

AN INTEGRATIVE LITERATURE REVIEW:
THE IMPACT OF THE COMPRESSED WORKWEEK
ON NURSING PRACTICE

by



Margaret Jean Tkachuk

A thesis
presented to the University of Manitoba
in partial fulfillment of the
requirements for the degree of
Master of Nursing
in the
School of Nursing

Winnipeg, Manitoba

Margaret Jean Tkachuk

Permission has been granted to the National Library of Canada to microfilm this thesis and to lend or sell copies of the film.

The author (copyright owner) has reserved other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without his/her written permission.

L'autorisation a été accordée à la Bibliothèque nationale du Canada de microfilmer cette thèse et de prêter ou de vendre des exemplaires du film.

L'auteur (titulaire du droit d'auteur) se réserve les autres droits de publication; ni la thèse ni de longs extraits de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation écrite.

ISBN 0-315-48003-3

AN INTEGRATIVE LITERATURE REVIEW:
THE IMPACT OF THE COMPRESSED WORKWEEK
ON NURSING PRACTICE

BY

MARGARET JEAN TKACHUK

A thesis submitted to the Faculty of Graduate Studies of
the University of Manitoba in partial fulfillment of the requirements
of the degree of

MASTER OF NURSING

© 1988

Permission has been granted to the LIBRARY OF THE UNIVERSITY OF MANITOBA to lend or sell copies of this thesis, to the NATIONAL LIBRARY OF CANADA to microfilm this thesis and to lend or sell copies of the film, and UNIVERSITY MICROFILMS to publish an abstract of this thesis.

The author reserves other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

I hereby declare that I am the sole author of this thesis.

I authorize the University of Manitoba to lend this thesis to other institutions or individuals for the purpose of scholarly research.

Margaret Jean Tkachuk

I further authorize the University of Manitoba to reproduce this thesis by photocopying or by other means, in total or in part, at the request of other institutions or individuals for the purpose of scholarly research.

Margaret Jean Tkachuk

The University of Manitoba requires the signatures of all persons using or photocopying this thesis. Please sign below, and give address and date.

DEDICATION

To Russell who helped to make this project
possible

ABSTRACT

The integrative literature review process was used to compare and combine findings from 46 research reports that examined the impact of the compressed workweek on nursing practice. The meta-analyses included 93 hypotheses. The analyses showed the compressed workweek has had positive, significant effects on job satisfaction, quality of care, recruitment, turnover, and nurse well-being, and insignificant effects on absenteeism, costs, overtime, and communication. Combined results for fatigue, shift satisfaction, and continuity of care could not be reported. Chi-square tests indicated the fatigue (perceptions) and shift satisfaction data were not comparable and the lack of fatigue (objective) and continuity of care data precluded analyses.

Study findings (N = 180) were assessed for effects of research methods and intervening variables. Significant differences were noted between findings from standardized and informal measurement tools and no significant differences were attributed to use of a control group or to study design. No significant differences were noted between findings from the United States and Canada, intensive care areas and general care areas, registered nurses and other subject groupings.

The combined research findings did not ascribe negative consequences to compressed workweek schedules. This lack of negative data may be attributed to the variables included in this study, variables studied in the literature, and/or a sample selection bias within some research. Future research needs to examine nurse staffing in terms of an open system, attending to intervening variables and the processes within the system rather than isolating outputs. In addition, research reports should include definitions of variables under study, include the statistics necessary for calculating effect sizes, and identify the direction of results when the reported findings are insignificant.

ACKNOWLEDGEMENTS

I am indebted to many people for assisting me with the development of this thesis. Dr. Jenniece Larsen has allowed me to be self-directed and has provided encouragement and valued editorial assistance. I am grateful to Dr. Alice Jope for her input into the project and to Dr. Jerry Gray for suggesting the meta-analytic approach to integrate research findings.

My special thanks go to the Nursing Research Institute, specifically to Jeff Sloan, Statistical Consultant, for his valuable support and statistical advice.

Acknowledgement is made to Dr. John Adair and Donald Sharpe for help in clarifying meta-analytical procedures.

Acknowledgement is made to the Manitoba Association of Registered Nurses and to the Health Sciences Centre MONA Local 10 Education Trust Fund for financial assistance.

I acknowledge with sincere thanks the assistance of: the Inter-Library Loan Service, University of Manitoba for their assistance in locating information; Loretta Secco for assistance with the coding procedure; and friends and family who helped me directly or indirectly to complete this study.

This study was written on a Macintosh 512 personal computer and two programs, Microsoft Works and Microsoft Excel, were used for word processing and calculation procedures.

TABLE OF CONTENTS

	<u>Page</u>
CHAPTER I: OVERVIEW OF THE STUDY	
Background to the Problem	1
Purpose.....	2
Statement of the Problem	3
Organizing Framework.....	3
Research Questions.....	6
Assumptions.....	7
Limitations of the Study.....	8
Research Methodology.....	8
Organization of Thesis.....	9
CHAPTER II: REVIEW OF RELATED LITERATURE	
The Milieu of Alternative Work Schedules.....	10
Historical background: Work hours.....	11
Factors Influencing Hours of Work and Work Schedules	12
Alternative Work Schedules Defined	13
Role of Employers, Unions, and Employees in Implementing the Compressed Workweek.....	14
Employers Role in Implementing the Compressed Workweek	14
Unions Role in Implementing the Compressed Workweek	15
Employees Role in Implementing the Compressed Workweek.....	16
Benefits and Negative Consequences Attributed to the Compressed Workweek.....	16
Benefits of Compressed Workweek Schedules to Employers	16
Negative Consequences of Compressed Workweek Schedules to Employers.....	17
Benefits of Compressed Workweek Schedules to Employees.....	17
Negative Consequences of Compressed Workweek Schedules to Employees.....	17
Benefits of Compressed Workweek Schedules to the Community...17	17
Conclusions.....	18
Reasons Given by Hospitals/Nurses for Implementing the Compressed Workweek.....	19
Commentary on Literature Reviews: Nursing Staff and the Compressed Workweek	21
Conclusions.....	24
CHAPTER III: METHODOLOGY	
Integrative Research Reviews.....	27
Strengths and Limitations.....	28
Strengths of Meta-Analysis.....	29
Criticisms Commonly Directed at Quantitative Review Procedures.....	29

	<u>Page</u>
Apples and Oranges Problem.....	30
Lumpy Nonindependent Problem.....	31
Selection Bias.....	32
Use of Data from "Poor" Studies.....	33
Significance to Present Study	33
Methodology.....	34
Sample.....	35
Target Population.....	35
Definition of Variables.....	35
Literature Search.....	37
Computerized Library Search	37
Manual Index Search	38
Reference Tracking	38
Literature Reviews.....	38
Contacts with Nursing Organizations and Individual Nurses..	38
Selection of Relevant Studies.....	39
Study/Data Point Rejection.....	40
Instrumentation	40
Procedures.....	41
Study Design.....	41
Unit of Analysis.....	41
Weighting of Studies.....	43
Methods of Analysis.....	43
Calculation of Effect Sizes.....	43
Comparing Significance Levels and Effect Sizes.....	44
Combining Results.....	44
Intervening Variables, Research Methods and Study Findings..	44

CHAPTER IV RESULTS

Description of Studies Included in the Review	46
Comparing Significance Levels and Effect Sizes.....	49
Quality Care (elements).....	51
Quality of Care (perceptions)	51
Costs.....	51
Job Satisfaction.....	51
Shift Satisfaction	51
Fatigue (perceptions)	55
Fatigue (objective)	55
Summary	55
Combined Significance Levels and Effect Sizes	56
Impact of Intervening Factors on Study Findings	57
Impact of Research Methods on Study Findings	61
Research Questions and Results	64

CHAPTER V DISCUSSION, CONCLUSIONS, AND IMPLICATIONS

Discussion	
Research Method.....	68

	<u>Page</u>
Coding procedures.....	68
Application of Data Rejection Criteria	70
Weighting of Studies	71
Validity Concerns	71
A Comparison between Findings from this Study and Rationale for Introducing Compressed Workweek into Hospital Settings	74
A Comparison between the Findings from this Study and the Experiences of Industry.....	77
A Comparison between the Findings from this Study and the Conclusions of other Nursing Literature Reviews.....	80
Conclusions.....	81
Implications for Nursing.....	83
Recommendations for Future Research.....	84
REFERENECESES	88

<u>Appendix</u>	<u>Page</u>
A. Citations of Studies Used to Develop Table 1.1.....	95
B. Reference List of Articles Used to Compile Table 2.2.....	96
C. Code Sheet and Directions.....	98
D. Revised Code Sheet and Directions.....	104
E. References: Literature Review Sample.....	104

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1.1 The Impact of the Compressed Workweek on Nursing Practice	2
2.1 Decline of Standard Working Hours Between 1900 and 1970.....	11
2.2 Reasons for Testing/Adopting Compressed Workweek Scheduling for Nursing Staff	19
3.1 The Five Steps of the Literature Review Process.....	47
4.1 The Year and Number of Studies Included in the Literature Review	42
4.2 Chi-Square Analyses of Significance Levels for 13 Dependent Variables.....	49
4.3 Chi-Square Analyses of Effect Sizes for the 13 Dependent Variables.....	50
4.4 Quality Care (elements) Z-Scores and Effect Sizes	52
4.5 Quality of Care (perceptions) Z-Scores and Effect Sizes.....	52
4.6 Costs: : Z-Scores and Effect Sizes.....	53
4.7 Job Satisfaction: Z-Scores and Effect Sizes.....	53
4.8 Shift Satisfaction: Z-Scores and Effect Sizes.....	54
4.9 Fatigue (perception): Z-Scores and Effect sizes.....	54
4.10 Chi-Square and p-Values for Significance Levels and Effects Sizes of Dependent Variables	55
4.11 Cumulative Significance Levels (p-value) and Effect Sizes (r-index).....	57
4.12 Frequency Table: Relationships Between Intervening Factors and Study Findings.....	59
4.13 Relationships Between Findings Reported in 10- and 12-hour Studies.....	60
4.14 Number of Hypotheses Classified According to Dependent Variable, Length of Shift and Inclusion in the Meta-Analysis.....	60
4.15 Frequency Table: Relationships Between Study Methods and Study Findings.....	62
4.16 Dependent Variables and Hypotheses: Effects of Research Methods and Intervening Variables on Study Findings.....	65
4.17 Dependent Variables and Hypotheses Included in the Meta-Analysis.....	66
5.1 The Compressed Workweek: Expectations of Hospitals and Nursing Staff.....	75

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1.1 Nurse Staffing Framework	5
5.1 Factors Influencing Hours of Work and Work Schedules During the 1960s and 1970s.....	76
5.2 Consequences of the Compressed Workweek to Employers, Employees, and the Community.....	78

CHAPTER I

OVERVIEW OF THE STUDY

Background to the Problem

The compressed workweek, introduced into industrial and health care workplaces in the late 1960s and early 1970s, is a work schedule that compresses weekly full-time hours of work into less than five days. Health care institutions using the compressed workweek generally divide the weekly scheduled hours of work into ten or twelve hour shifts. Research examining the impact of the compressed workweek on patient care, nursing staff and hospitals appears to have produced a variety of conflicting results.

The conflicting results are summarized in Table 1.1. The summary, compiled from findings reported in a sample of 29 articles (Appendix A), lists 13 outcome variables, indicates the direction of reported findings, and the number of studies reporting those findings. The 29 articles are the first reports that were gathered by the investigator during the preparatory phase of the present study. Their inclusion in Table 1.1 is based on two factors, the date they were found and their impact on the methodology for this study, rather than on a scientifically developed sampling strategy.

The summary of the 29 papers helped to define the problem and to determine the research method for the present study. Originally the investigator had planned to examine the impact of a compressed workweek schedule on one facet of nursing practice. Early in the literature search and during the process of defining the boundaries for the planned study the writer concluded that a great deal of time and money had been devoted to studying the topic without producing definitive results. The lack of definitive results pointed to a need to integrate findings from the studies prior to assuming commitments

associated with implementation of a research project in the field setting.

Table 1.1
Summary: The Impact of the Compressed Workweek on Nursing Practice.

Variable	Direction of change			Total No. of articles
	Increased/Positive	No change	Decreased/Negative	
Absenteeism	3	3	8	14
Communication	9	-	3	12
Continuity of care	4	-	2	6
Costs	-	2	3	5
Nurse fatigue (1)*	4	3	4	12
Nurse perceptions				
Job satisfaction	8	2	4	14
Quality of care	5	1	-	6
Work rotation	16	-	2	18
Overtime	2	-	5	7
Patient perceptions				
Quality of care	4	1	-	5
Quality of care	3	7	2	12
Recruitment	5	-	-	5
Terminations (1)**	-	1	4	6

(1)* author(s) reported fatigue develops when nurses work more than three consecutive shifts.

(1)** author(s) reported an initial increase followed by a decrease.

Purpose

The purpose of the present research is threefold: first, to identify and collect published studies and accessible unpublished reports that examine the effects of nursing staff working the compressed workweek; second, to gather, examine, and evaluate data from those studies; and third, to identify patterns of underlying relations and causalities within that data. In other words, the intent of the present study is to integrate, synthesize and make sense of past research on the impact of the compressed workweek on nursing practice.

Statement of the Problem

A cursory review of findings reported in research examining the impact of the compressed workweek on nursing practice shows the direction of change may vary from positive to negative (Table 1.1). This apparent variation in results causes two problems. First, the findings cannot be generalized to the scheduling of nursing staff's work hours and second, the inability to generalize the findings results in repeated calls for the replication of research.

The present study addresses the apparent inconsistent research results in the compressed workweek literature. A statistical approach applied to the relevant literature, rather than the traditional narrative approach, may reveal patterns of underlying relations and causalities within research findings. The integration of compressed workweek research findings should contribute to the accumulation and refinement of knowledge basic to scheduling nursing staffs' work hours, contribute to a scientific base to improve management decision making, identify specific areas needing further research, and demonstrate the potential value of nurse staffing research.

The Organizing Framework

The organizing framework chosen for the present study is an open systems model developed by Young, Giovannetti, Lewison, & Thoms (1981) for use in a comprehensive literature review of factors affecting nurse staffing in acute care hospitals. The authors used the framework to identify factors that affect staffing, to delineate interrelationships among such factors, and to isolate and identify factors that had been insufficiently investigated or neglected entirely (Young et al., 1981). The decision to employ the nurse staffing framework in the present study was based on the assumption that there are a number of variables, other than the compressed workweek, that affect the outcomes measured in the compressed workweek studies. This framework was adopted to assist the investigator to identify such variables, to delineate interrelationships among those variables

and to identify variables that have not been studied.

The nurse staffing framework (Figure 1.1) depicts the nursing care process as an organizational system with inputs and outputs, acted upon by intervening operational factors, and influenced by environmental factors.

Definition of terms

1. Input: consists of those factors that must be acted upon in order to produce an output. Personnel and patients are the most basic input factors (Young et al., 1981).
2. Synthesis: is the transformation of inputs to required outputs. The transformation involves the integration of four processes as well as the coordination and control of those processes (Young et al., 1981).
3. Operational factors: are the methods that govern the process of synthesis. The factors include procedures and techniques used to translate nursing philosophy and policies into daily operating practices (Young et al., 1981).
4. Environmental factors: are influencing factors that emanate from the setting. Environmental factors include the guidelines and constraints imposed by the hospital, the health care system and/or other external influences (Jelinek, Dennis, Schwarzmann, & Luskin, 1976).
5. Output: refers to the results of the processing of inputs (Jelinek et al., 1976).

The framework was used to identify pertinent variables from studies included in the review. The term nurse staffing encompasses the methods, procedures, and philosophical concepts used to determine the number and kind of nursing personnel required to provide a certain standard of care to patients (Young et al., 1981). Several factors listed in the framework are not mentioned in compressed workweek studies; hence, only terms

INTERVENING FACTORS

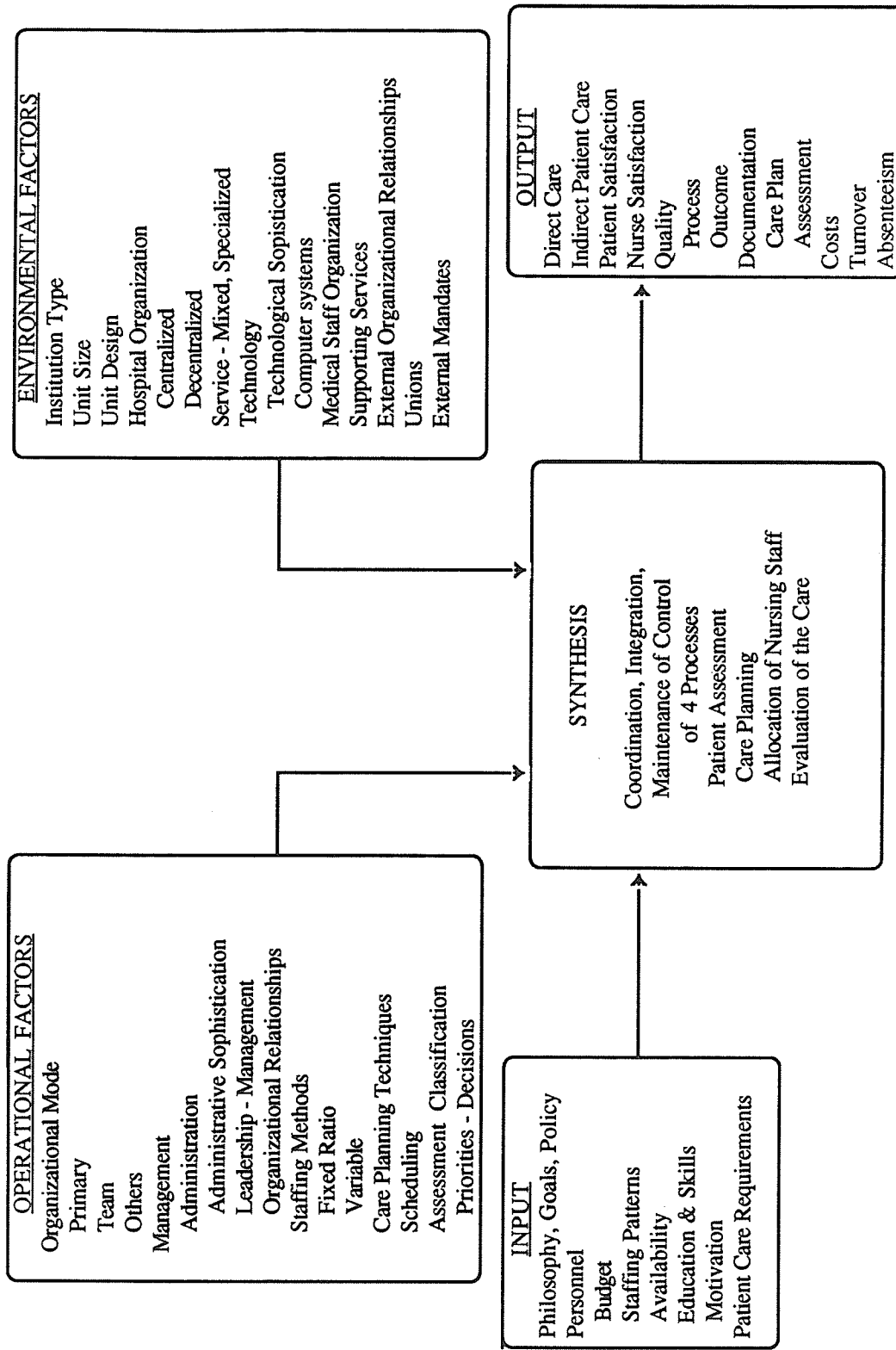


Figure 1.1: Nurse Staffing Framework (adapted from Young, Giovannetti, Lewison &Thoms, 1981)

pertaining to nurse staffing will be defined.

