criminal sanctions for infringement of copyright, infringement of moral rights and other offences under the Copyright Act 1968 (Cth). Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.
USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.
THE EFFECT OF SHIFT LENGTH ON THE NUMBER OF NEEDLESTICK INJURIES IN AN ACUTE PRIVATE HOSPITAL

BY -

J. McMAHON, R.N.

A Thesis Submitted in Partial Fulfillment of the Requirements for the Award of

BACHELOR OF HEALTH SCIENCE (NURSING) HONOURS

at the School of Nursing,
Western Australian College of Advanced Education.

Date of Submission: 22.10.90
# TABLE OF CONTENTS

Abstract 3
Declaration 5
Acknowledgements 6
List of Figures 7
Introduction 8
The Research Question 10
Definition of Terms 10
Limitations 11
General Assumption 12
Research Hypothesis 12
Literature Review 12
Theoretical Framework 16
Methodology 18
  - Methodological Assumptions 18
  - Subjects 19
  - Ethical Considerations 19
  - Instruments 20
  - Design 21
Data Analysis 22
  - Length of Shift and Number of Needlestick Injuries
  - Location of Work and Number of Needlestick Injuries 24
  - Time of Shift and Number of Needlestick Injuries
  - Time During Shift and Number of Needlestick Injuries 27
  - Dexterity Test 27
TABLE OF CONTENTS
Continued

Discussion
- Length of Shift and Number of Needlestick Injuries 28
- Location of Work and Number of Needlestick Injuries 29
- Time of Shift and Number of Needlestick Injuries 30
- Time During Shift and Number of Needlestick Injuries 31

Conclusion 32

Bibliography 33

References 34

Appendix 1 Letter of Approval 35

Appendix 2 Accident/Incident Form 36

Appendix 3 Dexterity Test 37

Appendix 4 Scoring Key 38
ABSTRACT

Needlestick injuries present a hazard to both nurse and patient in that they may be the source of transmission of Hepatitis B and the human immunodeficiency virus. It is therefore important to study the factors which either precipitate or prevent needlestick injury. This study examined the effect of shift length on the number of needlestick injuries. Variables which were tested included length of shift, location of work, time of shift, and time within shift. A descriptive survey was used to demonstrate a relationship between any of these variables and the occurrence of needlestick injuries. The study included two data sources: the Accident/Incident form completed by nurses after they sustained a needlestick injury, and a dexterity test designed to indicate whether nurses' dexterity levels decreased at the end of the shift when compared to the beginning of the shift. The population sample included all nurses working at the Mount Hospital between January 1989 and August 1990. General systems theory was chosen as a framework to guide this study. Chi-square calculations revealed that there was no significant relationship between the number of needlestick injuries sustained and length of shift, $\chi^2 (1, \text{ N 39}) = 0.38$, N.S., time of shift, $\chi^2 (1, \text{ N 39}) = 0.03$, N.S. or time within shift, $\chi^2 (1, \text{ N 39}) = 0.1$, N.S. Data for location of work and number of needlestick injuries was too small for chi-square calculations. The dexterity
test revealed that there was a decrease in dexterity at the end of a shift. Although these results indicate that there is no significant relationship between the variables and the number of needlestick injuries, the research suggests that nurse managers should organise their rosters with the knowledge that the length of shift does not necessarily predispose to an increase in the number of needlestick injuries. A further recommendation is that the research should be replicated with a larger study sample and across more study settings.
"I certify that this thesis does not incorporate, without acknowledgement, any material previously submitted for a degree or diploma in any institution of higher education and that, to the best of my knowledge and belief, it does not contain any material previously published or written by another person except where due reference is made in the text."

NAME .............................

DATE ..............................