1. Staffing methodology: refers to mechanisms or procedures used to determine the number and mix of nursing staff required to provide a certain standard of care to a specified patient population. Staffing methodology includes: (a) assessment and classification of patients; (b) allocation, assignment, and scheduling of nursing staff; and (c) evaluation and monitoring of services (Young et al., 1981).
2. Allocation: refers to staffing levels (the total hours of staffing time) and staffing patterns (the mix of professional and nonprofessional nursing staff) (Young et al., 1981).
3. Scheduling: refers to the manner in which nursing staff are scheduled/designated to work over a time period such as a shift, a week, a month, or longer (Young et al., 1981).

The compressed workweek is classified as an operational factor in the present study. The work schedule is conceptualized as interacting with other operational and environmental factors influencing the transformation of inputs into outputs. Those outputs are the elements of nursing practice that are measured by investigators who evaluate the functioning of the system.

Research Questions

The study examined reports and research studies that described the impact of the compressed workweek on nursing practice. The research process was guided by four broad research questions.

1. What relationships exist between research methodologies and findings reported in studies that have examined the impact of the compressed workweek on nursing practice?

The study examined the impact of sample size, use of control groups, and various

measurement strategies on findings reported in existing research. The impact of measurement strategies on findings was assessed in terms of measurement tools used. Information was coded as coming from a standardized measurement tool when the information collected was (a) objective data that was clearly described or (b) when a recognized data collection tool was used. The findings were classified as coming from informal tools when (a) the description of objective data was incomplete or (b) the data collection tool was developed for the particular study without concerns for validity or reliability.

2. What relationships exist between environmental factors and findings reported in studies that have examined the impact of the compressed workweek on nursing practice? The study examined the impact of both the type of service and geographical location on reported findings. The type of service was categorized as Intensive Care Units (pediatric and adult), Medical/Surgical: Pediatrics, Medical/Surgical: Adults, and Miscellaneous. The location of the hospital was categorized according to country (Canada and the United States).

3. What relationships exist between operational factors, such as, 10-hour and 12-hour shift schedules, and findings reported in studies that have examined the impact of the compressed workweek on nursing practice? The number of hours worked per day as well as the scheduling of those hours may have an impact on research findings.

4. What is the impact of the compressed workweek on: absenteeism; communication; continuity of care; costs; nurses' fatigue, job satisfaction, overtime hours, shift satisfaction, and well-being; quality of patient care; recruitment and terminations of nursing staff?

Assumptions

The study is built on three assumptions. The three assumptions, listed below, are unique to integrative literature reviews:

1. The collected studies are representative of the body of research done on the impact of the compressed workweek on nursing practice.
2. The data reported in relevant studies includes an accurate description of all conditions affecting the dependent variable(s) and both study findings and test statistics are computed and recorded accurately.
3. Individual data points included in the meta- analyses are independent.

Limitations of the Study

There are several limitations in this study. The representativeness of the literature review sample may be questioned. Many hospitals have investigated the impact of the compressed workweek on nursing practice without publishing their results or without preparing formal reports. The sample contains several unpublished reports but it is impossible to know how many such reports have been missed or how many reports were never written.

The quantitative analysis of effect sizes in the context of meta-analysis is a new field. The interpretation and statistical theory associated with formulae is in a developmental stage (Cooper, 1984). The newness of this method combined with the quality of research studies accepted into the review could adversely affect the findings of the present study.

Research Methodology

The study is descriptive research based on the integrative literature review process described by Cooper (1984). This review process was applied to a group of studies that examined the impact of the compressed workweek on nursing practice. The procedure, described in greater detail in Chapter III, involved selecting relevant studies; coding characteristics of research methods, participants, and variables as well as the outcomes of each study; evaluating the coded data in terms of relevance, accuracy, and validity of research method; and a statistical analysis of the resultant data.

The analysis was directed at identifying relationships and combining study findings. The relationships of interest were between research methods and study findings and between a variety of operational or environmental factors and study findings. The aggregated data for thirteen dependent variables was compared and when possible combined to provide cumulative effect sizes and significance levels.

Organization of the Thesis

The thesis is divided into five chapters. Chapter I provides an overview of the study. Chapter II is a narrative review of related literature. The chapter, divided into three sections, presents a detailed discussion of alternative work schedules, identifies the rationale for introducing the compressed workweek schedules into hospital nursing departments, and discusses other literature reviews that have examined the impact of compressed workweeks on nursing practice.

The third chapter describes the research methods employed in this study. The introduction to the chapter contains a description of integrative literature reviews, including the strengths and concerns regarding the methodology. The final two chapters present the findings and conclusions and recommendations from the study.

CHAPTER II

REVIEW OF RELATED LITERATURE

Throughout this chapter the term 'literature review' is used to refer to the contents of Chapter II or to literature reviews written by other authors. The term 'present study' is used to refer to the integrative literature review of the compressed workweek.

This chapter includes: (a) an introduction to the milieu of alternative work schedules, (b) a compilation of reasons given by hospitals and/or nurses for implementing compressed workweek schedules for nursing staff and (c) a commentary on literature reviews relevant to the compressed workweek and nursing practice.

The Milieu of Alternative Work Schedules

The Work in America Institute (1981) claimed that changes occurring in work schedules will be supported by the need for employers, unions, and employees to keep the workplace in tune with changes in society. The Institute indicated new work patterns: (a) produce significant economic benefits to the employer, (b) offer clear gains to the employee, and (c) have benefits for society and communities.

The claims of the Work in America Institute will serve as the organizing structure for the first section of the literature review. The presentation includes a brief historical overview of hours of work; describes recent changes in society which may have an impact on hours of work and work schedules; defines alternative work schedules; examines the role of employers, unions, and employees in implementing compressed workweek schedules; and lists the benefits and negative consequences attributed to the use of the compressed workweek.

Historical Background: Work Hours

Hameed (1974) described working hours between 1495 and 1900 as follows:

(a) throughout the period a six-day week prevailed, (b) a 12-hour day was a predominant feature of almost the entire period, with the exception of a longer day which was associated with the early production requirements of the industrial revolution, (c) a ten-hour day was established toward the close of the Nineteenth Century. (pp. 8-9)

Further reductions in working hours occurred between 1901 and 1960. The reductions were most notable between 1901 and 1910 and between 1945 and 1956. Hameed (1974) pointed to annual reductions in work hours of 0.63 percent during the first period and 1.44 percent during the second. His summary of the decline in standard working hours appears in Table 2.1.

Table 2.1

Decline of Standard Working Hours between 1900 and 1970 (Hameed, 1974, p .9).

	1901- 1919	1920- 1944	1945- 1956	1957- 1969
Average Annual Percentage Reduction	0.63	0.11	1.44	0.14
Total Percentage Reduction	12.1	2.6	15.9	1.7

Ronen (1984) addressed the topic of work hours in terms of hours per week rather than per year. The author pointed to a decline in weekly work hours from 60 to 40 hours between 1900 and 1940 and expressed surprise that recent cultural trends and trends reflecting increased interest in leisure time have not resulted in changes in hours worked. Maric (1977) speaking of work hours in Canada noted: "The current 40-hour week has been practically the same for the past 20 years. ... It is expected that the recent interest in the compressed working week ... will ultimately reinforce the drive towards a reduction in working time" (p.8).

Factors Influencing Hours of Work and Work Schedules

Melzer (1974) identified several factors that may prevent further declines in the number of hours in the standard workweek. The first is a propensity for workers to favor income or fringe benefit increases over increases in leisure, likely due to the wide use and high costs of leisure goods. A second contributing factor, inflation, could force workers to favor higher wages rather than more leisure time. Thirdly, as the availability of leisure time increases workers may choose when to take that time. The choice of early retirement reduces lifetime work hours. Thus, contributions to pension funds have to increase, resulting in decreased take-home pay, decreasing the likelihood of working fewer hours per week. Postponement of entry into the labor force through extended education means that workers are often reluctant to trade pay for hours. Finally, increases in the number of paid statutory holidays and in the length of paid vacations combined with ease of travel may well serve to counteract further declines in workweek hours.

Hedges (1971) and Maric (1977) suggested that workers are more interested in blocks of leisure time rather than shorter workweeks. Hedges (1971) suggested that a growing preference for blocks of leisure time is manifested in the extension of paid vacation. She claimed paid vacations and holidays together constituted two-fifths of the estimated 50-hour reduction in annual worktime during the 1960s. Maric (1977) noted: "Canadian workers prefer higher earnings, or leisure time in the form of longer annual leave or a larger number of statutory holidays, to a shorter working week" (p. 8).

Ronen (1984) discussed changes in the composition of the American work force and consequent changing attitudes toward work. The author noted a declining confidence in institutions; a greater tendency to question authority; less loyalty to work organization; less willingness for workers to subordinate their personal lives to their jobs; less dedication to work; more inclination to look for alternatives to the large, traditional, hierarchical organizations; greater importance assigned to leisure activities; less willingness to accept routine jobs; and increased expectations by employees for a greater voice in decisions

affecting their work lives.

The Work in America Institute (1981) indicated the influx of women, especially mothers with school-age children, into paid employment highlighted the demographic, social, and economic changes that transformed the work place in the 1970s. The Institute suggested new family structures, employee expectations, demands for leisure and education, rapid inflation, and the distances between work place and residence contributed to the development of alternative work schedules.

There are other social and demographic trends that will encourage further experimentation with work schedules. Such trends include (a) dual-career families, (b) further increases in the number of women in the work force, (c) increased preference of workers to trade money for time off, (d) increased costs and difficulties associated with commuting to work, (e) an increased awareness of innovative work patterns, (f) employees' desire to participate in decisions related to scheduling work, and (g) the ability of workers to relieve management of controversial scheduling problems by self-managed choices, bargaining, and group decisions (Work in America Institute, 1981).

Alternative Work Schedules Defined

Alternative work schedules appeared on the business scene in the late 1960s and early 1970s as major innovations of industrial relations. The schedules were viewed by many as benefits to make organizations more attractive to employees. Others saw in the new schedules a potential for producing widespread organizational change (Cohen & Gadon, 1978).

Alternative work schedules are variations on the standard workweek. The standard workweek consists of five eight hour work days scheduled between 9 AM and 5 PM (Nollen, 1979). Certain types of alternative work schedules, such as overtime and shift work, have been in use for a long time. The more recent alternative work schedules allow changes in the length of work time, the allocation of work time, or the control of work time

(Nollen, 1982). The new schedules include: permanent part time, staggered hours, task system, compressed workweek, and flexible working hours. Nollen defined the schedules as:

Permanent part-time employment: Regular voluntary employment carried out during working hours distinctly shorter than normal.

Staggered hours: Groups of employees are scheduled to arrive at and depart from work at different times.

Task system: Management assigns a specified quantity of work to be completed within a given maximum time period.

Compressed workweeks: The usual number of weekly full-time hours is compressed into fewer than five days.

Flexible working hours: Employees may chose their starting and stopping times within limits set by management, the contracted number of hours are worked within a specified time.

Each type of alternative work schedule can assume one of several forms. For example, the compressed workweek may be: (a) a four day workweek with 10-hour days, (b) a three day workweek with 12-hour days, (c) a four and one half day workweek with four 9-hour days and one 4-hour day, (d) a plan where persons work 9-hour days during alternating four and five day workweeks, or (e) a work weekend of two 12-hour shifts, paid at premium rates (Work in America Institue, 1982). The compressed workweek does not usually involve a reduction in total work hours nor an extension in workers' control over when the hours are worked, rather the central feature is the reallocation of work time.

Role of Employers, Unions, and Employees in Implementing the Compressed Workweek

Employers role in implementing the compressed workweek. Poor (1970), in a study

of the four day workweek, surveyed 27 firms. She found that management, not labor, initiated the changes from traditional work schedules to the four day workweek. She categorized managements' reasons for changing to the four day week as labor reasons and non-labor reasons. The labor reasons are listed as: (a) more incentive, better morale, and better living conditions for employees; (b) reduction of labor costs as a percentage of sales; (c) recruitment of more and/or better labor; (d) reduction in absenteeism, tardiness and/or turnover. The non-labor reasons included: (a) increased output; (b) decreased production costs; (c) reductions in non-labor costs, such as, better use of capital equipment; (d) improved throughput; (e) better sales promotion; and/or (f) better profits on sales. Poor's book, 4 Days, 40 Hours: Reporting a Revolution in Work and Leisure (1970) did much to popularize the concept of the compressed workweek (Nollen, 1979).

Hedges (1973) reported that the impetus for the four day workweek came from management. She suggested the change was the result of managements' intent to raise profits by increasing production and decreasing costs. Implementation of the four-day workweek supported increased production by extending the hours that equipment was in operation and customer service was available. Decreased costs occurred when productivity per person-hour was improved by: (a) reducing startup and shutdown time, (b) improving recruitment of skilled workers, (c) adjusting the supply of person-hours to work load patterns, (d) reducing absenteeism and turnover, and (e) improving worker morale.

The findings of Hedges and Poor are supported by the work of Metsasalu and Harrison (1971) who found, from a survey of 17 Canadian organizations, that the companies were responsible for introducing the compressed workweek in 70 per cent of the cases. The reasons given for implementing the compressed workweek were based on the companys' desires to improve efficiency, productivitiy, and services to customers.

Unions role in implementing the compressed workweek. There has not been much enthusiasm for the compressed workweek among labour unions. The Canadian Labour Congress, at a convention in May, 1972, resolved to resist pressures to accept changes in

hours of work such as the 4 day, 40 hour week. Unions were encouraged to press for a 32-hour workweek rather than endanger the eight hour or less per day already won by labor (Hameed, 1974; Maric, 1977). Similar actions occurred in the United States. The AFL-CIO Executive Council, while supporting attempts to reduce working hours and to reschedule workweek arrangements, urged the rejection of proposals to drop the requirement of time-and-one-half pay for over 8 hours of work a day (Hedges, 1971).

Employees' role in implementing the compressed workweek. The initiative in work scheduling usually remains with management, with the employees' role confined to reacting to management's proposals and inquiries (Hedges, 1973). There are some situations where management has responded to employee requests. For example, at the request of employees, a joint employee-management committee was set up at an Imperial Oil facility in Winnipeg to deal with shift-work problems. The committee recommended adoption of twelve hour shifts. The company agreed to the recommendations conditional upon: (a) the costs of administering the new schedule being roughly equivalent to that of the eight-hour schedule, (b) maintenance of safety standards, and (c) the new schedule having the support of a majority of employees (Northrup, Wilson, and Rose, 1979).

Benefits and Negative Consequences Attributed to Use of the Compressed Workweek

In 1979 the Work in America Institute embarked on an 18 month policy study to document experiments with work schedules and to present recommendations to aid future alternative work schedule projects. The information cited below came from one of the resulting books, New Work Schedules for a Changing Society (Work in America Institute, 1981).

Benefits of compressed workweek schedules to employers.

1. Production operations can be rationalized thus raising output and lowering costs. For example, fewer start-ups and shutdowns may result in better use of

equipment and/or facilities.

2. The morale of compressed workweek workers is sometimes higher, and paid absences are sometimes lower than those found in traditional work patterns.

Negative consequences of compressed workweek schedules to employers.

1. Interfacing and coverage problems occur when the work schedule does not synchronize with the operation schedule. For example, problems may develop if the company operates on a five day schedule and employees work a four day schedule.
2. Labor laws or union contracts may make the use of compressed workweeks uneconomical. The problems center around overtime pay and contractual holiday pay rules.
3. Fatigue may contribute to productivity declines and safety hazards.

Benefits of compressed workweek schedules to employees.

1. Leisure time is available in longer blocks of time. The three day weekend is treasured by younger employees. The unpleasant aspects of shift work can be partially alleviated.
2. There are savings in both time and cost commuting to and from work.

Negative consequences of compressed workweek schedules to employees.

1. Compressed workweek employees with young children at home or those involved in social or community activities during the week may find that family life and personal time have been compromised.

Benefits of compressed workweek schedules to the community.

1. Compressed workweeks have potential for large energy savings because of a decrease in number of required trips to work. (Documentation supporting such a claim is scant.)
2. The decreased use of gasoline should contribute to improved air quality in congested cities.

3. The improved air quality resulting from decreased travel will reduce public and private outlay of funds necessary to achieve the goal of clean air.

Conclusions

A steady decline in the number of hours worked per week was noted between 1900 and 1956. In recent years reductions in work hours have occurred as a result of an increased number of statutory holidays and vacations days. Workers preferences for higher earnings and blocks of leisure time combined with inflation, ease of travel, and decreased life work hours have inhibited the decline in the number of hours in the traditional workweek.

Changing attitudes toward work, the influx of women into the work place, new family structures, employee expectations, demands for leisure and education, rapid inflation, and distances between work place and residence have contributed to the development of alternative work schedules. Alternative work schedules allow for changes in: (a) the length of work time, (b) the allocation of work time, or (c) the control of work time. The compressed workweek compresses the number of weekly full-time hours into fewer than five days. The compressed workweek does not usually involve a reduction in total work hours, nor an extension in workers control over when the hours are worked, rather the central feature is the reallocation of work time.

The impetus for implementing the compressed workweek has usually come from management. The employees role is generally confined to reacting to proposals and inquiries from management. Unions have been slow to support the compressed workweek because of a hesitancy to give up time-and-one-half pay requirements for work in excess of eight hours per day.

The benefits associated with implementation of the compressed workweek for the employer, employee and community include: increased output, decreased costs, sometimes improved morale and lower absenteeism; larger blocks of leisure time, unpleasant aspects

of shift work partially alleviated, and savings in time and cost of commuting to work; energy saving and improved quality of air in congested cities. The negative consequences of the compressed workweek may include: the possibility of interfacing and coverage problems, increased expenses if overtime and contractual items are not renegotiated, employee fatigue, and disruptions in family and/or personal time.

Reasons Given by Hospitals/Nurses for Implementing the Compressed Workweek

Hospital nursing practice has been notorious for unattractive work schedules (E.M. Price, 1981). Patients require nursing care seven days a week, 24 hours a day. Thus, both shift and weekend work are essential ingredients of hospital nursing practice. The needs of hospitals and demands by nurses have resulted in many hospitals implementing pilot projects aimed at evaluating the effectiveness of the compressed workweek.

Several reasons for testing and/or adopting the compressed workweek schedule in nursing departments are summarized in Table 2.2. The information in the table was compiled from 24 articles found in nursing and hospital literature (Appendix B). Table 2.2 presents, in order of frequency, 18 reasons given by hospital nursing departments and/or nurses for introducing the compressed workweek as a method for scheduling working hours.

Table 2.2

A Summary of 24 Articles: The Rationale Given by Hospitals/Nursing Staff for Testing or Adopting Compressed Workweek Schedules.

Compressed workweek schedules were chosen to:

1. *prevent decreasing morale, increase job satisfaction* (Curtis, 1982; Feichtel-Pascuzzo, 1981; Hoffmann & Fischer, 1983; Kellman, 1983; Metcalf, 1982; Ward, 1981).
2. *be a potential force for reducing nursing turnover rates or dropout from nursing* (Arnold & Mills, 1983; Kellman, 1983; Meier & Todd, 1983; Mills, Arnold & Wood, 1983; Ryan, 1975; Yuska, Crabtree-Tonges & Schaps, 1984).

Table 2.2 (cont'd)

3. *provide a means for giving nursing staff alternate weekends off* (Alivizatos, 1981; Bauer, 1971; Boyarski, 1976; Colt & Corley, 1974; Ward, 1981).
4. *decrease the use of overtime* (Burrow & Leslie, 1972; Cales, 1976; Curtis, 1982; Metcalf, 1982; Underwood, 1975).
5. *provide for the same number and mix of staff seven days a week* (Alivizatos, 1981; Bauer, 1971; Boyarski, 1976; Colt & Corley, 1974).
6. *aid in recruitment of nursing staff* (Meier & Todd, 1983; Metcalf, 1982; Yuska, Crabtree-Tonges & Schaps, 1984).
7. *prevent eight and nine day work stretches* (Burrow & Leslie, 1972; Cales, 1976; Underwood, 1975).
8. *make it possible to give employees two consecutive days off* (Boyarski, 1976; Burrow & Leslie, 1972; Colt & Corley, 1974).
9. *solve staffing problems associated with excessive rotations and lack of suitable rest period between rotations* (Boyarski, 1976; Colt & Corley, 1974; Staples & Curtis, 1974).
10. *provide long weekends/blocks of time off* (Larsen, 1973; Staples & Curtis, 1974).
11. *solve staffing problems associated with an inability to find replacement staff* (Cales, 1976; Underwood, 1975).
12. *solve staffing problems associated with an inability to staff the evening and night shifts adequately* (Colt & Corley, 1974; Minor & Heldstab, 1971).
13. *provide a work schedule that allows staff to plan in advance for nonwork activities* (Colt & Corley, 1974, Farrington & Perla, 1971).
14. *provide a better arrangement of staff, resulting in more nursing personnel during peak periods* (Burrow & Leslie, 1972; Ward, 1981).
15. *increase productivity* (Meier & Todd, 1983).
16. *be a means to survive when staff are in short supply* (Demarsh & McLellan, 1971).
17. *help to ensure employees' safety when traveling to and from work late at night* (Colt & Corley, 1974).
18. *alter use of sick time* (Pierce, Hoffman, & Pelletier, 1974).

The expectations of both hospitals and nurses are remarkably similar to benefits

reported in studies of the impact of the compressed workweek in industry. There are two points listed in Table 2.2 that appear to be unique to nurses' schedules as they are not addressed specifically by Poor, Hedges, Metsaslu and Harrison, or the Work in America Institute. The first point is the safety of traveling time associated with the compressed workweek and the second point is the provision for staff to plan for nonwork activities.

The concerns for employee safety are likely related to the fact that most nurses are women. The problems associated with traveling at night can be of concern in both rural and urban areas. Rural nurses have to travel in sparsely populated areas using rarely traveled roads while urban nurses work in or have to travel through undesirable areas of the city. The use of the twelve hour shift means that nurses do not have to travel during the late evening or early morning hours.

The need to provide a work schedule that allowed nurses to plan for nonwork activities did not arise from nurses having to work the traditional 8-hour shift. The problem was associated with methods of scheduling and posting nurses' work hours. During the early 1970s nurses' hours were posted a week in advance and the use of specified rotations, a scheduling system whereby nurses could predict the shift and days they would be working during a specific week, were rare. The implementation of the compressed workweek schedule meant that master rotations were developed and nurses were provided with specific work schedules. The introduction of the compressed workweek meant that nurses could plan for such things as parent-teacher interviews, a dental appointment, or an evening out. Planned rotations other than the compressed workweek could have also provided similar benefits.

A Commentary on Literature Reviews: Nursing Staff and the Compressed Workweek

The investigator's decision to combine and analyze the results of research studies that examined the impact of the compressed workweek on nursing practice was preceded by a

search for literature reviews on the topic. The rationale for searching out existing reviews was, first, to determine if the present study would add to the existing body of nursing knowledge. Second, if the need for the study was established the reviews would serve as a model for selecting or rejecting approaches to the review process and third, the reviews would be a source of references.

There are three published literature reviews of import to the present study. The first two reviews of literature on the compressed workweek are parts of larger reviews supported by the U.S. Government (Jelinek et al., 1976; Younget al., 1981). The third, by Davis (1982), reviews five research studies on the impact of the 12-hour shift.

There are two unpublished literature reviews that examine nurses' experiences with twelve hour shifts. The first (Jensen, 1986) was commissioned jointly by the Ontario Nurses' Association and the Registered Nurses' Association of Ontario . The second was commissioned by the Minister of Health in British Columbia. The contents of the latter report are not yet available for public consumption.

Jelinek et al. (1976), in a study of nursing productivity, provided a brief review of the literature dealing with the benefits of altering traditional patterns in scheduling work hours. The narrative review summarized several reports on the use of 10-hour schedules but ignored the 12-hour shift literature. The organization of the review around a conceptual framework and the conceptualization of variables within the report were useful in developing the present study.

Young et al. (1981), in a study of factors affecting nurse staffing in acute care hospitals, produced a comprehensive narrative review of literature addressing nursing staffs' experience with the compressed workweek. The authors modified the conceptual framework used by Jelinek et al. (1976). This modified framework that has been adopted for use in the present study.

The Young et al. (1981) review is broader than the present study in that flextime or flexible working hours were included. The authors classified the literature as descriptive,

descriptive-evaluative, and research, under the headings: 4/40 (4 days, 40-hours) workweek, 7/70 (7 days, 70-hours) workweek, twelve hour day, and flexitime. Each article/study is summarized in an accurate and concise manner. The authors did not attempt to integrate findings of individual studies. They concluded:

The effect of modified workweek schedules on the numbers of personnel needed, absenteeism, overtime, turnover, staff fatigue, tension, quality of care, and continuity of care remain to be studied in depth. ... In general, the literature ... has focused on the impact of workweek innovations on staff satisfaction. Further, careful research examining the relationship of the modified workweek to organization modes, scheduling, amount of direct care provided to patients, staffing patterns, and staffing methodologies needs to be conducted. (Young et al., p. 122)

Davis (1982) presented a literature review of five studies that employed comprehensive research designs. The review examined the effects of the 12-hour shift on nurses' job satisfaction, fatigue, quality of care, costs of staffing, patient satisfaction, staffs' opinions, work environment, and health of staff nurses. The reviewer indicated that her purpose was to use a nursing administrator's viewpoint to examine the feasibility of the 12-hour shift. She concluded:

There exists no strong evidence ... that the implementation of the 12-hour shift will solve problems with ... quality of care or overall job satisfaction, or that it will result in decreased costs of staffing. ... the inconclusive results suggest a need for further research in this area. (Davis, 1982, p. 33)

Jensen (1986) reviewed 39 papers, published between 1971 and 1986, that dealt with the compressed workweek. Thirty-two of the papers examined 12-hour shifts, the remainder addressed 10-hour shifts. The review included published research papers, descriptive articles, a monograph authored by the Manitoba Organization of Nurses' Associations, two studies of the impact of 12-hour shifts in industry, and reviews by Davis (1982) and Eaves (1985). Jensen commented that only seven of the studies employed a systematic research design. The first part of the review presented data from studies under the headings: characteristics of nurses, morale and job satisfaction, leisure, travel to and from work, fatigue, communications, errors and incidents, quality of care, patients' and physicians' attitudes. Management perspectives, such as, effects of the extended shifts on

overtime/relief staff, turnover/recruitment, absenteeism, and cost were also included. The second portion of the review, an annotated bibliography, was used to evaluate the thoroughness of the literature search done for the present study.

Jensen concluded that the extended shift: (a) is popular with nurses and leads to increased morale and job satisfaction, (b) does not affect quality of care, (c) results in decreased absenteeism and turnover, and (d) saves hospitals money. She also stated:

Since the majority of the reports are either impressionistic or not conceptually comparable, they cannot serve as valid indications that the 12-hour shift is the best method of scheduling tours of duty. Further research with well defined concepts and scientific measurements should be undertaken. (Jensen, p. 22)

Two other articles, which are not formal literature reviews deserve mention. Eaves (1985), presented a well referenced, narrative review of the 12-hour shift literature. The reference list provided valuable information for the present study. E.M. Price (1981) presented an excellent review of the status and definitions of alternative workweek schedules used in hospital nursing departments, unfortunately, the author chose not to reference the information contained in the article.

Conclusions

Three of four literature reviews identified a need for further research. The fourth review did not make specific recommendations regarding the compressed workweek. Young et al. (1981) offered reliable summaries of material written between 1971-1978. Davis (1982) presented a narrative review, which summarized the results of five research studies under dependent variable headings. Jensen's (1986) narrative review of 39 papers attempted to integrate the literature by presenting conclusions under a number of headings. The annotated bibliography, while it did not comment on research methodology, offered clear and succinct summaries of the various reports, studies, and/or monographs included in the review.

All the reviews used a narrative approach. The narrative approach to the review process is subject to several weaknesses. Wolf (1986) listed five potential weaknesses of traditional literature reviews:

(1) selective inclusion of studies, often based on the reviewer's own impressionistic view of the quality of the study, (2) differential subjective weighting of studies in the interpretation of a set of findings, (3) misleading interpretations of study findings, (4) failure to examine characteristics of the studies as potential explanations for disparate or consistent results across studies, and (5) failure to examine moderating variables in the relationship under examination. (p. 10)

The four literature reviews demonstrated a number of the listed weaknesses. The Jelinek & Dennis (1976) review was not comprehensive. Young et al. (1981) summarized the literature and left much of the interpretation to the reader. The authors did not relate the characteristics of studies to differing results nor did they deal with moderating variables. Davis's (1982) review was not intended to be a comprehensive literature review. She clearly stated that she was examining five studies from an administrative perspective. Jensen (1986) dismissed findings from her review of 39 papers because the reports were either impressionistic or not conceptually comparable. She, like the other reviewers, did not investigate the differences in study characteristics and/or moderating variables as possible explanations for differing results. Finally, the reviewers based most of their conclusions on results from published papers.

The available reviews were all narrative, as such, fell victim to weaknesses implicit in the narrative approach to the review process. Glass, McGaw, and Smith (1981) suggested that research reviews should be more technical and statistical rather than narrative. They argued that the human mind cannot validly and reliably process the large amount of data necessary in a comprehensive research review. As an alternative "the findings of multiple studies should be regarded as a complex data set, no more comprehensible without statistical analysis than would hundreds of data points in one study" (p.12).

The present study differs from the reviews discussed earlier in that the study has incorporated technical and statistical procedures to analyze the findings from relevant

studies. The integrative review process and a description of the research method employed in the present study is discussed in the next chapter.

CHAPTER III

RESEARCH METHODOLOGY

This chapter begins with a general discussion of integrative research reviews. The introduction is followed by a description of the methodology employed in the present study. The methodology section is organized under the headings 'Sample', 'Instrumentation', and 'Procedures'.

Integrative Research Reviews

The focuses and purposes of research reviews vary substantially. Investigators may be interested in: (a) examining new substantive and/or methodological developments in a given field; (b) verifying existing theories or developing new ones; (c) synthesizing knowledge from different lines or fields of research; or (d) inferring generalizations about substantive issues from a set of studies. The integrative review focuses on inferring generalizations about substantive issues from a group of studies directly relevant to those issues (Jackson, 1980).

The integrative research review differs from the traditional narrative literature review in that the review process employs mathematically-based inferential research methods. The research methods include problem selection, hypothesis formulation, definition and measurement of variables, sampling, and data analysis (Glass, 1982; Cooper, 1984). The review process involves selecting a sample of studies relevant to the literature review topic, transforming the findings from each study into a common metric, coding various characteristics of each study, and then using statistical procedures to identify: (a) the presence of overall effects and (b) relations among the characteristics of the studies and the

findings.

This investigation of the compressed workweek's impact on nursing practice employed the integrative review approach as described by Cooper (1984). Cooper defined the integrative research review as follows:

Integrative reviews summarize past research by drawing overall conclusions from many separate studies that are believed to address related or identical hypotheses. The integrative reviewer hopes to present the state of knowledge concerning the relation(s) of interest and to highlight important issues that research has left unresolved. (p.11)

The integrative review process uses statistics to evaluate and analyze data obtained from a selected sample of studies. The term meta-analysis is commonly used to refer to the application of statistical procedures to the review process. Glass (1976), who coined the term meta-analysis, commented:

Meta-analysis refers to the analysis of analyses. I use it to refer to the statistical analysis of a large collection of analysis results from individual studies which typify our attempts to make sense of the rapidly expanding research literature. (p. 3)

The use of the terms 'integrative literature review' and 'meta-analysis' can be confusing as Cooper's integrative research review method is very similar to that of Glass's meta-analysis. In that the present study involved a comparison of findings from both qualitative and quantitative studies, the term 'integrative literature review' has been used to refer to the literature review process. The term 'meta-analysis' has been used to refer to the application of statistical procedures to the coded data.

Strengths and Limitations

The application of statistical procedures to the integration of research findings has both strengths and limitations. The strengths attributed to meta-analytical approaches and the limitations or criticisms commonly directed at quantitative review procedures are listed below. A detailed discussion of the criticisms of meta-analysis is also presented. These criticisms are important to the design of an integrative literature review and thus to the

validity of the reviews findings.

The Strengths of Meta-Analysis from Writings of Jackson (1980) and Green and Hall (1984)

1. Meta-analysis is a systematic, clearly articulated, and replicable approach for reviewing research.
2. Information from the best as well as the less-than-best studies can be used.
3. Quantitative reviews can provide estimates of population parameters.
4. The approach provides a means for investigating relationships among studies' methods, characteristics, and findings.
5. The methodology provides an efficient means to summarize a large body of literature.
6. The approach is more objective than traditional review methods.
7. The review process allows the investigation of hypotheses not investigated by primary researchers.

Criticisms Directed at Quantitative Review Procedures from Writings of Glass et al.(1981), Glass (1982), and Wolf (1986)

1. *The apples and oranges problem:* The comparison and aggregation of studies that use different definitions of variables, subjects, and measurement techniques cannot result in logical conclusions.
2. *The lumpy, nonindependent data problem:* Meta-analyses are conducted on data which include multiple results from the same study; this results in the use of nonindependent data and provides a mistaken impression of the reliability of the findings.
3. *Selection bias:* Meta-analysis results will be biased because nonsignificant findings are rarely published.
4. *The use of data from "poor" studies:* Meta- analysis fails to pay attention to the

quality of research studies included in the analysis.

The apples and oranges problem. The first criticism, the logic of comparing apples and oranges, relates to construct validity within quantitative literature reviews (Bangert-Drowns, 1986; Bryant & Wortman, 1984). Construct validity concerns the appropriateness and adequacy of how well the independent variable is operationalized, the procedures used to implement the research design, and how well the dependent variable(s) is measured (Shelley, 1984). The concerns regarding construct validity can be demonstrated in a brief description and discussion of the meta-analyses of psychotherapy outcome studies done by Smith and Glass (1977). The authors located approximately 500 studies and analyzed 375 papers. The authors collapsed 10 types of therapy into one definition of psychotherapy. The analysis included 833 effect size measures and represented an evaluation of approximately 25,000 control and experimental subjects. Effect sizes, the mean difference between the treated and control subjects divided by the standard deviation of the control group, were calculated on outcome measures contained in each study. Critics, basing their arguments on construct validity concerns, would reason that: the collapsing of 10 types of therapy into one broad definition of psychotherapy, the calculation of a common metric from a variety of tests measuring a variety of outcomes, and/or the collapsing of 833 effect sizes into 10 dependent variables could not accurately reflect the relevant underlying constructs of the original research, thus, the conclusions of the meta-analysis could not be considered valid.

Smith and Glass (1977) when discussing the methodology of their psychotherapy outcome study, argued that the practice of mixing outcomes together is defensible. They contended that all outcome measures were related to 'well-being' and the effect sizes were identified by type of outcome so that the magnitude of effects could be compared. Their rationale for combining the therapies together was to obtain an answer to the general question: "What effect does psychotherapy produce?"

Glass et al. (1981), addressing the apple and oranges problem, defended the practice of aggregating studies without addressing the concept of construct validity. They based their arguments on two factors. First, they contended that there is no need to compare studies that are the "same" since the studies would have the same findings within statistical error. They concluded that the only studies needing to be integrated are different studies. Second, the authors questioned the legitimacy of the apple and oranges problem itself. They argued that primary researchers compare different persons in much the same manner that meta-analysts compare different studies.

Several writers seem to agree that construct validity can only be assessed against the purposes of the reviewer (Bryant & Wortman, 1984; Cooper, 1984; Glass, 1977; and Glass et al., 1981). The relevance of study constructs depends on the specificity of the research question. A highly detailed research question, specifying a precise set of constructs, results in restrictive study selection procedures, while a summary of the literature on a broad topic is relatively permissive in selecting relevant studies (Bryant & Wortman, 1984). Cooper (1984), suggested that narrowly defined concepts can make review conclusions less definitive and robust, thus, reviewers should start out with the broadest possible conceptual definitions.

Bangert-Drowns (1986) accepted the argument that a reviewer's interest may be broader than that of the primary researcher, hence independent variables, such as in the psychotherapy meta-analysis, can be mixed. However, he saw the mixing of dependent measures that examined different constructs as less justifiable. He argued: "Treatments may influence many phenomena but averaging measures of all these phenomena only confuses our picture of the treatment. ... It seems better to let every average effect size represent one type of dependent measure" (Bangert-Drowns, 1986, p. 397).

The lumpy, nonindependent data problem. The second criticism of meta-analyses, the lumpy, nonindependent data problem, is of concern because the use of such data can produce biased or invalid findings. Lumpy data result because of differences among

studies in the sample. These differences include factors such as sample sizes and outcome measures. The nonindependent data are the result of allowing some studies to contribute more than one outcome measure to a given analysis. The nonindependent data problem can be seen in the description of the meta-analysis of psychotherapy outcome studies. The analysis was based on 833 effect size measures obtained from 375 papers. The authors noted that the inclusion of more than one effect size for each study could potentially introduce dependence in the errors and violate some assumptions of inferential statistics. However, they chose to sacrifice statistical purity rather than to lose valuable information (Smith & Glass, 1977).

A second problem, arising from the inclusion of multiple effect sizes from one study in a meta-analysis, is referred to as "inflated Ns". Studies are represented in a meta-analysis by the number of outcomes reported, thus a study reporting many outcomes can have a greater impact on meta-analysis results than those reporting fewer outcomes. Bangert-Drowns (1986) contended that 'inflated Ns' can threaten the generalizability or external validity of meta-analyses.

Selection bias. The third criticism of meta-analysis, selection bias, is a criticism that can be dealt with via meta-analytic means. Glass et al. (1981), after comparing effect sizes for findings reported in journals and dissertations, found that findings reported in journals were, on the average, one-third standard deviation or 33% larger than those reported in thesis and dissertations. The same authors noted that similar biases can be introduced in selecting studies by date; studies published more recently tend to have a larger effect size. The existence of such biases within a sample of studies can be identified when the data coded from those studies are evaluated.

An additional source of selection bias in a quantitative literature review may arise from the exclusion of studies with findings not amenable to quantitative summarization (Curlette & Cannella, 1985). This group of studies includes studies which do not contain reports of the statistical data required to calculate a common metric.

The use of data from "poor" studies. The final criticism of meta-analysis, the inclusion of findings from "poor" research in the analysis, has been the subject of much debate. Comments by Eysenck (1978) are frequently quoted by persons discussing the effects of study selection procedures on quantitative literature review results. Eysenck referred to Smith and Glass's (1977) study as an exercise in mega-silliness, commented that the two authors advocated and practiced the abandonment of critical judgments, and further suggested that their work exemplified the axiom of garbage in-garbage out.

Glass and Smith (1978) responded to the above comments with the statement: "The mass of 'good, bad, and indifferent' reports show almost exactly the same results" (p. 518). Glass and his cohorts have been adamant that meta-analysis should include all available relevant studies. They argued that integration should include an analysis of covariance of research findings with descriptions of design and study features. In situations where covariation is large the studies should be eliminated from the analysis (Glass et al., 1981). Glass (1982) stated: "As a general rule, there is seldom much more than one-tenth standard deviation difference between average effects for High validity and Low validity experiments" (p. 104).

Some authors have argued that a sample of studies can share a common bias. When such a bias is present the impact of that bias on study findings cannot be discerned. For example, when a body of research contains few well-designed studies the impact of methodological quality on findings cannot be assessed (Bangert-Drowns, 1986; Bryant and Wortman, 1984; Jackson, 1980).

Significance of the Strengths and Limitations to the Present Study

The purpose of the present study is to organize and make sense of research examining the impact of the compressed workweek on nursing practice. The integrative review process is a systematic, efficient research method for summarizing the relevant literature. The process provided a method to determine the cumulative results of studies and to

examine the relationships among studies' methods, characteristics, and results.

The four criticisms or problems associated with quantitative literature reviews were considered when the proposed methodology for the present study was developed. The strategies adopted to minimize the effects of these problems are summarized below. These strategies are discussed in greater detail in Chapter V.

1. The apples and oranges problem: The variables have been assigned broad conceptual definitions.
2. The lumpy independent data problem: The meta-analysis used the individual study as the unit of analysis, that is, a given study contributed one effect size to the analysis of one dependent variable.
3. Selection bias: The literature search strategies and the inclusion of qualitative studies in the sample should minimize selection bias.
4. The use of poor studies: Decisions to accept or reject a given study into the review were based on the application of two sets of criteria. These criteria are outlined on pages 39-40.