22/10/90
ACKNOWLEDGEMENTS

I would like to record my appreciation to all those at the Mount Hospital who participated in this study and offered encouragement. I would also like to thank my Supervisor, Ann McMurray, without whose guidance, I would not have completed this research.
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>Feedback mechanism in systems theory</td>
<td>16</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Hypothesised model</td>
<td>17</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Comparison between number of needlestick injuries sustained on 8 hour and 10 hour shifts</td>
<td>23</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Comparison between wards of number of needlestick injuries sustained</td>
<td>24</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Comparison between percentage of nurses working on a shift and number of needlestick injuries</td>
<td></td>
</tr>
<tr>
<td>Figure 6</td>
<td>Dexterity scores for the two groups at the beginning and end of shifts</td>
<td>27</td>
</tr>
</tbody>
</table>
INTRODUCTION

The following study explores the impact of variable shift lengths for nurses on the number of needlestick injuries sustained. The introduction of a career structure for registered nurses in W.A. in 1986 has indirectly contributed to the need for flexible work hours. To progress upwards through the structure nurses have had to secure further education and employers have met this need by organising variable shift rosters. This practice has been supported by the National and State Nurses Union, the Australian Nurses Federation.

Nurses at the Mount Hospital, an acute private hospital, enjoy the benefits of a flexible rostering system. At this hospital, nurses are able to work shifts from four to ten hours in length; full or part-time. It is not known if variable shift lengths have any effect on clinical performance, specifically administering injections.

With the growing incidence of hepatitis A and B; and immuno-deficiency virus positive clients (H.I.V., 1990), it is important that as many causes of needlestick injury as possible be identified. One cause may be the practice of recapping a needle after use. This practice has been advised against by the Association for Practitioners in Infection Control (Sandborn, Luttrell & Hoffman, 1988, p.25). Many nurses, when asked in a non-threatening
manner, reveal that they continue to recap needles after use although, they are aware of the dangers and hospital policies which state that they should not recap.

In recent times, much has been reported about Acquired Immunodeficiency Syndrome (AIDS) and the danger to health care workers. This is a disease which is fatal if contracted as no cure has been found. It can only be treated symptomatically until the immune system becomes overwhelmed and death occurs. However, the chance of contracting this disease is much less than that of contracting hepatitis B, which is more prevalent in our society and very easily transmitted. In the hospital system it could be transmitted from client to nurse or from nurse to client. The mortality rate of patients with this disease (Cooper, 1988) is not as great as those with AIDS, but it is a debilitating illness which causes liver damage and leaves residual symptoms for a long time.

If the nurse who sustains a needlestick injury contracts either hepatitis or AIDS there will be a catastrophic effect on the nurses' health, the financial cost to the hospital in workers compensation would be enormous. The recent incident in New York where a doctor who contracted AIDS from a needlestick injury was paid $200 million in damages (Hospital, 1990) should be enough warning that this problem should be researched more thoroughly.
Although the scope of this study does not allow for the investigation into every cause of needlestick injury, its purpose is to investigate the relationship between time of shift, and time during shift length, location of work, on the number of needlestick injuries sustained.

THE RESEARCH QUESTION

The question for this study was - "What is the relationship between needlestick injuries sustained by nurses at the Mount Hospital and the length of shift, location of work, time of shift, and time during shift the injury was sustained?"

DEFINITION OF TERMS

For the purpose of this study, shift length has been separated into two categories: eight hours or ten hours. Location of work takes into account the area in which a greater proportion of needlestick injuries occurred. The six areas being considered at the Mount Hospital are -

1) Banksia B, a short-stay surgical ward;
2) Karri, a gynaecology/urology/plastic surgery ward;
3) Tuart, an oncology, general surgery ward;
4) Jarrah, an orthopaedic ward;
5) Wandoo, the cardiothoracic, high-dependency ward, and
6) Theatre.
Time of work refers to whether the nurse worked a morning, afternoon or night shift. Time during shift refers to whether the injury was sustained in the first (beginning) or second (end) half of the shift.

A needlestick injury refers to a puncture wound from a needle which occurs after an injection has been administered.

**LIMITATIONS**

As the data have only been collected from one hospital during a twenty month period, the generalisability of the results is limited to that hospital. Also, a dexterity test was performed and it is not known if the small number (twenty in each group) of tests performed by the nurses is large enough to achieve statistical significance.

Several variables which would impact on the number of needlestick injuries were not studied. These include factors outside the hospital which would affect the nurses performance, such as family problems, psychological state and anxiety connected with juggling study, work and family commitments. Injection equipment represents another factor which may also be conducive to needlestick injury. However research is currently being carried out with a view to changing the design of needles and syringes to reduce the possibility of needlestick injury (AIDS, 1990, p.25). Injection technique which includes the way the nurse
draws up, administers the injection and disposes of the needle and syringe may also impact on the possibility of sustaining a needlestick injury. A further factor which may impact on nurses' performance would be the overall activity level of the ward. Nurses' performance may be affected by exceptionally busy periods on the ward.

**GENERAL ASSUMPTION**

The general assumption which guides this study is that if all factors related to needlestick injury can be identified strategies for reducing needlestick injury can be developed.

**RESEARCH HYPOTHESES**

There are four null hypotheses which may explain the relationship between needlestick injury and the variables in the study. These are:

1. There is no relationship between length of shift and the number of needlestick injuries.
2. There is no relationship between location of work and the number of needlestick injuries.
3. There is no relationship between time of shift and the number of needlestick injuries.
4. There is no relationship between time during shift and the number of needlestick injuries.
5. There is no relationship between dexterity and the number of needlestick injuries.

**LITERATURE REVIEW**

A review of the literature was carried out in order to
determine the extent to which this subject had been studied, and to relate the literature to the present study.

There was little evidence of any research carried out to link longer shifts with an increase in the number of needlestick injuries. Duncan (1988, p.313) referred to the relationship between needlestick injuries, tiredness and "excessive working hour". Nurses in a study by Sandborn, Luttrell, and Hoffman (1988, p.27) reported tiredness and carelessness as causes of needlestick injuries. Dwyer, cited by Bell (1989, p.41), stated that "poor technique" was a major cause of needlestick injury. This was supported by Justice Michael Kirby who reported that needlestick injury is usually sustained by a nurse who "breaches proper procedure" (Kirby, 1990, p.15). These factors can all be logically linked to longer shifts.

A study reported in the New England Journal of Medicine and cited by Millam (1990, p.61) showed the highest incidence of needlestick injuries occur in acute care units (68%), with intensive care units (13%), laboratories and special procedure units (11%) and emergency departments (4%) reporting fewer injuries. Research carried out by medical students in 1989 on the incidence of needlestick injury in emergency departments in three major teaching hospitals in Perth revealed that 32.2% of the staff surveyed had sustained a needlestick injury in the past twelve months. In comparison with the
number of Incident Forms completed it showed that some injuries sustained were not reported (Constantine, Mytych, Overmeire and Peters, 1989, p.1). They also found that those with less experience sustained a greater number of needlestick injuries (p.19).

Shiftwork is cited by Benner and Wrubel (1989, p.338) as a threat to productivity, accuracy and safety. Night shift was identified as the one which causes most stress and may contribute to a higher incidence of needlestick injuries. However, in a study of shiftworkers in various occupations in Australia it was shown that the frequency of accidents was not related to any particular shift (Shiftwork, 1980).

Many authors agreed that circadian rhythm disturbance and lack of sleep are the major causes of stress on night duty. This can result in a reduction in productivity and safety. Vidacek, Kaliterna, Radosevic-Vidacek, Foulkard, (1986, p.50), found that performance corresponds with body temperature, therefore performance levels are lowest in the early hours of the morning. Foulkard however, reported that performance levels can run independently of temperature rhythm (Vidacek, Kaliterna, Radosevic-Vidacek, Foulkard, 1986, p.1588).

Dopson (1988, p.35) identified the problem on night duty of many treatments being ordered for 0600 hours when the nurses were more likely to make errors. It may also lead to an increase in the number of needlestick injuries.
Bacon and Kun (1986) reported on a survey which was carried out in a Victorian hospital in which some nurses changed from eight to nine and a half hour shifts for a trial period. They found that reported tiredness did not vary with length of shift. However, they did not study performance indicators. Information from the literature was inconsistent and therefore, there is a need to do more research before a decisive statement can be made as to whether length of shift makes a difference to the number of needlestick injuries.

If excessive working hours lead to tiredness and carelessness, resulting in an increase in needlestick injuries this is an important concept to investigate. The majority of night staff work ten hour shifts and there is an increasing number of nurses working ten hour day shifts. Areas where more needlestick injuries occur should be identified so that recommendations can be made about length of shift, organisation of work schedule in those areas, and education requirements of the area which will increase the staff's awareness of the risks involved when the correct procedures are not carried out.