Methodology

The methodology section is organized under the headings 'Sample', 'Instrumentation', and 'Procedures'. The sample section includes descriptions of the target population, variables, literature search, and study selection and rejection criteria. The instrumentation section contains information pertinent to the coding of relevant studies. The procedures section contains a description of the study design, a discussion of potential threats to validity, as well as comments on the unit of analysis, weighting of studies, and analytic methods relevant to quantitative analyses of the coded data.

The Sample

Sample selection procedures involved the following six steps: (a) the definition of the target population, (b) the definition of variables relevant to the study, (c) a literature search, (d) the establishment of study selection criteria, (e) the coding and evaluation of information contained in the studies, and (f) the establishment of study rejection criteria. The step involving the coding and evaluation of data will be considered under 'Instrumentation'.

Target Population

The target population for the present study included published reports, unpublished reports, dissertations, and theses that examine the compressed workweek's impact on nursing practice.

Definition of Variables

A study was considered relevant to the integrative literature review when the definitions of variables within the study were congruent with the definitions listed below.

1. Compressed workweek: a work schedule that compresses weekly full-time hours of work into less than five days.
2. Nursing practice is a term used to represent all the dependent variables in the literature review.
3. Patients: individuals who consume nursing services within an institutional setting.
4. Nursing staff: registered nurses and licenced practical nurses employed to provide nursing care in health care institutions. When ancillary staff were included in a study sample and when the findings from the ancillary group could not be separated from other findings the study was accepted into the review. When an

investigator(s) reported the findings for registered nurses, licenced practical nurses, and ancillary staff the results from the ancillary staff were excluded from the analyses.

5. Health care institutions: acute care or chronic care facilities that use nursing services.
6. Quality of care: "the essential character of care, [is] considered in the context of grade or degree of merit" (Jelinek et al., 1976, p. 183) Quality, thus, includes the elements of care as well as a value judgement made by patients, nurses, and physicians.
7. Continuity of care: "the assignment of one member of the nursing staff the responsibility for the direct care of an individual patient on the morning shift for at least two consecutive days" (E.M.. Price, 1970, p.76).
8. Communication: "the degree to which information is transmitted among the members of a social system" (J.L. Price, 1972).
9. Fatigue: weariness from bodily or mental exertion, measured by a variety of operations and as percieved by nursing staff.
10. Job satisfaction: "degree to which the members of a social system have a positive affective orientation toward membership in the system " (J.L. Price, 1972, p. 56).
11. Shift satisfaction: the degree to which nursing staff have a positive orientation toward their working hours.
12. Well-being: "a satisfactory state of physical, mental and social health..." (Jennings, 1981, p.7).
13. Costs: "refers to costs incurred by the hospital through provision of nursing salaries and fringe benefits..." (Hibberd, 1972, p.7).
14. Absenteeism: " the degree to which the members of a social system fail to report for work at the time they are scheduled to work " (J.L. Price, 1972, p.14).
15. Recruitment: the enlistment of new nursing staff members.

16. Terminations/Turnover: when a person "leaves an organizational role for another role within a different organization-moves across the membership boundary of the organization" (J.L. Price, 1972, p. 185).
17. Overtime hours: time in excess of a prescribed work period.

Literature Search

A broad and exhaustive search of the literature is the best means to protect the validity of an integrative reviews findings. Cooper (1984) suggested "... searchers should always employ multiple channels so that the chances of a strong unidentified bias distinguishing included from unincluded studies is small" (p.55). He also urged reviewers to be explicit in their descriptions of how the search was conducted as such information allows the reader to judge the validity of the reviews conclusions.

The search for relevant studies for this review included: (a) computerized library searches; (b) manual searches through the Hospital Literature Index (1960-1986), International Nursing Index (1970-1986), and Cumulative Index to Nursing and Allied Health Literature (1970-1986); (c) reference tracking; (d) examination of research reviews of the compressed workweek; (e) contacts with nursing organizations and individual nurses.

Computerized library search. The first computerized library search was done before the research problem was clearly defined. The search done on March 3, 1986 used the following search terms: nurse, nurses, and nursing; schedule, shift; eight hours, twelve hours; circadian rhythms, human biologic rhythms; fatigue, error, frustration, illness, sickness, problem solving.

The second search, done on December 5, 1986, looked through Dissertation Abstracts. The search terms used were nurse, nurses; modified, compressed, alternative, 10-hour, 12-hour work schedule/shift. One dissertation which was not relevant to the review and two relevant theses were identified.

The third computerized search, done January 8, 1987, came about because the manual search of the Hospital Literature Index produced information that had not been found by earlier computer searches or by reference tracking. This search did not produce any new information.

Manual Index search. As mentioned above, the manual search through the Hospital Literature Index was productive. Relevant studies were found under the headings 'Administration: Work Schedules' and 'Efficiency'. The search through the International Nursing Index was not productive while the search of the Cumulative Index to Nursing and Allied Health Literature under the heading of 'Personnel, Staffing, and Scheduling' produced several relevant studies.

Reference tracking. The follow-up on reference lists and bibliographies was the least time consuming of the literature search strategies and possibly one of the more productive methods used. The two major literature reviews (Jelinek et al., 1976; Young et al., 1981) were found through reference tracking.

Literature reviews. Four literature reviews (Davis, 1982; Eaves, 1985; Jelinek et al., 1976; and Young et al. 1981) were most helpful in locating studies. References cited in a fifth review (Jenson, 1986), located after the literature search for the present study was almost complete, had been located by other means.

Contacts with nursing organizations and individual nurses. The enquiry to the Canadian Nurses Association librarian added three master level theses to the list of relevant studies. Two of the three identified theses did not appear on the computer search printouts and one of the three was not identified by other search strategies.

An interview with the executive director of the Manitoba Organization of Nurses' Association lead to the identification of a two phase study presently underway in Ontario. The Registered Nurses Association of Ontario and the Ontario Nurses Association have jointly commissioned a study on the impact of twelve hour shifts. Phase one of the study was a literature review (Jensen, 1986). Phase two will be a research project conducted in

the field setting.

Contacts with individual nurses resulted in locating two significant studies. The first was a two phase study commissioned by the British Columbia Minister of Health. Phase one was a literature review and phase two will be a research study. This material is not yet available for public consumption. The second study was named in a list of recent research projects. The study is an unpublished report from an Alberta hospital (Reid, 1983).

The literature search was done over an eleven month period and yielded 102 articles.

Selection of Relevant Studies

The selection of relevant studies for the review was based on two sets of criteria. The first set of criteria, significant to the initial selection of studies, stated that: (a) the material had to be written in English; (b) the independent variable involved nursing staff working the compressed workweek and the dependent variables related to attributes of nursing practice; and (c) there were indications within the study that dependent variables were measured.

The application of the above criteria to the 102 articles/studies located during the literature search eliminated 46 works. The first criterion, material had to be written in English, was applied to the literature search procedure, hence all articles evaluated for inclusion in the review were written in English. Fifteen works, including a doctoral dissertation and a masters report, were excluded because the variables did not coincide with those of this study and 31 works were excluded because the method of measurement was not clearly identified. The latter group included 13 articles which reported on experiences with the compressed workweek and 18 articles that offered advice or information about the compressed workweek.

Fifty-six reports met the three selection criteria. Ten redundant articles were removed because the sample included both published and unpublished versions of the same research (8 articles reporting on 6 theses and 2 reports) as well as three articles that dealt with one hospital's experiences with the 12-hour shift. Thus, the review sample consisted of 46

works and where possible the unpublished version of a given study was used rather than the published article.

Study/Data Point Rejection Criteria

The decision to exclude a given study or portion of a study was to be made after data from the initial sample were coded and evaluated. In actual fact some of these decisions were made during the coding process. This point is addressed in the 'Discussion' section of Chapter V. The decision to include or exclude data was based on the application of a set of data rejection criteria to information coded from the original sample of studies.

There were four rejection criteria applied to the coded data. Data assessed as (a) not relevant, (b) erroneous, (c) discordant, and/or (d) originating from invalid research methods were excluded from the analyses. Data were considered irrelevant when the definitions of variable(s) were not congruent with the definitions used in the review. Data, assessed as erroneous, included situations where there were apparent errors in recording, calculation, or choice of statistical tests. Discordant data were reported findings that did not fit with the majority of data within a particular analysis. Judgements regarding discordant data and the validity of research methods were based on statistical findings.

Instrumentation

Coding methods included the development of coding sheets, a standardized method of using the coding sheets, and pilot testing of the coding procedure. The coding sheet and the accompanying explanation are located in Appendix C. The coding sheet was designed to collect information from each study in the sample. Pertinent information included characteristics of the report itself, characteristics of participants, characteristics of variables, outcomes of the study, and interactions between the main effect and other variables.

The coding sheets were pilot tested by the investigator and revisions had to be made to

both the coding sheets and to the accompanying directions (Appendix D). A second person used the revised coding sheet to code one study and the resultant coded material was compared to that done by the investigator. This comparison demonstrated two additional revisions that need to be made to the coding directions. First the coder must code findings from the 'total variable' rather than findings from attributes of a given variable. For example, when an author reports no significant differences in job satisfaction between nurses working the 8-hour and 12-hour shifts and then notes that there were significant differences in one of the variables within the job satisfaction measure, the latter finding should not be coded. The second change needed is a clarification of the calculation directions. 'N' should have been defined as the number in the pretest or control group plus the number in the posttest or experimental group ($N = n_1 + n_2$).

Procedures

The important procedures in the research review process included developing the study design, identifying the unit of analysis, weighting studies, and choosing the analytic methods.

Study Design

The study design was based on Cooper's (1984) description of the integrative review process. He listed the following five phases or steps: (a) problem formulation, (b) data collection, (c) evaluation of data points, (d) analysis and interpretation, and (e) presentation of results. The implementation of review process is depicted in Table 3.1.

Unit of Analysis

The study served as the unit of analysis for the analyses of individual dependent variables. Thus, a given study had one input into a dependent variable analysis. When a study provided more than one measurement for a given variable one of two approaches was used. The value entered into the analysis was generally the mean of the effect sizes

Table 3.1
The Five Steps of the Literature Review Process

Problem Formulation	Data Collection	Data Evaluation	Analysis & Interpretation	Public Presentation
<p>1. Initial question "What is the impact of the compressed workweek (CWW) nursing practice?"</p> <p>2. Define CWW, nursing practice, patients, nursing staff, health care institutions, quality of patient care, patient satisfaction, nurse job satisfaction, shift satisfaction, fatigue, well-being, communication, costs, recruitment, overtime terminations/turnover.</p> <p>3. Set study selection criteria: written in English; examine defined variables; measure dependent variables.</p> <p>4. Identify common intervening variables.</p> <p>5. Develop code sheet and instructions. Pilot test</p>	<p>1. Identify target: pertinent studies 1970-present.</p> <p>2. Establish literature search strategies: computer search, Indexes, reference-tracking, existing literature reviews, contacts with nursing organizations and peers.</p> <p>3. Identify data sources: published reports, unpublished reports and dissertations.</p> <p>4. Plans to deal with data retrieval problems: Inter-library loan, purchase dissertations as necessary contact authors of recent publications (1981+) when material is particularly significant.</p> <p>5. Code data</p>	<p>1. Apply data rejection criteria to coded data: irrelevant, erroneous, discordant data or data originating from invalid research methods is to be excluded.</p> <p>2. Calculate effect sizes.</p> <p>3. When an author reports non-significant data without reporting numerical values assign a p of .5 (1-tailed test) and a relationship strength of 0.</p> <p>4. Prepare data to use individual studies as the unit of analysis.</p> <p>5. Test data for homogeneity.</p>	<p>1. Adjust ES metric to remove bias.</p> <p>2. Examine variability across studies.</p> <p>3. Combine results of different studies.</p>	<p>Thesis.</p>

and significance levels. However, there were occasions when one measure was deemed more accurate than another; when this occurred the more accurate measure was used.

Weighting of Studies

The analysis included both weighted and unweighted significance levels and effect sizes. The weighting scheme was based on sample sizes and was applied to the data as described by Rosenthal (1984). The purpose of the weighting was to give more credence to findings from studies using large samples. Generally greater differences are noted in findings from smaller samples, this method of weighting allows the researcher to determine the impact of small sample size on aggregated results.

Methods of Analysis

The description of the statistical analysis can be divided into four phases. The preliminary phase involved the calculation of effect sizes, the second phase involved comparing significance levels and effect sizes, the third was the combining and weighting of significance levels and effect sizes, and the fourth involved analyzing the impact of intervening variables and research methods on study findings.

Calculation of effect sizes . The effect size is a statistic which reflects the degree to which a treatment (here the compressed workweek) separates two observed means. The present study used the r -index (Pearson's product-moment correlation) as an effect size because: no adjustments had to be made when t -tests from correlated or independent results were used (Rosenthal, 1984); the index was generally easy to calculate from data reported in the group of studies; and finally, r is a fairly simple statistic to interpret.

The effect sizes for each variable within each study were calculated manually during the coding process. When a study contained two or more measurements of a given variable the mean significance level and mean effect size were entered into the analysis. The calculation of means were based on Z -scores and Fisher's Z_r transformation rather

than on the p-values or r values. (See Rosenthal, 1984, p.33)

Comparing significance levels and effect sizes. The essential ingredients for the statistical analyses were the number of observations within a study, the Z-score associated with the significance level, the r value and its associated Fisher's Zr. The rationale for using Fisher's Zr in meta-analytic procedures is based on the premise that: "... as the population value of r gets further and further from zero the distribution of r's sampled from that population becomes more and more skewed. This fact complicates the comparison and combination of r's" (Rosenthal, 1984, p. 27). Fisher devised a transformation (Zr) that is distributed nearly normally. This transformation ($Zr = 1/2 \log_e [(1+r)/(1-r)]$) was used throughout the present study.

Chi-square values were calculated to compare both the significance levels and effect sizes of findings reported for each of the 13 dependent variables. The purpose of these analyses was to determine whether the similarity between and among study significance levels and effect sizes was sufficient to permit the findings to be combined. When the grouped data were homogenous the findings were combined and when the data were heterogenous attempts were made to identify and remove the source of variance to enable the combining of results.

Combining results. The Z-scores obtained from the set of studies were combined to get an estimate of the probability that no relationship existed between the dependent variable and the compressed workweek. The effect sizes were combined, using Fisher's Zr, to obtain an estimate of the combined effect size. The combining procedures were repeated with the weighted data.

Analyzing the impact of intervening variables and research methods on study findings. The findings for each dependent variable were categorized as increased, no change, or decreased under 8 headings within two frequency tables (p. 64, 68). The sign test was used to calculate Z-scores and the resultant Z-scores were compared.

Summary

The methodology chapter began with a description of integrative literature reviews. The description included a discussion of the strengths and limitations attributed to the application of statistical procedures to the literature review process. The significance of these strengths and limitations to the present study was outlined.

The second portion of the chapter, organized under the headings 'Sample', 'Instrumentation', and 'Procedures', detailed the methods employed in the present study. The discussion will now move to the presentation of results.

CHAPTER IV

RESULTS

This chapter is divided into six sections. The first section provides a general description of studies included in the review. The second and third sections are devoted to the meta-analyses of study findings (N = 93). Section two deals with the comparisons of significance levels and effect sizes and section three presents the combined significance levels and effect sizes. The aggregated findings (N = 180) from all studies are considered in sections four and five. The two sections provide a description of the impact of intervening variables and research methods on study findings. The final section summarizes the results in terms of the following four research questions:

1. What relationships exist between research methods and findings reported in studies that have examined the impact of the compressed workweek on nursing practice?
2. What relationships exist between environmental factors and findings reported in studies that have examined the impact of the compressed workweek on nursing practice?
3. What relationships exist between operational factors, such as, 10-hour and 12-hour shift schedules, and findings reported in studies that have examined the impact of the compressed workweek on nursing practice?
4. What is the impact of the compressed workweek on: absenteeism; communication; continuity of care; costs; nursing staffs' fatigue, job satisfaction, overtime hours, shift satisfaction, and well-being; quality of patient care; recruitment and terminations or turnover of nursing staff?

General Description of Studies Included in the Review

The review included 46 reports (listed in Appendix E) that originated from 23 different

journals, 6 universities, and 4 hospitals. The dates of the articles span the years 1971 to 1986. The distribution and frequency of those dates are given in Table 4.1. Thirty-five studies appeared in journals, 7 studies were master's theses or reports (6 of which were later published), and 4 were hospital reports (2 of which were later published).

Table 4.1

The Year and the Number of Studies Included in the Literature Review

Year	Number	Year	Number	Year	Number	Year	Number	Total
1971	1	1975	4	1979	1	1983	7	13
1972	6	1976	1	1980	1	1984	5	13
1973	4	1977	0	1981	3	1985	0	7
1974	4	1978	2	1982	3	1986	4	13
Total	15		7		8		16	46

The majority of the reports ($N = 29$) described the impact of the 12-hour shift. There were variations in the scheduling of shifts. Some units scheduled staff to work 7 consecutive days followed by seven days off, some used the extended shift on night duty or weekends only, others chose a combination of eight-hour and extended workdays.

The bulk of the studies ($N = 32$) were done in the United States, the others were done in Canada ($N = 13$) and England ($N = 1$). The most frequent site for the studies was in the Emergency and/or Intensive Care areas ($N = 19$). There were a few hospitals ($N \approx 4$) that used the schedule throughout the institution.

There were variations in both composition and size of the samples used in the studies. The samples included registered nurses, a mixture of nursing personnel, physicians, patients, support personnel or individual hospitals. The sample sizes varied from 7 to 436 nurses, 5 to 222 patients, and 1 to 8 hospitals.

The majority of the studies were done after the compressed workweek was introduced (N = 33) and only 13 of the 46 reports employed a control group. The period of time between the introduction of the compressed workweek and measurements of dependent variables varied from 3 weeks to 5 years.

Overall, the 46 studies investigated 180 hypotheses. The dependent variables and the number of hypotheses related to those variables are listed below.

<u>Dependent Variable</u>	<u>Number</u>	<u>Dependent Variable</u>	<u>Number</u>
Absenteeism	27	Quality of care (perceptions)	14
Shift satisfaction	25	Overtime hours	13
Job satisfaction	20	Communication	11
Quality of care (elements)	16	Recruitment	6
Turnover	15	Well-being (nurse)	3
Costs	14	Fatigue (objective)	2
Fatigue (perceptions)	14	Continuity of care	0

There were variations in the type of measurement used. The majority of observations were based on perceptions obtained through use of informal rather than standard measurement tools. Measurements of overtime, absenteeism, turnover and recruitment were based on the examination of records before and after the introduction of the compressed workweek and/or comparisons with a control group. Two studies provided objective measures of nurse fatigue and 16 studies contained objective measurements for quality of care. The quality of care measures were based on chart audits, direct observations, medication errors, and incident reports.

The following description depicts the modal study included in the review. The study was published in a journal in 1983, the sample involved 24 nurses working twelve hour shifts on a 29-30 bed unit in a general hospital located in the United States. The dependent variables included absenteeism, job satisfaction, shift satisfaction, turnover, and quality of care. The study was evaluative in nature and was done 6 months after the introduction of the compressed workweek. The investigator developed the measurement tools to test

perceptions and hospital records were used to tabulate absenteeism rates, turnover, medication errors and/or incident reports.

Comparing Significance Levels and Effect Sizes

The comparison of study findings took two forms. First, the p-values associated with study findings were compared and second the effect sizes or r-indexes were compared. Calculations involving p-values were based on Z, the standard normal deviate and calculations involving the r-index were based on Fisher's Z transformation.

The comparisons of significance levels, based on Chi-square tests for homogeneity, for each of the thirteen dependent variables are listed in Table 4.2. The results indicate the

Table 4.2

Chi-Square Analyses of Significance Levels for 13 Dependent Variables

<u>Dependent Variable</u>	<u>Chi-square</u>	<u>Degrees of Freedom</u>	<u>p-value</u>
Absenteeism	0.131	10	.9999
Communication	0.777	3	.9999
Costs	10.184	8	.2523
Fatigue (objective)			
Fatigue (perception)	328.600	8	.0000
Job Satisfaction	176.068	12	.0000
Overtime	0.275	7	.9999
Quality of Care (elements)	35.692	6	.0000
Quality of Care (perceptions)	14.110	7	.0493
Recruitment	5.236	1	.0221
Shift Satisfaction	423.997	12	.0000
Turnover	7.712	6	.2600
Well-being (nurse)	3.419	1	.0645

data contained in the absenteeism, communication, costs, overtime, turnover, and nurse well-being analyses are homogeneous and thus comparable. However, the Chi-square analyses of fatigue (perception), job satisfaction, quality of care (elements and perception),

recruitment, and shift satisfaction are heterogeneous. This heterogeneity of significance levels demands that the findings from the latter analyses not be combined.

The comparisons of effect sizes using Chi-square analyses for each of the thirteen dependent variables are listed in Table 4.3. The results indicate the data contained in the absenteeism, communication, overtime, recruitment, turnover, and nurse well-being analyses are reasonably homogeneous, thus comparable. The effects sizes for job satisfaction, costs, fatigue (perceptions), quality of care (elements and perceptions) and shift satisfaction are significantly different; thus, the combining of significance levels will not produce reliable results.

Table 4.3

Chi-Square Analyses of Effect Sizes for the 13 Dependent Variables

<u>Dependent Variable</u>	<u>Chi-square</u>	<u>Degrees of Freedom</u>	<u>p-level</u>
Absenteeism	0.999	10	.9999
Communication	0.571	3	.9999
Costs	15.910	8	.0437
Fatigue (objective)			
Fatigue (perception)	344.900	8	.0000
Job Satisfaction	155.466	12	.0000
Overtime	0.274	7	.9999
Quality of Care (elements)	41.728	6	.0000
Quality of Care (perceptions)	40.880	7	.0000
Recruitment	0.718	1	.3968
Shift Satisfaction	584.650	12	.0000
Turnover	11.523	6	.0735
Well-being (nurse)	2.280	1	.1311

The next step of the analyses involved looking for the source of variance within the grouped findings. Study findings that were included in the analyses of quality of care (elements), quality of care (perceptions), job satisfaction, shift satisfaction and fatigue (perceptions) are presented in Tables 4.4, 4.5, 4.6, 4.7 and 4.8 respectively. The tables also include information about study design and intervening factors.

Quality of care: elements. (Table 4.4) The Z-score and Fisher's Zr from study number 24 are considerably different from the other values in the table. The removal of study 24 from the analyses resulted in Chi-square values of 5.1658 for significance levels and 6.0109 for effect sizes, each with 5 degrees of freedom.

Quality of care: perceptions. (Table 4.5) There are not any negative Z-scores or Fisher's Zrs in the quality of care (perceptions) data, however, the Chi-square analysis indicated that the group of effect sizes was not homogenous. The removal of outlier values, contributed by studies 34, 45, and 47, from the analyses resulted in a Chi-square of 4.9105 for significance levels and 8.32195 for effect sizes, each with 4 degrees of freedom.

Costs. (Table 4.6) The aggregated significance levels from the cost data were not comparable. The removal of study number 15 from the analyses resulted in a Chi-square values of 1.9892 (7df) for significance levels and 1.5125 (7df) for effect sizes.

Job satisfaction. The data-base for the job satisfaction analyses is presented in Table 4.7. The Z and Zr scores from studies 14 and 42 are considerably larger than those from the remaining 11 studies. The removal of these two studies from the analyses resulted in a Chi-square of 12.6449 (10 df) for significance levels and 16.5542 (10 df) for effect sizes.

Shift satisfaction. The shift satisfaction data is presented in Table 4.8. The results from two studies are an average from two groups. The results from study 33 came from two samples, nurses ($n_1 = 25$, $n_2 = 33$) and physicians ($n_1 = 15$, $n_2 = 19$); the results from study 42 originated from nurses ($n_1 = 245$, $n_2 = 188$) and support staff ($n = 4$). The inclusion of these results as an average does not account for the high Chi-square values, 423.997 (12 df) for significance levels and 584.65 (12 df) for effect sizes. The wide variations in Z-scores (-3.638 to 10.345) and the Fisher's Zr (-1.39 to 1.74) means that these results cannot be combined to produce a reliable measure. The source of the variance could not be identified.

Table 4.4
Quality Care (elements): Z-Scores and Effect Sizes Included in Chi-square Tests for Homogeneity

Study No.	Source	Year	Service (Exp)	Service (Control)	Shift	Design	Control	Number (Exp)	Number (Control)	Method	Z-score	r-index	Zr
22	Nursing Research	1983	SICU		12	OXO	no	5	5	Chart audit	0.0006	0.0002	0.0002
24	Thesis	1979	M,S,S	S,S,S,	12	XO	yes	29	28	Qualpacs	-5.113	-0.677	-0.824
38	Thesis	1975	Surg	surg	12	XO	yes	25	25	chart audit	1.97	0.2786	0.2862
39	Unpub report	1973	ICU/renal		12	OXO	no	52	78	DO	0.1866	0.0164	0.0164
42	Unpub. report	1983	mixed		12	XO	yes	15 units	7 units	qua mon*	2.2667	0.4833	0.5273
44	Thesis	1972	2 med	surg	12	OXO	yes	24	40	nsg √ list	0	0	0
47	Nursing Manag. *Quality monitoring scores	1986	mixed		12	XO	no	8 hosp		med errors	0.7071	0.25	0.2554

Table 4.5
Quality Care (perceptions): Z-Scores and Effect Sizes Included in Chi-square Tests for Homogeneity

Study No.	Source	Year	Service (Exp)	Service (Control)	Shift	Design	Control	Sample	Number (Exp)	Number (Control)	Z-score	r-index	Zr
25	AJN	1972	peds		10	OXO	no	mixed	24.7	24.7	2.952	0.42	0.4477
29	Hospitals	1974			10	XO	no	RN	115		1.287	0.12	0.1206
33	Unpub. Report	1973	Peds		12	OXO	no	phys	19	15	1.2828	0.22	0.2237
34	Canadian Nurse	1982	ICU		12	XO	no	st nse	22		3.4112	0.7273	0.923
38	Thesis	1975	Surg	surg	12	XO	yes	RN	20	17	0.5767	0.0936	0.0939
44	Thesis	1972	2 med	surg	12	OXO	yes	patients	155	67	0	0	0
45	Unpub. Report	1975	ICU,renal		12	XO	no	nurses	27		4.0415	0.7778	1.0398
47	Nursing Manag.	1986	mixed		12	XO	no	hospitals	8		1.7678	0.625	0.7332

Table 4.6
Costs: Z-Scores and Effect Sizes Included in Chi-Square Tests of Homogeneity

Study No.	Source	Year	Institution	Service	Shift	Sample	Number (Exp)	Number (Cont)	Z-score	r-index	Fisher's Zr
5	Nursing Times	1986	Heart-Lung	Medical	12	staff required	10.56	10.56	0	0	0
15	Nursing Managen	1984	General	Medicine	12	units staff	8	8	-3.189	-0.8	-1.090882
26	Nursing Managen	1983	not stated	Medicine	10	man hrs	2	2	-0.017	-0.01	-0.0086
39	Unpub report	1973	General	ICU/renal	12	personal time	52	78	0.0342	0.003	0.003
40	Nsg Admin Quart	1984	not stated	Surgery	12	pt days/pd wk hr	7	7	-0.027	-0.01	-0.0072
41	J Cont Ed in Nur	1986	General	I S educ	10	unsched time	4	4	-0.198	-0.07	-0.070115
42	Unpub report	1983	General	Mixed	12	pot prod time	26	26	0.0177	0.002	0.002452
44	Thesis	1972	General	Medicine	12	osts/pot prod tim	15/26	15/26	0.0721	0.01	0.01
47	Nursing Managen	1986	8 hospitals	Mixed	12	productivity	8	8	-1.414	-0.5	-0.549306

Table 4.7
Job Satisfaction: Z-Scores and Effect Sizes Included in Chi-Square Tests for Homogeneity

Study No.	Design	Contro	Category	Number (Exp)	Number (Cont)	Measure	Z-score	r-index	Fisher's Zr
5	OXO	yes	RN	15	55	Informal	-0.258	-0.067	-0.067
11	XO	yes	RN	41	40	standard	-0.323	-0.034	-0.034
14	XO	yes	RN	40	82	standard	3.2414	0.3624	0.3796
20	XO	yes	RN	125	16	standard	-0.451	-0.031	-0.031
23	OXO	yes	mixed	16	24.7	informal	-0.224	-0.04	-0.04
25	OXO	no	mixed	24.7	16	informal	2.817	0.41	0.4356
32	XO	yes	RN	12	25	standard	0.8001	0.1512	0.1524
33	OXO	no	mixed	33	24	informal	0.3803	0.05	0.05
35	OXO	no	RN	24	24	standard	0	0	0
38	XO	yes	RN	20	17	informal	0.8	0.1315	0.1323
42	XO	yes	mixed	245	188	informal	13.956	0.6707	0.812
43	OXO	no	RN	7	7	informal	2.2075	0.59	0.679
47	XO	no	mixed	8	8	informal	1.7678	0.625	0.7332

Table 4.8
Shift Satisfaction: Z-Scores and Effect Sizes Included in Chi-Square Tests for
Homogeneity

Study No.	Design	Control	Shift	Number (Exp)	Number (Cont)	Measure	Category	Z-score	r-index	Fishers Zr
4	XO	no	12	17		Informal	Nurses	-3.638	-0.88	-1.39
13	XO	no	12	33		informal	RNs	5.3999	0.94	1.738
29	XO	no	10	115		informal	Nurses	2.189	0.13	0.076
31	XO	no	12	426		informal	Nurses	19.401	0.94	1.738
33	OXO	no	12	25&15	33&19	informal	Nse/phys	1.3489	0.19	0.194
34	XO	no	12	22		informal	Nsg. studs	2.985	0.64	0.752
35	OXO	no	12	24	24	standard	RNs	3.3635	0.38	0.541
38	XO	yes	12	20	20	informal	Patients	-1.34	-0.21	-0.22
42	XO	yes	12	245&4	188	informal	Ns,sup.ser	10.345	0.48	0.525
43	OXO	no	12	7	7	informal	RNs	1.54	0.41	0.438
44	OXO	yes	12	15	15	informal	Nurses	-1.832	-0.33	-0.34
45	OX	no	12	27		informal	RNs	2.7906	0.51	0.565
47	XO	no	12	8		informal	Nurses	0.8061	0.49	0.536

Table 4.9
Fatigue (perception): Z-Scores and Effect Sizes Included in Chi-Square Tests for
Homogeneity

Study No.	Sample	Design	Control	Number (Exp)	Number (Control)	Shift	Service	Z-score	r-index	Fishers Zr
5	RNs	OXO	Yes	15		12	Medical	1.291	0.33	0.347
22	RNs	OXO	No	29	29	12	SICU	0.6128	0.08	0.081
29	RNs	XO	No	115		10	Hospital	1.501	0.14	0.141
33	Nurses	OXO	No	25	33	12	Pediatrics	-0.609	-0.08	-0.08
34	Nse st	XO	No	22		12	ICU	-1.279	-0.27	-0.28
35	RNs	OXO	No	24	24	12	ICU	-2.433	-0.33	-0.37
43	RNs	OXO	No	7	7	12	Mixed	-1.7	-0.46	-0.49
45	RNs	XO.	No	27		12	ICU/Renal	-4.234	-0.81	-1.14
47	DON	XO	No	8		12	Mixed	0.3536	0.13	0.126

Fatigue (perceptions). The fatigue perception data is presented in Table 4.9. The wide variation among findings (Z-scores -2.433 to 1.291 and Fisher's Zr -1.1411 to .34654) reported in 9 studies resulted in Chi-square values of 328.6 and 344.9 suggesting the aggregated findings would not produce reliable results. The source of the variation could not be identified.

Fatigue (objective). Two studies examined nurse fatigue but the statistics from one study could not be converted to an r-index so the results from the two studies could not be combined.

Summary

The removal of certain study findings from the aggregated data produced several groupings that were homogenous and thus comparable. The data are summarized in Table 4.10. The source of variance in the shift satisfaction and fatigue (perception) data could not be identified.

Table 4.10

Chi-square and p-values for Significance Levels and Effects Sizes of Dependent Variables

Dependent variable	Chi-square significance levels	Degrees of freedom	p-value	Chi-square effect sizes	Degrees of freedom	p-value
Absenteeism	0.1314	10	.9999	0.0999	10	.9999
Communication	0.7773	3	.9999	0.5712	3	.9999
Costs	1.9892	7	.9604	1.5125	7	.9819
Fatigue (objective)						
Fatigue (perceptions)						
Job satisfaction	12.6449	10	.3172	16.5520	10	.0849
Overtime	0.2748	7	.9999	0.2748	7	.9999
Quality of Care (el)	5.1658	5	.3960	6.0109	5	.3052
Quality of Care (perc)	4.9105	4	.2966	8.3219	4	.0805
Recruitment	5.2359	1	.0221	0.7181	1	.3968
Shift satisfaction						
Turnover	7.7117	6	.2600	11.5237	6	.0735
Well-being (nurse)	3.4191	1	.0645	2.2800	1	.1311

Combined Significance Levels and Effect Sizes

Once the aggregated findings were screened for homogeneity the combined significance levels and effect sizes were determined (Table 4.11). The results from the recruitment analysis should be viewed with caution. The Chi-square tests indicated the aggregated effect sizes were homogenous but the analysis of significance levels indicated heterogeneity. Weighted combined findings are also included in Table 4.11. The purpose of the weighting scheme was to give more credence to findings from studies using large sample sizes; thus, indicating the impact of small sample size on the aggregated results. The weighted results, other than the communication findings, are smaller and less significant than the corresponding unweighted results.

Table 4.11

Combined Significance Levels (p-value) and Effect Sizes (r-index): Weighted and Unweighted

Dependent Variable		Z-score	p-value Z-score	Weighted Z-score	p-value Z-score	Fisher's Zr	r index Zr	
Absenteeism	- 0.152	0.4404	- 0.0517	0.4801	- 0.0142	- 0.014	- 0.0046	- 0.005
Communication	- 0.404	0.3446	- 0.6426	0.2743	- 0.0125	- 0.012	- 0.0340	- 0.034
Costs	- 0.542	0.2946	- 0.0421	0.4840	- 0.0775	- 0.078	- 0.0191	- 0.019
Job Satisfaction	2.2666	0.0038	0.4866	0.3121	0.1828	0.181	0.0553	0.055
Overtime	- 0.200	0.4207	- 0.0115	0.4960	- 0.0171	- 0.017	- 0.0056	- 0.006
Quality Care(e)	2.0947	0.0183	1.1474	0.1251	0.1809	0.179	0.1009	0.101
Quality Care(p)	4.5347	0.0000	1.3812	0.0838	0.1772	0.176	0.1004	0.100
Recruitment	4.6047	0.0000	5.1227	0.0000	0.5641	0.511	0.6490	0.571
Turnover	- 3.741	0.0001	- 2.7585	0.0029	- 0.4167	- 0.394	- 0.2787	- 0.272
Well-being	1.8491	0.0322	1.1503	0.1251	0.1985	0.196	0.1276	0.127

The heterogeneity of aggregated findings from Table 4.11 would not permit the calculation of an overall significance level and effect size for the impact of the compressed workweek on nursing practice. The findings from the analysis of absenteeism, costs, and overtime were aggregated giving an unweighted r-index of .0363 with a p-value of .2483. The findings from the two quality care analyses were compared and then combined producing a significant r-index of .178 ($p = .0000$, $Z = 5.004$). The findings from the recruitment and turnover analyses were also comparable and when combined gave a significant r-index of .455 ($p = .0000$, $Z = 5.90$).

Impact of Intervening Factors on Study Findings

Intervening factors are the operational and/or environmental factors that may influence the dependent variables frequently measured in the compressed workweek research. (A more complete discussion of these factors can be found on pages 4 and 5). This study investigated the impact of the length of the shift, geographical location, type of service, and category of subject on study findings.

The findings for each dependent variable were categorized as increased, no change, or

decreased under each independent variable, in this case, extended shift, location of study, type of service, and subject category (Table 4.12). The sign test was used to calculate significance levels for findings reported in this table and the resultant Z-scores were compared using the formula " $\frac{Z_1 - Z_2}{\sqrt{2}}$ is distributed as Z" (Rosenthal, 1984, p. 66).

The analysis revealed that there were no significant differences between findings reported in the United States and Canada ($p = .3745$), between findings from special care areas and general care areas ($p = .2611$), between findings from registered nurses and other subject groupings ($p = .3483$). However, there were significant differences between findings reported in the 10- and 12-hour shift literature ($p = .0188$).

The impact of the length of shift on study findings was examined in greater detail. First, the sign test was used to calculate the significance levels of findings reported for each dependent variable and the resultant Z-scores were compared using the formula mentioned previously. This analysis, summarized in Table 4.13, revealed that differences between findings from 10- and 12-hour shifts were almost significant in the communication data ($p = .0793$) and insignificant in the remaining data.

Table 4.12

Frequency Table: Relationships Between Intervening Factors and Findings Reported in Compressed Workweek Literature
 Direction of change is indicated as (+) increased, (0) no change, and (-) decreased.

Direction of change -> Dependent Variables	Intervening Factors																									
	Extended shift			Location(a)			Type of Service			Category																
	12-hours			Canada			ICU(b)			RNs																
	10-hours	12-hours	12-hours	US	Canada	Other(c)	ICU(b)	Other(c)	RNs	Mixed																
Absenteeism (n=27)	1	2	8	3	4	13	3	1	3	2	2	7	4	3	9	0	4	5	4	1	7					
Communication (n=11)	1	0	2	5	0	2	2	0	2	3	0	1	4	0	3	4	0	0	3	0	3					
Costs (n=14)	0	0	5	3	1	5	0	0	10	3	0	0	1	0	1	2	1	8	N/A	N/A	3					
Fatigue (obj) (n=2)	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0	0	0	1	1	0	0				
Fatigue (perc) (n=13)	1	0	0	5	1	6	5	0	1	0	1	0	5	1	1	4	0	4	0	4	2	1	2			
Job Satisfaction (n=20)	3	0	0	12	2	2	11	0	1	4	2	1	4	1	0	10	1	3	8	1	3	7	1			
Overtime (n=13)	2	1	6	2	0	2	2	1	8	1	0	0	2	0	3	2	1	5	3	1	1	1	0			
Quality of Care (el)(n=16)	1	1	0	5	5	4	3	3	1	3	3	2	4	1	4	2	3	0	3	3	4	3	1			
Quality of Care (perc)(n=1)	2	0	0	9	1	2	7	0	1	4	1	1	4	0	1	7	1	1	4	0	1	7	1			
Recruitment (n=6)	1	0	0	5	0	0	5	0	0	1	0	0	5	0	0	1	0	0	3	0	0	2	0			
Shift Satisfaction (n=25)	8	0	0	13	0	4	14	0	1	7	0	2	9	0	0	12	0	4	8	0	3	12	0			
Turnover (n=15)	0	0	5	1	0	9	1	0	11	0	0	3	1	0	5	0	0	8	1	0	4	0	0			
Well-being (n=3)	0	0	0	1	0	2	0	0	1	1	0	1	1	0	1	0	0	1	1	0	2	0	0			
N=178	20	4	26	68	14	46	57	8	50	29	9	21	36	8	25	51	10	46	37	10	26	42	7			
Column Totals	178												176												148	
Category totals	178												176												148	

(a) England: costs 0, fatigue (perc) +, job & shift satisfaction -, overtime +.

(b) ICU includes special care areas such as Emergency, Labour & Delivery, ICN, CCU, SICU.

(c) Other areas not traditionally classified as special care areas. The category includes studies in which the nursing staff work the CWW throughout the hospital.

(obj) objective data

(perc) perceptions

(el) elements

The number of studies reported in the frequency columns does not equal 'N' when the

information was not reported or when data could not be categorized under the column heading.