The literature revealed that there has been some research into the effect of shiftwork and night duty on nurses' performance. It also showed that some research has been done to identify some of the factors which may lead to needlestick injuries, and the areas in which a greater number of these injuries occur. One study reported that
there was a difference between the number of needlestick injuries reported and the number which actually occur. No literature was found which would positively link the introduction of longer shifts with an increase in the number of needlestick injuries.

**THEORETICAL FRAMEWORK**

General systems theory was chosen as the theoretical framework for this study. This theory holds that a system is a set of interacting parts or subsystems and that the system is greater than the sum of its parts. Some of the properties that systems demonstrate include interdependence of variables, the ability to increase their complexity and change and develop over time, they can be open to outside influences or closed, adaptive or stable, and they have the ability to "provide for self-correction" through a feedback loop (Putt, 1978, p.3).

Each system and subsystem has inputs, throughputs and outputs linked by a feedback mechanism which allows the system to regulate itself and control its input and output (Kozier, B. & Erb, G. 1987, p.22).

![Feedback mechanism in systems theory.](image)
Dysfunction of a part of the system causes a "disturbance in the system rather than the loss of a single function" (Putt, 1978, p.28).

The organisation of nursing care is a subsystem of the hospital system. This nursing subsystem is affected by many factors and inputs. In this study these inputs are identified as longer shifts, the number of hours into the shift (towards the end rather than the beginning) and busy wards. The variables in the present study have been conceptualised as inputs into the hospital system. It is hypothesised that each of these inputs will have an impact on the functioning of the system.

These factors impact on the throughput (a process which makes the inputs useful to the system) of the system. In this case throughputs (nursing care) may be influenced by tiredness, carelessness and poor technique. The output would then be negatively affected causing an increase in the number of needlestick injuries to assess the system and to adjust such inputs as shift length and structure of the work schedule as required.

With the subsystem of nursing care operating efficiently the hospital system will be able to function at an optimal level.
Figure 2 The hypothesised model.

METHODOLOGY

METHODOLOGICAL ASSUMPTIONS

1. The fact that nurses are taking part in a study by completing a dexterity test will not cause them to act differently.

2. Deviations from normal dexterity levels can be partially affected by behavioural outcomes of tiredness.

3. The data collected will be generalisable to nurses working at the Mount Hospital.

4. Additional handling, i.e. recapping a needle after use, increases the risk of sustaining a needlestick injury.
5. The hospital incident reports represent a true and accurate record of needlestick injury.

SUBJECTS

The sample for this study was drawn from nursing staff working at the Mount Hospital between January 1989 and August 1990 and included all those who had sustained a needlestick injury. These people were identified by analysis of Accident/Incident forms.

A random sample of twenty nurses working shifts of eight hours, and twenty nurses working ten hours were chosen for the dexterity test using a table of random numbers. It was expected that the sample size would be large enough to reduce the risk of Type II error, that is that the null hypothesis would be accepted wrongly.

ETHICAL CONSIDERATIONS

Individual nurses have been protected from identification as no demographic data from the Accident and Incident forms has been used. The Administrator of the Mount Hospital gave her permission for this study to be undertaken (Appendix 1). Nurses completing the dexterity test indicated their consent by participating. A letter was sent to all nurses working in the hospital explaining what the research was about, emphasising that there was no penalty for non-participation, and that their identity would remain confidential.
INSTRUMENTS

The major instrument used for this research has been the Accident and Incident forms filled out by nurses sustaining needlestick injuries (see Appendix 2). This supplied the information about where and when the incident occurred. Rosters were then checked to find the length and time of shift worked.

The reliability and content validity of this instrument can only be assumed as these Accident and Incident forms have been used to report needlestick injuries over a long period. The assumption is being made that nurses freely fill out a form when they sustain a needlestick injury under no threat of penalty. They also have face validity as they require a straightforward account of the incident.