Table 4.13

The Relationships Between Findings Reported in 10- and 12-hour Studies (based on data presented in Table 4.12, p. 64)

Variable	Z-score	p-value	Variable	Z-score	p-value
Absent Hours	1.0616	.1446	Quality of Care (E)	0.4714	.3192
Communication	1.4083	.0793	Quality of Care (P)	0.4924	.3121
Costs	1.0812	.1401	Recruitment	0.8741	.1922
Fatigue (P)	0.9203	.1788	Shift Satisfaction	0.4565	.3228
Job satisfaction	0.6651	.2514	Turnover	0.2077	.4168
Overtime Hours	1.0000	.1587			

Second, the distribution of the 10- and 12-hour hypotheses among the 13 variables was examined (Table 4.14). This examination revealed that the differences between findings identified by the original sign test may have been due to the relatively small number of 10-hour hypotheses included in several of the analyses. Furthermore, there

Table 4.14

The Number of Hypotheses Classified According to Dependent Variable, Length of Shift and Inclusion in the Meta-Analysis

Dependent variable	Total number of hypotheses		Number of hypotheses included in the meta-analysis	
	10-hours	12-hours	10-hours	12-hours
Absenteeism	11	16	6 (54.6%)	5 (31.6%)
Communication	3	8	2 (66.7%)	2 (25.0%)
Costs	5	9	2 (66.7%)	7 (77.8%)
Fatigue (objective)	0	2	0	1 (50.0%)
Fatigue (perceptions)	1	12	1 (100%)	8 (66.7%)
Job satisfaction	3	16	1 (33.3%)	10 (62.5%)
Overtime	9	4	4 (44.4%)	4 (100%)
Quality of Care (elem)	2	14	0	7 (50.0%)
Quality of Care (perc)	2	12	2 (100%)	6 (50.0%)
Recruitment	1	5	0	2 (40.0%)
Shift satisfaction	8	17	1 (12.5%)	12 (70.6%)
Turnover	5	10	3 (60.0%)	4 (40.0%)
Well-being	0	3	0	2 (66.0%)
Totals	50	128	22 (44.0%)	70 (54.7%)

were proportionately fewer 10-hour hypotheses (44.0%) compared 12-hour hypotheses (54.7%) included in the meta-analysis. This further decrease in the number of 10-hour hypotheses may have negated the apparent differences between the 10- and 12-hour findings. However, the original data in only 5 of the 13 meta-analyses were homogenous and four of these data groupings contained equal representation of 10- and 12-hour hypotheses (absenteeism [N₁₀ = 6, N₁₂ = 5]; communication [N₁₀ = 2, N₁₂ = 2]; overtime [N₁₀ = 4, N₁₂ = 4]; and turnover [N₁₀ = 3, N₁₂ = 4]) suggesting that (a) the impact of 10-hour shifts was not negated and (b) the findings from both shifts are comparable.

Third, the data included in the meta-analysis were examined in light of possible differences between the 10- and 12-hour findings. The Chi-square test indicated that 7 of the original data groupings were heterogenous. When this data was divided and regrouped according to the length of shift the data remained heterogenous which suggests that the length of the shift was not responsible for the variance.

In sum, the more detailed analyses of the findings from the 10- and 12-hour hypotheses indicated that the findings are comparable. The differences between findings in the communication data, as identified by the sign test, although not significant (.0793) may be worth noting.

Impact of Research Methods on Study Findings

The investigation of the impact of research methods on study findings was conducted in much the same manner as the investigation of the relationships between intervening variables and study findings. The findings for each of the dependent variables were categorized as increased, no change or decreased under each independent variable (Table 4.15). The independent variables included study design, use of a control, relevant statistics, and measurement method. The data under relevant statistics provide the

Table 4.15

Frequency Table: Relationships Between Research Methods and Findings Reported in the Compressed Workweek Literature
 Direction of change is indicated by (+) increased, (0) no change, and (-) decreased.

Direction of change -> Dependent Variables	Study Characteristics												Measurement							
	Design		Use of control			Relevant statistics			Standard		Informal(b)		+ 0 -	+ 0 -						
	O	XO	No Control	Control	Included(a)	Not Included	+	0	-	+	0	-								
Absenteeism (n=27)	1	3	3	4	15	1	1	3	2	2	6	4	3	10	5	3	10	1	2	6
Communication (n=11)	2	0	2	7	4	0	0	0	1	0	3	6	0	1	0	0	1	7	0	3
Costs (n=14)	2	0	4	1	0	8	2	1	2	3	1	6	0	0	4	N/A	N/A	N/A	N/A	N/A
Fatigue (obj) (n=2)	1	1	0	0	0	1	1	0	0	1	1	0	0	0	0	1	1	0	0	0
Fatigue (perc) (n=13)	2	0	3	4	1	3	5	1	6	1	0	4	0	5	2	0	1	1	0	2
Job Satisfaction (n=20)	5	2	1	10	0	2	10	1	0	5	1	3	8	1	3	7	1	0	11	0
Overtime (n=13)	2	0	2	2	1	6	3	0	6	1	1	2	3	0	5	2	1	3	N/A	N/A
Quality of Care(el) (n=16)	1	4	1	5	2	3	4	5	2	2	1	2	3	2	2	3	4	2	N/A	N/A
Quality of Care(perc)(n=1)	2	1	0	9	0	2	0	1	1	11	0	1	6	1	1	5	0	1	0	0
Recruitment (n=6)	1	0	0	5	0	0	6	0	0	0	0	0	0	0	4	0	0	N/A	N/A	N/A
Shift Satisfaction (n=25)	5	0	2	16	0	2	19	0	1	2	0	3	10	0	3	11	0	1	2	0
Turnover (n=15)	1	0	3	0	0	11	0	0	1	1	0	13	0	0	7	1	0	7	N/A	N/A
Well-being (n=3)	1	0	0	0	0	2	0	0	1	1	0	1	1	0	1	0	0	1	1	0
N=178	26	11	23	60	6	53	59	13	45	27	5	30	44	8	42	45	9	31	14	6
Column Totals	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179
Category totals	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179

(a) Findings listed under this heading provide the basis for the meta-analysis.

(b) Absenteeism is based on number of absent hours, if a study reported changes without qualifying days or hours the study has been entered under informal measurement.

(obj) objective data

(perc) perceptions

(el) elements

The number of studies reported in the frequency columns does not equal 'N' when the information was not reported or when data could not be categorized under the column heading.

direction of the findings that were used in the meta-analysis as well as findings that could not be converted to an r -index and Z -score. The measurement variable is subdivided into standard and informal measurements. Findings were coded as coming from standardized measurement tools when a recognized data collection tool was used. The findings were classified as coming from informal tools when (a) the description of objective data was incomplete or (b) the data collection tool was developed for the particular study without concerns for validity or reliability. The costs, overtime, quality of care (elements), recruitment, and turnover findings were based on objective data so were excluded from this analysis.

The sign test was used to calculate significance levels for findings reported in Table 4.15 and the resultant Z -scores were compared. There were no significant differences between findings reported in studies that employed a pretest:posttest design and studies that used a posttest design ($p = .4364$). The use of a control did not significantly alter study findings ($p = .1026$) nor were there significant differences between findings included in the meta-analyses and findings from studies that were not included ($p = .1635$). Significant differences were noted among findings from studies employing standardized measurement tools as opposed to informal tools ($p = .0009$).

The impact of measurement strategies on study findings was examined in greater detail. The sign test was used to calculate the significance levels for each dependent variable and the resultant Z -scores were compared. Significant differences were noted between the communication ($p = .0548$) and quality of care: perceptions ($p = .0384$) findings and insignificant differences were noted between the fatigue: perception ($p = .1314$), job satisfaction ($p = .0721$), shift satisfaction ($p = .1131$), and absenteeism ($p = .3377$) findings. The absenteeism data were classified as coming from informal measurement tools when the unit of change was not reported, for example, a report noting a 10% reduction in absenteeism without indicating whether the reduction was based on hours or days was coded as coming from an informal measurement tool.

The overall effect of measurement tools on findings included in the meta-analysis could not be determined. The type of measurement tool was not the source of variance in the communication and job satisfaction data. The communication data were homogenous and the job satisfaction data became homogenous following the removal of two findings, one from each type of tool. The impact of measurement strategies on the quality of care (perceptions) and shift satisfaction data could not be assessed. All measurements in the quality of care data came from informal tools and the source of variance within the shift satisfaction data was not identified.

There were some differences noted among the data subdivisions. For example, the communication findings included in the meta-analysis differed significantly from those that were excluded ($p = .0207$). The studies used in the meta-analysis tended to report a negative impact while the other studies reported a positive impact. Differences were also noted within the shift satisfaction data, the studies that used a control tended to report negative findings while studies that did not use a control reported positive findings ($p = .0008$). These differences make the combined communication results suspect and may point to reasons for the extreme variations within the shift satisfaction data.

Research Questions and Results

The findings from 180 hypotheses were used to determine the results for the first three research questions. The dependent variables and the number of hypotheses that were included in these analyses are listed in Table 4.16.

Table 4.16

Dependent Variables and Number of Hypotheses Included in the Assessment for Effects of Research Methods and Intervening Variables on Study Findings

Dependent Variable	Number	Dependent Variable	Number
Absenteeism	27	Quality of care (perceptions)	14
Shift satisfaction	25	Overtime hours	13
Job satisfaction	20	Communication	11
Quality of care (elements)	16	Recruitment	6
Turnover	15	Well-being (nurse)	3
Costs	14	Fatigue (objective)	2
Fatigue (perceptions)	14	Continuity of care	0

Research question 1. What relationships exist between research methods and findings reported in studies that have examined the impact of the compressed workweek on nursing practice?

There were no significant differences between findings reported in studies that employed a pretest:posttest design and studies that used a posttest design ($p = .4364$). The use of a control did not significantly alter study findings ($p = .1026$) nor were there significant differences between findings included in the meta-analyses and findings from studies that were not included ($p = .1635$). Significant differences were noted among findings from studies employing standardized measurement tools as opposed to informal tools ($p = .0009$). Studies employing informal measurement methods tended to report more increases, for example, increased job satisfaction, increased shift satisfaction, or increased fatigue than did studies using standardized tools.

Research question 2. What relationships exist between environmental factors and findings reported in studies that have examined the impact of the compressed workweek on nursing practice?

Research question 3. What relationships exist between operational factors, such as, 10-hour and 12-hours shift schedules, and findings reported in studies that have examined

the impact of the compressed workweek on nursing practice?

The second and third research questions were combined; thus, the focus became the impact of intervening variables, such as the length of the shift: 10- versus 12-hours; the location of the study: Unites States versus Canada; special care areas versus medical (adult and child), and surgical (adult and child) areas; and the composition of the sample: registered nurses versus other subject groupings.

There were no significant differences in findings reported between the United States and Canada ($p = .3745$), between the type of service ($p = .2611$) or between findings attributed to the composition of the sample ($p = .3483$). Significant differences were noted between findings reported in the 10- and 12-hour shift literature ($p = .0188$). The latter finding was not supported by the meta-analysis results.

Research question 4. What is the impact of the compressed workweek on: absenteeism; communication; continuity of care; costs; nurses' fatigue, job satisfaction, overtime hours, shift satisfaction, and well-being; quality of patient care; and recruitment and terminations/turnover of nursing staff?

The results for the fourth research question are based on 93 findings which included the statistics necessary to calculate an r-index and significance level. The dependent variables and the number of hypotheses that were included in the meta-analysis are listed in Table 4.17.

Table 4.17

Dependent Variables and Number of Hypotheses Included in the Meta-Analysis

Dependent Variable	Number	Dependent Variable	Number
Shift satisfaction	13	Quality of care (elements)	7
Job satisfaction	12	Turnover	7
Absenteeism	11	Communication	4
Costs	9	Recruitment	2
Fatigue (perceptions)	9	Well-being (nurse)	2
Overtime hours	8	Fatigue (objective)	1
Quality of care (perceptions)	8	Continuity of care	0

The meta-analysis results are summarized in Table 4.11 (p. 57). These results were supported by findings reported in studies that did not contribute to the meta-analysis ($p = .1635$). The results indicate that the compressed workweek has had the following impact on nursing practice:

1. Positive, significant effects on job satisfaction ($r = .181, p = .0038$); quality of care: elements ($r = .179, p = .0183$); quality of care: perceptions ($r = .176, p = .0000$); recruitment ($r = .511, p = .0000$); turnover ($r = .394, p = .0001$); and nurse well-being ($r = .196, p = .0322$).

2. Insignificant effects on absenteeism ($r = -.014, p = .4404$); costs ($r = -.078, p = .2946$); overtime ($r = -.017, p = .4207$), and communication ($r = -.034, p = .3446$). The communication findings may be suspect because of interactions between findings and intervening variables. The analyses of the communication data revealed significant differences between findings from standardized and informal measurement tools ($p = .0119$) and between findings included in and excluded from the meta-analysis ($p = .0207$).

Combined findings for fatigue, shift satisfaction, and continuity of care are not included in the results. The Chi-square tests showed that findings from the fatigue (perception) and shift satisfaction data were not comparable and there were insufficient data to measure continuity of care ($N = 0$) and fatigue (objective [$N = 1$]).

The presentation of the review's results is now complete. A discussion of the research method and the results as well as an examination of the implications of these results for nursing practice and future research will be considered in the next chapter.

CHAPTER V

DISCUSSION, CONCLUSIONS, AND IMPLICATIONS

The research method used in this study involved five steps: problem formulation, data collection, data evaluation, data analysis and interpretation, and written presentation. The first three steps and part of the fourth were presented in the preceding four chapters. The descriptions of the data collection, evaluation, and analysis were presented with little or no comment. At this point certain aspects of the research method warrant discussion. This discussion is followed by the interpretation of the study's findings. The interpretation includes a look at the findings in terms of (a) the rationale for introducing the schedule into hospital settings, (b) industry's experiences with the schedule, (c) other nursing literature reviews, (d) the conclusions from this study, (e) the implications for nursing practice, and finally (f) the recommendations for nursing research.

Research Method

The discussion in this section deals with the coding procedures, application of data rejection criteria, weighting of studies, and validity of the method.

Coding procedures. For the purpose of this discussion coding procedures include the selection of relevant studies, development and use of the coding form and directions, and calculation of effect size statistics.

In spite of having preset selection criteria (p. 44) the selection of relevant studies from the material collected during the literature search was not a simple, objective activity. First, the dependent variables were not always clearly defined. The lack of definitions

meant that the decision to include or exclude a given study was often based on the coder's intuition. This factor may account for some of the heterogeneity within the aggregated data. Second, a similar situation occurred when the coder had to determine whether a dependent variable had been measured. For example, when a hospital or nursing journal reported that implementation of the compressed workweek resulted in a 10% decrease in overtime hours, the coder had to decide whether this data was admissible. This type of data were included when the author was named; however, such data had to be excluded from a portion of the analysis as an effect size could not be calculated.

The Nurse Staffing Framework (Young et al., 1982) was used to identify the input, intervening, and outcome variables that were included on the coding form. Unfortunately, the section of the form used to gather the demographic data of subjects did not correspond to the demographic data presented in the studies. This meant that the information could not be coded without major revisions to the data collection tool. In that the research questions did not require the data this portion of the tool was not revised.

The decision to use the study as the unit of analysis combined with an attribute of the coding form meant the impact of certain study characteristics could not be studied. For example, the impact of the time interval between implementation and evaluation of the schedule on study findings could not be assessed. The reasons for this are rather complex and can best be explained in point form. First, the fact that each study had only one input per dependent variable meant that when more than one measurement was made the data entry was either an average of the figures or the value assessed as the most accurate. Thus, the impact of time interval on findings within each study was lost. Second, the time interval between measurement and implementation of the compressed workweek was recorded on the face sheet of the coding form rather than with each dependent variable. Unfortunately, the time interval was not always the same for each variable studied; thus, the coded data was not accurate. Third, when an article reported two evaluations of the compressed workweek the report did not always include two measurements for each

variable. The coding procedure did not provide a means for coding this type of information; therefore, the coded data was not consistently accurate.

The situation described in the previous paragraph could have been prevented if: (a) individual study findings had been used as the unit of analysis rather than the study, and/or (b) the time interval had been coded with each dependent variable rather than on the face sheet.

The calculation of effect sizes and Z-scores was complex and time consuming. The activity was made more difficult by the investigator's decision to use the r-index as the effect size after the studies had been coded. The reasons for selecting the r-index were (a) the data needed to calculate r were more readily available than the data needed to calculate other effect sizes and (b) no adjustments had to be made when r was calculated from t-values based on correlated or independent data.

In brief, the calculation of effect sizes was complex and time consuming because: (a) the decision to use the r-index meant that additional data had to be coded, (b) the variety of statistics reported in studies meant that a variety of formulae had to be used to calculate effect sizes, and (c) the statistics needed to calculate an effect size were frequently missing from reports and occasionally when the necessary statistics were available the direction of change was not clearly stated.

The difficulties caused by missing statistical data cannot be controlled by a reviewer but the difficulties created by the remaining two factors could have been minimized by: (a) selecting the effect size statistic prior to coding the studies, and (b) including a list of formulae needed to calculate effect sizes in the coding instruction sheet. The formulae used for calculating the r-index were included in the revised instruction sheet (Appendix D).

Application of data rejection criteria. The data evaluation phase of this research method required that coded data be assessed to determine the data's inclusion or exclusion from the study. Coded data which were not relevant, erroneous, discordant, and/or

originated from invalid research methods were to be excluded. In actual fact, the evaluation of data in terms of relevance and accuracy was done during the coding procedure. The relevance of data, assessed in terms of the fit between definitions of variables in the review and a particular study, and accuracy could best be identified within the context of a given study rather than in isolation. Calculation errors were found in one study. Fortunately, the study included the raw data necessary for recalculating the means and standard deviations. The corrected findings were included in the meta-analysis.

Weighting of studies. The original weighting schemes were based on sample size, variance within study findings, and then on both sample size and variance. The strong relationships between the r-index and variance made the latter two weighting schemes inappropriate so both were excluded from the reported findings.

The use of sample size as the weighting factor gave more power to findings from larger studies. The resultant effect sizes and significance levels were smaller and less significant than findings from the corresponding unweighted values which suggests that small sample size has had an effect on study findings.

Validity concerns. A detailed discussion of criticisms and validity concerns commonly attributed to quantitative literature reviews was given in Chapter III. These criticisms and their significance to the present study are summarized below:

Criticism 1. The comparison and aggregation of studies that use different definitions of variables, subjects, and measurement techniques cannot result in logical conclusions.

The variables in this study were assigned definitions that were broad enough to include variables from other studies. The paucity of variable definitions in the group of studies included in the review is worth noting. As a general rule the variables included in these were well defined while other reports rarely included such definitions. There were many variations among subjects included in the study samples. These differences were considered appropriate because the differences meant the impact of the compressed workweek could be examined in terms of nurses working in different service areas and

hospitals. The differences in subjects also supplied a broader base from which to study the impact of the work schedule as findings from nurses, patients, physicians, and support services were included in the analyses. The results from this study indicate that the differences among findings were not attributable to subject groupings ($p = .3483$).

Some investigators have argued that different measurement tools measure different facets of a given variable; thus, the aggregation of findings from a group of studies can produce noteworthy results. The quality of care (elements) and costs results from this study may have benefited from the use of different measurement tools. However, the tendency to develop and use different tools without adequately defining the variables under study means that the aggregated findings based on subjective data are of little or no value. The differences reported in this study between findings from informal and standardized measurement tools ($p = .0009$) highlight this problem. The absenteeism, overtime, recruitment, and turnover findings are based on objective data and similar measurement strategies; hence, are not suspect.

Criticism 2. Meta-analyses are conducted on data which included multiple results from the same study; this results in the use of nonindependent data and provides a mistaken impression of the reliability of the findings.

The analysis of findings for each dependent variables was based on the study as the unit of analysis; therefore, the data are independent. However, the aggregation of findings from the dependent variable analyses to calculate the impact of the compressed workweek on: (a) absenteeism, costs and overtime hours ($r = .0366$, $p = .2483$); (b) quality of care: elements and perceptions ($r = .178$, $p = .0000$); and (c) recruitment and turnover ($r = .455$, $p = .0000$) are suspect. These results are based on study findings as the unit of analysis; therefore, may be based on nonindependent data.

Criticism 3. Meta-analyses results may fall victim to selection bias.

The impact of selection bias was minimized by the literature search strategy (described on pages 37-39). One possible source of bias may exist if investigators have not published changes in reported results. For example, if an institution tested and adopted the

compressed workweek and later found the schedule unsatisfactory, the latter result may have gone unpublished. A second possible source for bias may be attributed to the geographical source of studies. The meta-analysis included hypotheses from seven studies done in Alberta. Each of the seven studies was written in a different year and completed by different investigators. Four studies came from Calgary and 3 from Edmonton. The descriptions of the studies from both cities are remarkably similar: a thesis (both sets of results have been published) and an unpublished report originated from each city and two articles originated from Calgary and one from Edmonton. The sign test, done on all hypotheses included in the review, did not support the existence of a geographical bias. A third potential source for bias may be attributed to the availability of studies. Many hospitals have studied the impact of the compressed workweek and some of these studies were never written up and others are not available; if this is the case the representativeness of the literature included in this review can be questioned.

Criticism 4. Meta-analyses fails to pay attention to the quality of research studies included in the analysis.

There seem to be differences in opinions among meta-analysts regarding inclusion of findings from poor quality research in a meta-analysis. Glass (1982) claimed that there is seldom more than one tenth of a standard deviation difference between average effect sizes for high and low validity experiments. Other authors have argued that a sample of studies can share a common bias (Bangert-Drowns, 1986; Bryant and Wortman, 1984; Jackson, 1980). When such a bias exists, the impact of the bias on study findings cannot be assessed. Therefore, when a body of research contains few well-designed studies the impact of the methodological quality on findings may go unnoticed.

The number and design of studies relevant to this study dictated that quality of research could not be used as a criterion for admission into the review. If the arguments presented by Bangert-Drowns, Bryant & Wortman, and Jackson are true the Chi-square tests for homogeneity would not identify differences among findings attributable to

research quality. For this reason the sign test was used on aggregated findings from studies employing: pretest/posttest design versus posttest design and studies using a control versus no control. The tests indicated that there were no significant differences among findings ($p = .4761$ and $.1026$ respectively).

A Comparison between the Findings from this Study and the Rationale for Introducing the Compressed Workweek into Hospital Settings

The trends that have influenced hours of work and the reasons given by hospitals and nurses for implementing the compressed workweek schedule were presented in Chapter II. The purpose of the present discussion is to examine the findings from this study in light of that discussion. Accordingly, the expectations of hospitals and nurses are outlined in Table 5.1 and a review of the trends is summarized in Figure 5.1. The data in Table 5.1 is a synopsis of material presented in Table 2.2 (pages 19 - 20) and the trends were referenced previously (see pages 12 - 13).

There are similarities between the expectations of nurses and the worker attitudes outlined in Figure 5.1. The fact that nurses wanted longer blocks of time, alternate weekends, and consecutive days off may point to an increased interest in leisure activities. These demands combined with an expressed interest in being able to plan in advance for nonwork activities shows that nurses, like other workers, may be less loyal to the work organization in that they are less willing to subordinate their personal lives to their jobs, and are expecting a greater voice in decisions affecting their work lives. The point to be made is that these attributes were largely responsible for introducing changes to work schedules in the past; thus, will undoubtedly continue to be a force in the future.

Table 5:1

The Expectations of Hospitals and Nursing Staff Regarding the Impact of the Compressed Workweek on Scheduling of Work Hours, Staffing, and Morale or Job Satisfaction

Effect of CWW on:	Hospitals' Expectations	Nursing Staffs' Expectations
1. Scheduling work hours	Same number and mix of staff 7 days a week. More staff available during peak work periods. Decrease in use of overtime. Resolve shift scheduling difficulties.	Longer blocks of time off. Alternate weekends off. Consecutive days off. Prevent 8 and 9 day work stretches. Allow nurses to plan in advance for nonwork activities. Fewer rotations, provision for rest periods between rotations. Safer traveling hours.
2. Staffing	Reduce turnover. Aid in recruitment. Reduce need for/increase availability of, relief staff. Improve productivity. Alter use of sick time.	
3. Morale/Job satisfaction	Increase job satisfaction, Improve morale.	Increase job satisfaction, Improve morale.

The comparison of the findings from this study with nurses' expectations of the compressed workweek may not be appropriate as this study did not examine the literature in terms of specific worker expectations. However, there are indications in both the shift and job satisfaction data that nurses who worked the compressed workweek were happier with their work schedule. Even though the shift satisfaction data were not homogenous the fact that 10 of the 13 effect sizes were positive shows that nurses who worked the schedule were happier than they had been with the traditional work pattern. In addition, the findings show that the compressed workweek has had a significant positive impact on job satisfaction. This finding is congruent with both hospitals' and nurses' expectations.

A comparison of hospitals' reasons for implementing the compressed workweek (Table 5.1) with industry's needs (Figure 5.1) shows that the two are similar, although the major focus of hospitals was toward efficiency and productivity rather than improved

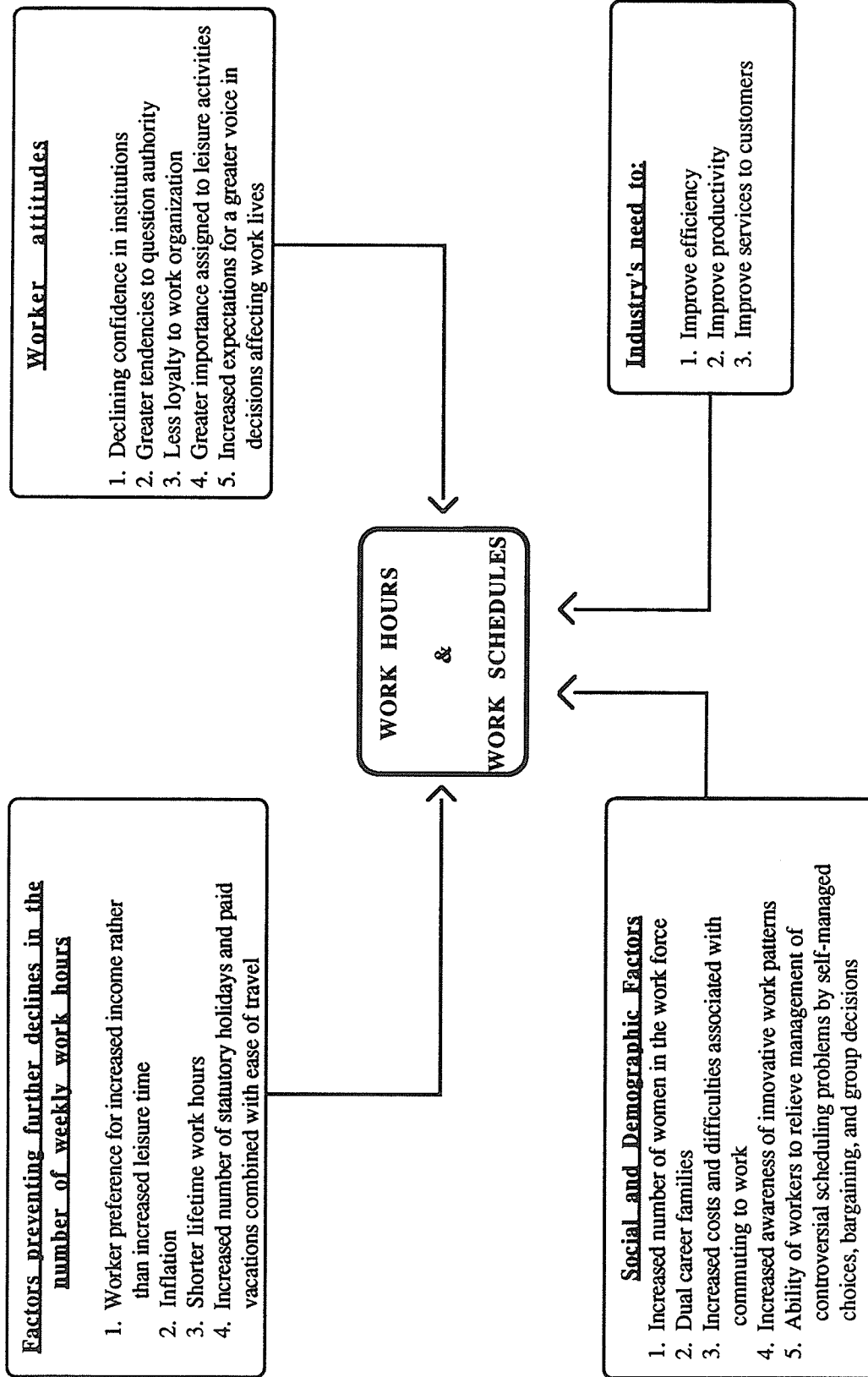


Figure 5.1: Factors Influencing Hours of Work and Work Schedules

services to their patient populations. The findings from this study indicate the introduction of the compressed workweek has significantly reduced turnover, improved job satisfaction, and may have had a positive impact on recruitment. Interestingly, the findings show that the schedule has had very little impact on overtime or absent (sickness) hours.

This study did not examine the impact of the compressed workweek on (a) the number and mix of staff over a 7 day period, (b) the availability of staff during peak work periods, nor (c) the use of relief staff. However, the small, insignificant, decrease in overtime hours and data in the cost analysis point to a decrease in the use of relief staff following the introduction of the work schedule.

A Comparison between the Findings from this Study and the Experiences of Industry

The Work in America Institute (1981) documented experiments with work schedules in industry. The Institute summarized the positive and negative consequences associated with use of the compressed workweek. These attributes were discussed in Chapter II and are summarized in Figure 5.2.

The findings from this study indicate that the experiences of industry and health care institutions are similar. The health care research has not addressed the impact of the compressed workweek on the community nor has the research identified the negative consequences to the employer or employee. The Work in America Institute found the schedule was responsible for a reduction in costs attributable to increased productivity and to better use of equipment. The findings from this study indicate hospitals have incurred small, insignificant reductions in costs attributable to more efficient use of staff, decreased use of overtime, decreased absenteeism, and decreased turnover.

Industry experienced some interfacing and coverage problems following the introduction of the compressed workweek. These difficulties occurred when the work

and operation schedule did not fit. None of the research included in the present study investigated the fit between work and operation. There are references to supervision

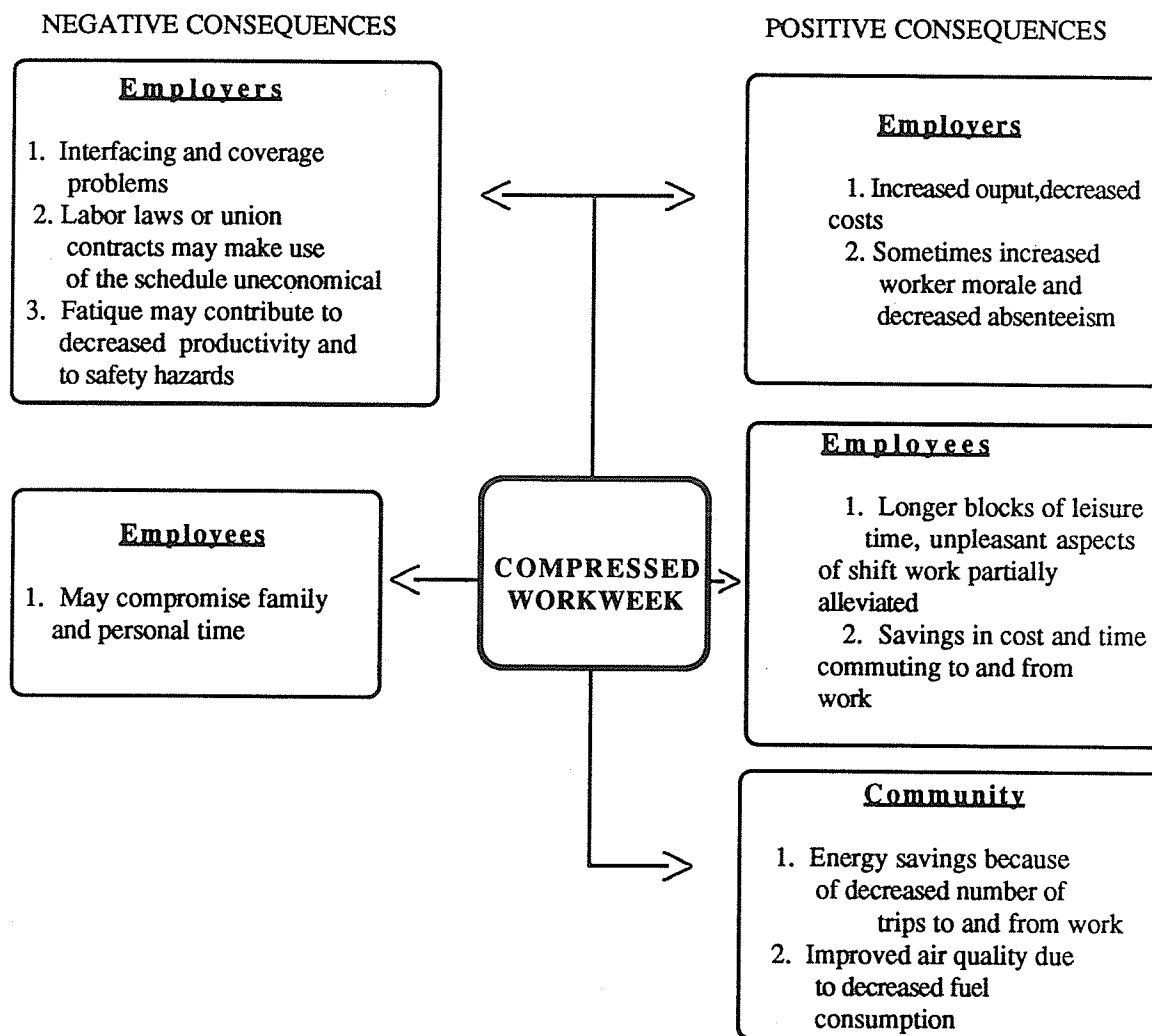


Figure 5.2: The Consequences of the Compressed Workweek to Employers, Employees, and the Community (based on data from the Work in America Institute, 1981).

difficulties when the head nurse participated in the compressed workweek schedule. These difficulties seemed to dissipate when the head nurse returned to the traditional work pattern. A comparison between head nurses' roles and the performance of those roles on units employing the traditional and compressed workweek and/or objective measurements

of continuity of care on such units would indicate whether interfacing and coverage problems are a consequence of the compressed workweek.

The role of nursing unions and/or labour laws in preventing or promoting the use of the compressed workweek is beyond the scope of this study; hence, the experiences of industry and hospitals were not be compared.

Industry has reported that fatigue may affect productivity and safety. There are little data in the hospital literature to support or refute this claim. The existing data point to an improved quality of care. This fact combined with the insignificant decrease in costs suggests that productivity has not been compromised. Several studies used the number of medication errors and/or incident reports to measure the impact of the compressed workweek. There were no indications in this data that the schedule has had a detrimental effect on patient or staff safety. Questions can be raised regarding the use of medication errors as indicators of nurse fatigue. These errors are generally identified and reported by nurses and if nurses are suffering from fatigue such errors may go unnoticed.

The benefits of the compressed workweek to employees in industry and the health care system are similar. A comparison of negative consequences is made difficult because the negative consequences to nursing staff are not readily discernable. Nurses who do not want to work the schedule tend to work in areas where the traditional work pattern is in place; thus, their feelings and or experiences with the schedule have generally not been noted. This tendency can be seen in the shift satisfaction data (Table 4.8, p. 59) and in Table 4.15 (p. 68) where study findings are clustered according to research method. The shift satisfaction data in Table 4.8 (N = 13) show 9 of 10 studies that did not use a control and 1 of 3 studies that used a control reported increased shift satisfaction among nurses who worked the compressed workweek. Similarly, the data in Table 4.13 show 19 of 20 studies that did not use a control and 2 of 5 studies that used a control reported increased shift satisfaction. The opposing trend in findings from studies that used and studies that did not use a control points to a bias in the data favouring the compressed

workweek. The existence of this bias, based on sample selection, may have precluded the collection of negative data.

A Comparison between the Findings from this Study and the Conclusions of other Nursing Literature Reviews

There are no quantitative literature reviews of the compressed workweek in the nursing literature; however, there are two narrative reviews that examined the impact of the compressed workweek on nursing practice.

Young et al. (1981), in a review of modified workweek schedules, indicated that the number of personnel needed, absenteeism, overtime, turnover, staff fatigue, tension, quality of care, and continuity of care needed to be studied in greater depth. The findings from this study show that research has been done in some of these areas; for example, absenteeism (Number of hypotheses [N] = 27), overtime (N = 13), turnover (N = 15), and quality of care (N = 16). However, there are indications that some of the deficiencies persist. Virtually no research has been done on nurse fatigue (N = 2), continuity of care (N = 0), and nurse well-being (N = 2).

Young et al. also indicated that much of the literature included in their review focused on the impact of workweek innovations on staff satisfaction. This trend seems to persist as the findings from this study included 25 hypotheses related to shift satisfaction, 20 to job satisfaction, and 14 to perceived fatigue. In other words, 59 or 32.38% of the 180 hypothesis included in the present study focused on staff satisfaction.

Jensen (1986), in a review of 39 papers, concluded that the compressed workweek was popular with nurses; increased job satisfaction; did not affect the quality of care; and resulted in decreased absenteeism, turnover, and costs. Jensen's findings are similar to those of the present study but there are some subtle differences. This study noted that absenteeism and costs decreased, however, these decreases were small and insignificant.

In addition, the findings from this study point to significant improvements in patient care while Jensen found no change.

Jensen commented on the lack of well defined concepts and scientific measurement in the compressed workweek literature. These two points also emerged in the present study. The lack of clearly defined variables was identified during the discussion of coding procedures (p. 75) and validity concerns (p. 78). The statistical analysis demonstrated that measurement strategies were responsible for differences among study findings. These two findings support Jensen's call for well defined concepts and more scientific measurements in future research.

Conclusions

The findings of this study lead to the conclusions that:

1. The compressed workweek has had a positive impact on nursing practice. The schedule does not incur increased costs, indeed there may be savings associated with decreased absenteeism, overtime hours, and turnover. In addition, the quality of care and the nurses' level of job satisfaction may improve.
2. Virtually no research has used objective data to compare the impact of traditional and compressed workweek schedules on continuity of care or on nurses' fatigue and/or health. The reason for this void may be related to the complex nature of the variables and a corresponding lack of research on the concepts. In addition, very little research has measured the impact of 10-hour shifts on the quality of patient care.
3. The combined research findings do not ascribe negative consequences to compressed

workweek schedules. This lack of negative data may be attributed to the variables included in this study, variables studied in the literature, and a sample selection bias within some research.

4. The experiences of industry and hospitals with scheduling work hours appear to be comparable which suggests that nurses and/or hospitals should be looking outside their traditional body of literature for new ideas, methods of dealing with work scheduling problems, as well as for trends which may have an impact on the work place.

6. The research method used in the present study provided a means to summarize findings from the compressed workweek literature; however, this approach failed to provide a means to describe the innovations that have been used with this type of scheduling.

7. The final conclusion deals with a technical detail within meta-analytic procedures. Smith and Glass (1977) chose to use findings rather than the study as the unit of analysis because they opted to sacrifice statistical purity rather than to lose valuable information. The present study used the study as the unit of analysis. The investigator did not understand the significance of Smith and Glass remarks until the difficulties that seemed to be associated with the coding procedures were analyzed (see page 68-70). The final conclusion is that there is a price to be paid when either the study or the findings are chosen as the unit of analysis; hence, an investigator needs to clearly define the purpose for the research before deciding which is more important: statistical purity or information. In that the major purpose for this study was directed at combining the findings the loss of information was not problematic.

Implications for Nursing Practice

The findings from this study have two major implications for nursing practice.