A dexterity test was developed in which the nurse was asked to hold a pen ten centimetres from the tip, (the approximate distance from the tip of a needle to where a syringe would be held to recap a needle) (see Appendix 3). The dexterity test was pilot tested on 5 subjects to determine the ease of administering the test. Ten dots were placed by the nurse as close to the centre of a two centimetre cross as possible holding the pen approximately five centimetres above the paper and without supporting the arm. These dots were then measured in concentric circles measuring five millimetres, ten millimetres and fifteen millimetres in diameter radiating from the centre of the
cross. These diameters were chosen as the five millimetre diameter corresponds with the width of needle cap. The dexterity test was measured at the beginning and end of the shift to support the possibility of shift length affecting the number of needlestick injuries.

A scoring key was used to allocate a score to the tests at both the beginning and end of the shift (Appendix 4). Dots in the five millimetre circle = 3 points, ten millimetre circle = 2 points, fifteen millimetre circle = 1 point and outside = 0. A higher score signifies a higher level of dexterity. This was expected to be the case at the beginning of the shift.

This instrument has face validity as it appears to be an approximation of the actual technique of injecting and recapping a needle. Construct validity (the extent to which the test measures the concept of decreasing dexterity toward the end of a shift), and reliability (the accuracy of the instrument) will be established when the instrument is used for similar studies.

DESIGN

A descriptive survey was employed in an effort to identify the relationship between the variables and the number of needlestick injuries.

This study consisted of two data sources. The first was a survey of the Accident and Incident forms filled out over a period of twenty months. From these forms the
number of needlestick injuries and time of occurrence was extracted. Rosters were also checked to measure the frequency and circumstances related to needlestick injuries. These records are all kept by either the Nurse Co-ordinator or the Infection Control Nurse who gave permission for them to be used in the survey.

There are several factors which may affect the incidence of needlestick injuries in the hospital which should be considered. Because it is the policy at this hospital that needles should not be recapped after use, each nurse who sustains a needlestick injury through recapping is followed up by the Infection Control Nurse who explains why the hospital policy about recapping of needles has been adopted. This encourages more care to be taken in future.

The second data source was the dexterity test which has been described previously. This was administered over a period of two months from July - August 1990 at the beginning and end of the shift worked by the nurses chosen to take part.

**DATA ANALYSIS (RESULTS)**

In this section each of the following variables will be considered as they relate to the number of needlestick injuries:

1) Length of shift;
2) Location of work;
3) **Time of shift;**

and

4) **Time during shift.**

The results from the dexterity test will also be presented.

Over the twenty month period from January 1989 to August 1990 the total number of Accident/Incident Forms completed by nurses sustaining needlestick injuries was 41. This represented 17% of nurses employed in the clinical stream at the Mount Hospital. Only two of these incidents occurred on night duty and it was decided not to include them in the calculations, except when comparing shifts. This decision was made because if the chi-square distribution has an expected frequency of less than 5 the sample size is considered inadequate. This gave a total number of 39 needlestick injuries for the twenty month period.

**LENGTH OF SHIFT AND NUMBER OF NEEDLESTICK INJURIES**

The number of needlestick injuries sustained on eight hour and ten hour shifts was found by checking the Accident/Incident Forms and rosters. A chi square calculation was performed to find out if there was a difference between the two groups. There was a total of 28 needlestick injuries sustained by nurses working 8 hour shifts and 11 needlestick injuries sustained by nurses working 10 hour shifts (see Figure 3).

\[ \chi^2(1, N = 39) = 0.38 \text{ N.S.} \]
Figure 3  Comparison between number of needlestick injuries sustained on 8 hour shifts (n = 28) and 10 hour shifts (n = 11).

LOCATION OF WORK AND NUMBER OF NEEDLESTICK INJURIES

Accident/Incident Forms also revealed the location of work of nurses sustaining the needlestick injury. In order to assess whether nurses had more needlestick injuries in some wards than in other wards, it was necessary to take into consideration the fact that there were different numbers of nurses in each ward.

Of the 39 needlestick injuries, 8% were sustained on Banksia Ward (n=3) where 4% of the nursing staff work. 10% were sustained on Karri (n=4) where 15% of the nursing staff work. 15% were sustained on Tuart (n=6) where 11% of the nursing staff work. 15% were sustained on Jarrah (n=6) where 15% of the nursing staff work. 15% were sustained on Wandoo (n=6) where 17% of the nursing staff work, and 36% needlestick injuries were sustained in theatre.
(n=14) where 38% of the nursing staff work (see Figure 4).

Chi-square calculations were not done as the number of needlestick injuries on each ward over the 20 month period was too small.

Figure 4 Percentage of needlestick injuries sustained in each ward compared with percentage of nurses working on each ward. (B = Banksia Ward, K = Karri Ward, T = Tuart Ward, J = Jarrah Ward, W = Wandoo Ward, OT = Theatre).

TIME OF SHIFT AND NUMBER OF NEEDLESTICK INJURIES

The information as to what time the shift was that the nurse sustained the needlestick injury on was found by checking back through the rosters. Fifty-four per cent of needlestick injuries occurred while the nurse was working a morning shift (n=22), 41% on an afternoon shift.
(n = 17) and 5% on night shift (n = 2).

Chi-square calculations were considered to be appropriate to discover whether there was a difference between the morning and afternoon shifts $\chi^2 (1, N = 39) = 0.03$, N.S. As there were such a small number of needlestick injuries occurring on night duty it was not possible to include them in the chi-square calculations.

Figure 5 shows that there is little difference between the percentage of nurses working and the needlestick injuries sustained on each shift.

---

**Figure 5** Comparison between percentage of nurses working and needlestick injuries sustained during a shift.
TIME DURING SHIFT AND NUMBER OF NEEDLESTICK INJURIES

The information for this part of the study was found by checking the time of the incident against the hours of the shift worked. Fifteen needlestick injuries occurred at the beginning of the shift (38%) and twenty four at the end of the shift (62%). Chi-square calculations which discover whether there is a difference between the two groups were carried out, \( \chi^2 (1, N = 39) = 0.1, \) N.S. On the basis of this data, there is no evidence of any difference in needlestick injuries related to time during shift.

DEXTERITY TEST

All nurses chosen by random sampling agreed to perform the dexterity test at the beginning and end of their shifts. Twenty nurses working 8 hour shifts and twenty nurses working 10 hour shifts completed the test. A two-way analysis of variance was carried out, comparing time within shift (beginning or end) and length of shift (8 hours or 10 hours).

The main effect for time within shift was significant, \( F(1, 38) = 0.0070, \) p = \( \leq 0.01 \). This indicates that there is a difference in the level of dexterity between the beginning and end of the shift, i.e. the level of dexterity is higher at the beginning of the shift than the end of the shift.

The main effect for length of shift was also significant, \( F(1, 38) = 0.156, \) p = \( \leq 0.05 \). This indicates
that there is a difference in dexterity levels between nurses working 8 hour shifts and nurses working 10 hour shifts. Results show that nurses working 10 hour shifts have a higher dexterity level than nurses working 8 hour shifts.

No significant interaction was found between the two variables, $F(1, 38) = 0.1267$, $p < 0.05$ (see Figure 6).

![Dexterity scores for the two groups at the beginning and end of shifts.](image)

**Figure 6** Dexterity scores for the two groups at the beginning and end of shifts.

**DISCUSSION**

In this section the relationship between the number of needlestick injuries and length of shift, location of work, time of shift and time during shift will be discussed. Results from the dexterity test will also be related to these variables.
LENGTH OF SHIFT AND NUMBER OF NEEDLESTICK INJURIES

The null hypothesis states that there is no relationship between the length of shift and the number of needlestick injuries. Results from chi square calculations indicate that there is not a significantly higher number of needlestick injuries sustained during 8 hour shifts than 10 hour shifts. As a result of these findings the null hypothesis could not be rejected.

The majority of 10 hour shifts are worked by nurses on night duty. These nurses represent 13% of the total nursing staff in the clinical stream. Fewer injections are given during the period from 2100 hours to 0730 hours than on either of the other shifts. These factors may explain the lack of a significant difference in the number of needlestick injuries sustained between nurses working 8 hour shifts and those working 10 hour shifts.

The dexterity test showed that nurses working 10 hour shifts had a higher level of dexterity than those working 8 hour shifts. However, this cannot be related to a higher incidence of needlestick injuries on either shift. The dexterity levels of those nurses working 10 hour shifts may be higher than those of nurses working 8 hour shifts because the nurses are less busy and have more time to devote to the procedure of administering an injection. It may also be speculated that the practice effect could lead to those nurses working 10 hour shifts having higher levels of dexterity due to more injections being given over a
greater length of time. These findings must be viewed with caution as there are so few injections given on night duty.

The results from this section of the study suggest that those nurses working 10 hour shifts are therefore in no more danger of sustaining a needlestick injury than those working 8 hour shifts. This has implications for those hospitals that wish to change their rostering system to allow nurses to work longer shifts if they choose to.

LOCATION OF WORK AND NUMBER OF NEEDLESTICK INJURIES

The null hypothesis states that there is no relationship between the location of work and the incidence of needlestick injuries. Chi-square calculations were not performed on the results from this survey as the numbers were too small. Percentages of needlestick injuries on each ward revealed no evidence of a significant difference between the areas. It was therefore not possible to reject the null hypothesis.

As illustrated in Figure 4, there are differences in the numbers of needlestick injuries between areas. However, these differences are proportional to the number of nurses working in each area.

TIME OF SHIFT AND NUMBER OF NEEDLESTICK INJURIES

The null hypothesis states that there is no relationship between the time of shift and the number of needlestick injuries. Chi-square calculations reveal that there is no significant difference in the number of needlestick injuries occurring on morning or afternoon
shifts. As a result, the null hypothesis could not be rejected. The small number of needlestick injuries occurring on night duty (2) was inadequate to include in the calculations.

During a morning shift, nurses are busy attending to the general nursing care needs and treatment schedules of their clients. They also have to admit new clients and prepare them for theatre. Consequently the procedure of giving an injection may be rushed, increasing the possibility of sustaining a needlestick injury.

On the whole, afternoon shifts are not as busy as morning shifts. Most of the clients going to theatre have been prepared by the morning staff and there are not quite as many admissions in the afternoon. Therefore, although some of the clients require intensive treatment post-operatively, the workload is steady and can be planned more easily. It is unlikely that nurses would find afternoon shift very stressful as it does not have the factors of excessive busyness of the morning shift or tiredness during the night shift.

The number of needlestick injuries occurring on night duty was very low. Although it proved impossible to test for a difference, Figure 5 suggests that night duty nurses may sustain fewer injuries and this could be explained by the fact that less injections are given on night duty, thus reducing the risk of sustaining a needlestick injury.
Also, night nurses are not under the same time pressure as
day nurses and have more time to devote to procedural
activities such as drawing up, administering and disposing
of an injection.

Those nurses working on night duty and 10 hour day
shifts work only four shifts consecutively whereas those
working 8 hour shifts may work six to eight shifts in a
row. Consequently, nurses working an extended number of
shifts may be more tired and prone to sustaining
needlestick injuries.

**TIME DURING SHIFT AND NUMBER OF NEEDLESTICK INJURIES**

The null hypothesis states that there is no
relationship between time during shift and the number of
needlestick injuries. On the basis of chi-square
calculations, which proved not significant, the null
hypothesis was not rejected. This means that there is
not a significant difference in the number of needlestick
injuries occurring at the beginning (first half) or end
(second half) of the shift.

The dexterity test revealed that there is a decline in
the level of dexterity for nurses working both 8 and 10
hour shifts. These results however, cannot be related to a
greater number of needlestick injuries occurring at the
end of the shift. This may indicate that dexterity has
very little to do with the occurrence of needlestick
injuries. The fact that the dexterity levels were
measured at the beginning and end of the shift, whereas
the number of needlestick injuries occurring within the shift were measured in the first half and second half of the shift may have influenced the discrepancy in these results.

In terms of systems theory, there are many variables which affect the nursing care giving subsystem. The study findings however, provided no conclusive evidence that the variables under study (shift length, location of work, time of shift and time during shift) provide a major influence on the functioning of that subsystem.

**CONCLUSION**

The results from this study show that there does not appear to be any significant relationship between the number of needlestick injuries sustained and length of shift, location of work, time of shift, or time during shift. Any differences seen in the graphs may be due to chance as the chi-square calculations revealed no significant difference. Consequently, there must be other factors which have a greater influence on the problem of needlestick injuries.

It is possible that personal and situational variables may play a major part in this problem. In an effort to identify some of these factors an informal survey was carried out in which selected participants were asked what circumstances led to them sustaining a needlestick injury.
Most nurses could not identify any particular contributing factors. This study concentrated on the rostering system and its effects on the incidence of needlestick injury and has shown that variables studied were not significant.

Perhaps Nurse Managers need to focus more on the personal variables when they try to provide a solution to this problem. There is also a possibility that the equipment being used to administer injections could be improved to reduce the risk of nurses sustaining needlestick injury. Research is being conducted into this and many alternatives to the traditional needle and syringe, such as retractable needles and syringe guards are being produced (Millam, 1990).

Further research could be conducted in a similar format to this study involving a much larger number of nursing staff from different hospitals. Although the sample size was small it was important that the variables studied showed no significant correlation with the number of needlestick injuries. Further work should therefore be extended to include the study of personal and situational variables and their relationship to the incidence of needlestick injuries.

A retrospective study may be carried out in which nurses are asked to describe the circumstances leading to them sustaining a needlestick injury as close to the time of injury as possible. This may lead to more
information on the personal and situational variables which may influence the problem of needlestick injury.

This research suggests that the introduction of longer shifts and a more flexible rostering system by nursing management will enable nurses to pursue their interests without having any significant effect on the number of needlestick injuries sustained.
BIBLIOGRAPHY


REFERENCES


HIV Test before Surgery imminent (1990 August 22) The Australian.

Hospital settles in AIDS needle case. (1990, March 10). The West Australian.


March 26th, 1990

Miss J. McMahon
3/48 Osborne Street
JOONDANNA, W.A. 6060

Dear Jan,

I am quite happy for you to do the Research Project concerning needlestick injuries at Mount Hospital. I am sure the people concerned will be interested in the results.

Best wishes,

M.A. GILES, (Mrs.)
ADMINISTRATOR.
An incident is any happening which is not consistent with the routine operation of the Hospital or the routine care of a particular patient. It may be an accident or a situation which might result in an accident to a Patient/Visitor.

**LOCATION:**
- Ward/Dept. ............................................. Bed No. ..........................................................
- Bathroom  □  Other (specify) ..........................................
- Patient Room ..................................................
- Corridor ......................................................

**PRE-INCIDENT STATE (PATIENT ONLY)**
- Rational □  Disoriented □  Restrained □  Unconscious □  Sedated □  Drug .................
- Time given ........................................

**WHEN**
- Date ................../........../19
- TIME ......................... Hours

**WHAT**

**WITNESSED BY**
- NAME (please print) ...........................................
- Category of Staff ...........................................
- Signature ...................................................

**PERSON MAKING REPORT**
- NAME .......................................................
- Category of Staff ...........................................
- Signature ...................................................

**ACTION TAKEN AND COMMENTS**
- Name of Doctor (if notified) .................................... Time ..........
- Treatment ordered .......................................... Time ..........
- □ Recorded in Health Record □ Relatives Notified Time ..........
- Security Consultants Notified YES □  NO □ Time ..........
- Action Taken ................................................

**ACTION TAKEN TO PREVENT RECURRENCE OF INCIDENT**

TO BE FORWARDED TO ADMINISTRATOR ON DAY OF INCIDENT
Dexterity Test
This test is designed to determine your level of dexterity. Please hold the pencil provided at the 10 centimetre mark and place ten dots as close to the centre of the cross as possible.

At the beginning of the shift:

and at the end of the shift:

Please indicate shift length with a tick.

- [ ] 8 hours
- [ ] 10 hours

Note: Your participation in this test will indicate your consent. Non-participation will incur no penalty.

Thank you for your co-operation.
## Appendix 4

**Scoring key**

<table>
<thead>
<tr>
<th>Location</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner circle</td>
<td>3</td>
</tr>
<tr>
<td>2nd circle</td>
<td>2</td>
</tr>
<tr>
<td>3rd circle</td>
<td>1</td>
</tr>
<tr>
<td>outside</td>
<td>0</td>
</tr>
<tr>
<td>maximum</td>
<td>30</td>
</tr>
</tbody>
</table>