1. The compressed workweek is an economical and viable solution for work scheduling problems when the attributes of the schedule meet the needs of the hospital and the nurse.
2. The second implication is related to the lack of research on two, possibly three variables. The research from industry has noted that coverage problems and increased worker fatigue, which has an impact on safety concerns, may be consequences of the compressed workweek. There is little research on either of these variables in the hospital-based compressed workweek literature.

Within the hospital framework continuity of care is a 'coverage' factor and as such is accepted as an important aspect of patient care. There seems to be some confusion over the definition of this term. Part of this confusion may relate to different types of patient needs, for example, the attributes of the concept 'continuity of care' for a patient on a coronary care unit for three days may well differ from those of a patient on a mental health unit for 25 days. In addition, the role of an individual nurse and the role of the written care plan as attributes of continuity of care need to be clarified.

Interestingly, most of the quality of care findings used in this study came from quality assurance measurements. Many of these measurements contained a chart audit component which is based on the assumption that recorded nursing interventions have been done and those that were not recorded were not done. The significant improvements noted in the quality of care provided on the compressed workweek units may reflect the need to communicate nursing activities rather than an actual improvement in care. In other words the quality of care findings in the present study may reflect efforts directed at promoting continuity of care.

As mentioned previously, there is virtually no research that has evaluated and compared nurse fatigue and/or health from traditional 8-hour and compressed workweek schedules. This lack of research could be problematic to both nurses and hospitals because of the increased frequency of litigation. Three Ontario coroner's reports have implicated the 12-hour shift in cases of accidental death. This led the Ontario Nurses' Association and the Registered Nurses Association of Ontario to hire a research consultant to conduct an extensive review of the compressed workweek literature. Jensen (1986) completed the review and made the following comment regarding the coroner's reports: "...there is no evidence in these write-ups of any relationship between the death and the hours worked by nurses, In fact, all of the deaths occurred within seven hours of the start of the shift" (p. 2). The fact that the 12-hour shift was implicated in these accidental deaths without any supporting evidence suggests that nurses and hospitals would profit from research that examined work schedules in terms of nurse fatigue and safety hazards.

The point to be made is that nurses have a role to play in protecting their own and their patients' welfare; therefore, they have to assume responsibility for the acquisition of knowledge related to the impact of work schedules on continuity of care, nurse fatigue and health, and ultimately patient safety.

Recommendations for Future Research

1. The meta-analytic approach to research could be used to glean additional information from the studies included in the present review. The compilation of (a) demographic data of nurses working the compressed workweek, (b) the positive and negative consequences of the compressed workweek to the employee and employer, and (c) the inputs and intervening variables commonly addressed and/or ignored by researchers would be of interest to nurses, hospitals, and investigators.

The demographic data would provide a useful description of nurses who choose to

work the compressed workweek schedule. The information would shed light on the impact of the schedule on the employment of nurses over 40 and on nurses with pre-school and school age children. If the older nurses or nurses with children are not working this schedule other scheduling methods such as the traditional 8-hour pattern, part time work, flexible scheduling, and /or task assignment could be used along with the compressed workweek to recruit such nurses into the hospital work force.

This study has failed to identify any negative consequences attributable to the compressed workweek. Possibly, the defining and subsequent analysis of data from different variables, such as head nurse supervision, continuing education, use of relief staff, and nurse autonomy would lead to the identifications of such consequences. On the other hand, the negative impact of this schedule might better be identified using a content analysis approach as the paucity of statistics makes the value of the meta-analytic approach questionable. This alternative approach would supply information as to where the negative consequences might exist and provide a base from which suggestions for further research could be made.

Much of the research included in this review looked at the changes associated with implementing the compressed workweek without considering other variables that may have influenced study findings. A compilation of the intervening variables and inputs that are commonly included in these studies would determine what relationships between findings and research methods and intervening variables could feasibly be studied. Such information could also be used to identify areas that have been ignored, for example, the present study could not examine the impact of the educational preparation of head nurses and/or staff nurses on the quality of care (objective) because the studies did not included the data.

2. Nursing needs to attend to both the methodological rigor of research and to the quality of the written presentation of that research. Variables need to be defined, scientific

measurements tools need to be developed, and sample selection procedures need to be evaluated. Research reports should include variable definitions, describe the intervening variables that had an impact on study findings, and provide the statistics necessary for calculating effect sizes.

Generally, the reports in this review did not supply definitions for the dependent variables. This omission decreased the accuracy of the review and indeed was responsible for wasted effort as data from the communication, fatigue (perceptions), quality of care (perceptions), and shift satisfaction analyses had to be discarded.

While some reports failed to provide any statistics many reports stated that a variable increased or decreased by a given percentage. This figure is of no value unless the number in the sample is clearly articulated. The reports also must clearly state the direction of results. This omission is particularly frustrating to the meta-analyst when authors include the statistics necessary for calculating an effect size, then report an insignificant change without indicating the direction of that change.

The lack of attention to intervening variables was mentioned previously. If the research on the impact of the compressed workweek had included information such as the educational level of nurses the interaction between the nurses' education and study findings could have been examined. Such analyses could demonstrate differences/ lack of differences in costs or quality of care attributable to the level of nurse education. This information would be a valuable contribution to nursing knowledge. The major point is that research findings can be compared and combined and interactions which were not part of the primary researcher's purposes can be studied. These interactions can only be studied when the intervening variables (Figure 1.1, p. 5) are described. If research employed conceptual or organizing frameworks common intervening variables would not go unnoticed and their impact on aggregated findings could be studied.

3. The cultural trends in North America dictate that changes in working patterns will

continue. Thus, hospitals and nurses will have to continue monitoring their respective needs in conjunction with the health care needs of the community. Innovations in the scheduling of work hours and evaluations of those innovations can result in improved nursing practice. The findings from this study suggest that researchers should: (a) investigate the impact of the compressed workweek on (i) continuity of care, (ii) nurse fatigue, (iii) communication, (iv) nurse well-being, (v) nurse recruitment; (b) develop, test, and use reliable measurement strategies; and (c) design studies using control groups (especially important for the collection of subjective data). Further, researchers must be cognizant of and investigate possible disruptions in assigned work when work schedules are altered.

REFERENCES

- Alivizatos, M.S. (1981, February). A new concept in scheduling for nurses. Supervisor Nurse, 20-22.
- Arnold, B. & Mills, M.E. (1983, July, August). Core-12: Implementation of flexible scheduling. The Journal of Nursing Administration, 9-14.
- Bajnok, I. (1975). A comparison of the quality of care provided by registered nurses working the twelve-hour shift and those working the eight-hour shift in a large general hospital. Unpublished master's thesis, University of Western Ontario, London, Ontario.
- Bajnok, I. (1975). It's good for nurses but is it good for patients? Hospital Administration in Canada, 17(10), 25-26.
- Bangert-Drowns, R.L. (1986). Review of developments in meta-analytic method. Psychological Bulletin, 99(3), 383-399.
- Bauer, J. (1971, November-December). Clinical staffing with a 10-hour day, 4-day work week. Journal of Nursing Administration, 1, 12-14.
- Beach, L.L. (1986, January-February). Design and implementation of a ten-hour work schedule for an ED nursing staff. Journal of Emergency Nursing, 12(1), 30-34.
- Blanchflower, S. (1986, March). Alternative rota systems. Nursing Times, 82(10), 55-58.
- Boyarski, R.P. (1976, July). Nursing workweek equalizes shifts, time off. Hospital Progress, 36-45.
- Bryant, F.B. & Wortman, P.M. (1984). Methodological issues of quasi-experimentation. In W.H. Yeaton & P.M. Wortman (Eds.) Issues in data synthesis, pp. 5-24. San Francisco: Joney-Bass.
- Burrow, E., & Leslie, E. (1972, July). The 4-day, 40-hour week one year later. Hospital Progress, 53(7), 33-41.
- Cales, A. D. (1976). Twelve hour schedule experiment. Supervisor Nurse, 7(6), 71-76.
- Cleveland, R.T., & Hutchins, C.L. (1974, August). Seven days' vacation every other week. Hospitals, 48, 81-85.
- Cohen, A., & Gadon, H. (1978). Alternative work schedules: Integrating individual and organization needs. Massachusetts: Addison-Wesley..
- Colt, A., & Corley, T. (1974, February). What nurses think of the 10-hour shift. Hospitals. Journal of the American Hospital Association, 48, 134-142.

- Cooper, H.M. (1984). The integrative research review: A systematic approach. Beverly Hills: Sage.
- Crump, C. K. (1974). The twelve-hour shift in nursing services. The University of Western Ontario, School of Business Administration, Working paper series number 112, London, Ont.
- Crump, K. C., & Newson, P. (1975). Implementing the 12 hour shift: A case history. Hospital Administration in Canada, 17(10), 20-24.
- Curlette, W.L., & Cannella, K.S. (1985). Going beyond the narrative summarization of research findings: the meta-analysis approach. Research in Nursing and Health, 8, 293-501.
- Curtis, R. A. (1982). The effectiveness of an eight hour/ten hour day shift rotation. AANNT Journal, 9(5), 11-14.
- Davis, C. (1982). Evaluating the 12-hour shift schedule. Dimensions Health Services (Canada), 59(6), 30-31, 33-34.
- Deans, J.H., & McSwain. (1972, June), Nurses have more time on, more time off with seven-day week scheduling. Modern Hospital, CXVIII, 107-108.
- DeMarsh, K.G., & McLellan, E.I. (1971, November). Nurses sold on shortened work week. Canadian Hospital, 48, 64-66.
- DeMarsh, K.G., & McLellan, E.I. (1972, January). The seven-day fortnight. The Canadian Nurse, 37-38.
- DeMarsh, K.G., & McLellan, E.I. (1972, October). The 7-day fortnight--18 months after. Hospital Administration in Canada, 14(10), 33-34.
- Eaton, P., & Gottselig, (1980, August). Effects of longer hours, shorter week for intensive care nurses. Dimensions in Health Service, 57,(8), 25-27.
- Eaves, D. (1985, April 3). Where the 12-hour shift works. Nursing Times, 81(14), 34-36.
- Eysenck, H.J. (1978). An exercise in mega-silliness. American Psychologist, 33, 517.
- Farrington, M.M., & Perla, G. (1971, October). The 4-day week in nursing service. Supervisor Nurse, 2, 63,66-71.
- Feichtel-Pascuzzo, S.A. (1981). The 12-hour day. Nursinglife, 1 (3), 56-59.
- Fortin, A. (1973). Extended day in critical care unit. Canadian Nurse, 69(4), 4-5.
- Fraser, L.P. (1972, September, October). The reconstructed work week: One answer to the scheduling dilemma. The Journal of Nursing Administration, 12-16.
- Ganong, W.L., Ganong, J.M., & Harrison, E.T. (1976). The 12-hour shift: Better quality, lower cost. Journal of Nursing Administration, 6, 17-29.
- Glass, G.V. (1976, November). Primary, secondary, and meta-analysis of research. Educational Researcher, 3-8.

- Glass, G.V. (1977). Integrating findings: The meta-analysis of research. In L.S. Shulman (Ed.), Review of research in education, 5, pp. 351-379.
- Glass, G.V. (1982). Meta-analysis: an approach to the synthesis of research results. Journal of Research in Science of Teaching, 19(2), 93-112.
- Glass, G.V. & Smith, M.L. (1978). Reply to Eysenck. American Psychologist, 33, 517-519.
- Glass, G.V., McGaw, B., & Smith, M.L. (1981). Meta-analysis in social research. Beverly Hills: Sage.
- Green, B.F. & Hall, J.A. (1984). Quantitative methods for literature reviews. Annual Review of Psychology, 35, 37-53.
- Hameed, S.M.S. (1974). Four day, 32 hour work week. In S.M.A. Hameed & G.S. Paul (Eds.), Three or 4 day work week (pp.7-30). Edmonton: University of Alberta, Faculty of Business Administration.
- Harrison, E.T. (1974). A study of of the twelve-hour nursing shift. Unpublished master's report, Duke University.
- Hedges, J.N. (1971, October). A look at the 4-day work week. Monthly Labor Review, 33-37.
- Hedges, J.N. (1973, February). New patterns for working time. Monthly Labor Review, 3-8.
- Hibberd, J.M. (1972). Compressed work week for nursing staff: A field experiment. Unpublished master's thesis, The University of Alberta, Edmonton, Alberta.
- Hibberd, J. M. (1973, January). 12-hour shifts for nursing staff: A field experiment. Hospital Administration in Canada, 15, 26-30.
- Hoffman, T., & Fischer, S. (1983). Weekend scheduling: The 12-hour shift. Dimensions Critical Care Nursing, 2(3), 171-173.
- Jackson, G.B. (1980). Methods for integrative reviews. In R.J. Light (Ed.), Evaluation Studies Review Annual, Volume 8 (pp.133-155). Beverley Hills: Sage.
- Jelinek, R.C., Dennis, L.C., Schwarzmann, J.F., & Luskin, D.B. (1976). A review and evaluation of nursing productivity. (DHEW Publication No. HRA 77-15). Bethesda, MD: U.S. Department of Health, Education, and Welfare.
- Jennings, E.M. (1981). Shift work and well-being. Unpublished master's thesis. The University of Calgary, Alberta.
- Jennings, E.M., & Rademaker, A.W. (1987). Eight- and twelve-hour shifts and well-being among hospital nurses. Nursing Papers, 19(1), 31-44.
- Jensen, P.M. (1986). A review of the literature on the 12-hour shift for nurses. Unpublished manuscript.

- Jones, J.J., & Brown, R.M. (1986, May). A survey of the 12-hour nursing shift in 25 North Carolina hospitals. Nursing Management, 17(50), 27-28.
- Kellman, D. (1983). The ten-hour schedule. Nursing Management, 14(2), 58-62.
- Kent, L.A. (1972). The 4-40 workweek on trial. American Journal of Nursing, 72(4), 683-686.
- Larsen C.A. (1973). A four-day week for nurses. Nursing Outlook, 21(10), 650-651.
- Libre, E. (1975). The good & bad of 12-hour shifts. RN, 38(9), 47-52.
- Maric, D. (1977). Adapting working hours to modern needs. Geneva: International Labour Office.
- McGillick, K. (1983). Modifying schedules makes jobs more satisfying. Nursing Management, 14(12), 53-55.
- Meier, P., & Todd, C. (1983, May, June). Four-day, forty-hour workweek for neonatal intensive care nurses. JOGN, 12(3 Suppl), 89s-95s.
- Melzer, J.I. (1974). Longer daily hours: For how long? In S.M.A. Hameed & G.S. Paul (Eds.), Three or 4 day work week (pp.31-40). Edmonton: University of Alberta, Faculty of Business Administration.
- Metcalf, M.L. (1982). The 12-hour weekend plan - Does the nursing staff really like it? Journal Nursing Administration, 12(10), 16-19.
- Metsasalu, T., & Harrison, G.F. (1971, November). The shortened work week: Canadian trend or a fad? The Canadian Personnel, 19(6), 17-23.
- Mills, M.E., & Arnold, B. (1983). The impact of 12-hour scheduling on recruitment and retention. Focus on Critical Care, 10(6), 37-41
- Mills, M.E., Arnold, B., & Wood, C. M. (1983). Core-12: A controlled study of the impact of 12-hour scheduling. Nursing Research, 32(6), 356-361.
- Minor, Sister Mary Ann, & Heldstab, Betty. (1971, July). 10- and 6-hour nursing shifts solve staffing problem. Hospital Progress, 52, 62-63, 66.
- Niemeier, D., & Healy, S. (1984). The 12-hour Shift: Is it viable? Nursing Outlook, 32(4), 193-196.
- Nollen, S.D. (1979). New patterns of work. Scarsdale, NY: Work in America Institute.
- Nollen, S.D. (1982). New work schedules in practice: Managing time in a changing society. New York: Van Nostrand Reinhold.
- Northrup, H.R., Wilson, J.T., & Rose, K.M. (1979). The 12-hour shift in the petroleum and chemical industries. Industrial and Labor Relations Review, 32(3), 312-326.
- Nursing staff of the intensive care and renal units. (1974, July, 1975, April). Trial of the extended work day. Unpublished report, Foothills Hospital, Calgary, Alberta.

- Pierce, P.S., Hoffman, J.L., & Pelletier, L.P. (1974, Feb.). The 4 day work week versus the 5- day work week: Comparative use of sick time and overtime by direct-care personnel in an institutional facility for the severely and profoundly retarded. Mental Retardation, 12, 22-24.
- Poor, R. (Ed.). (1970). Four days, 40 hours: Reporting a revolution in work and leisure. Cambridge: Bursk and Poor.
- Prendergast, M.B., Foxen, M.B., Leonard, J.L., Todd, S.E., & Shiro A.G. (1986, March- April). An analysis of the implementation of a 10-hour day framework for staff education. Journal of Continuing Education in Nursing, 17(2), 54-58.
- Price, C.A. (1984). The 12-hour Shift: Is it viable? Nursing Outlook, 32(4), 193-196.
- Price, E.M. (1970). Staffing for patient care, a guide for nursing service. New York: Springer Publishing.
- Price, E.M. (1981). The demise of the traditional 5-40 work week. American Journal of Nursing, 81, 1138-1141.
- Price, J.L. (1972). Handbook of organization measurement. Toronto: D.C Heath & Company.
- Reid, D. (1983, July). Examination of staff nurse satisfaction with the 12 hour shift. Unpublished manuscript, Royal Alexander Hospitals, Edmonton, Alberta.
- Ricci, J.A. (1984, Jan.). 10 hour night shift: Cost vs cost savings. Nursing Management, 15(1), 34-35, 38-42.
- Ronen, S. (1984). Alternative work schedules. Homewood, IL: Dow Jones-Irwin.
- Rosenthal, R. (1984) Meta-analytic procedures for social research. Beverly Hills: Sage.
- Ryan, S.M. (1975, July-August). The modified work week for nursing staff on two pediatric units. Journal of Nursing Administration, 5(6), 31-34.
- Sellars, T.V. (1973, Sept.1). The 4/40: Does it raise personnel costs? Hospitals, 47, pp. 94,96,100,101.
- Shaw, P. (1978). The 10 hour day in the four day week. Supervisor Nurse, 9(9), 47-56.
- Shelley, S.I. (1984). Research methods in nursing and health. Toronto: Little, Brown and Co.
- Smith, M.L. & Glass, G.V. (1977). Meta-analysis of psychotherapy outcome studies. American Psychologist, 32, 752-760.
- Stanton, M.P., Laughlin, J.A., & Wheeler, C.E. (1983, Oct.). Do extended shifts satisfy nurses more? Nursing Management, 14(10), 49-52.
- Staples, S., & Curtis, B.L. (1972, September- 1974, August). Hours of work study. Unpublished manuscript, Saint Paul's Hospital, Vancouver, B.C.
- Staples, S., & Curtis, B.L. (1975). Extended workday-two years later. Hospital

- Administration in Canada, 17(1), 32-34.
- Stinson, S.M., & Hazlett, C.B. (November, 1973). Research Report: Nurse and physician surveys of the modified work week trial. Unpublished manuscript, University of Alberta Hospital.
- Stinson, S.M., & Hazlett, C.B. (1975). Nurses and physician opinion of a modified work week trial. Journal of Nursing Administration, 5(7), 21-26.
- Underwood, A. B. (1975). What a 12-hour shift offers. American Journal of Nursing, 75(7), 1176-1178.
- Varughese, A. (1984). Levels of job satisfaction among registered nurses working two alternative shift patterns. Unpublished master's thesis, Texas Woman's University, Denton, Texas.
- Vik, A.G. (1979). A comparative study of the quality of care received by patients from nurses who work a 12-hour shift versus nurses who work an 8-hour shift. Unpublished master's thesis, Dalhousie University, Halifax, Nova Scotia.
- Vik, A. G., & MacKay, R. C. (1982, January). How does the 12-hour shift affect patient care? The Journal of Nursing Administration, 11-14.
- Ward, R.T., & Fuhs, P.A. (1981, October 16). Change in nursing shift patterns. Hospitals, 64,68.
- Wolf, F.M. (1986). Meta-analysis quantitative methods for research synthesis. Beverly Hills: Sage.
- Work in America Institute. (1981). New work schedules for a changing society: A Work in America Institute policy study. Scarsdale, NY: Work in America Institute.
- Young, J.P, Giovannetti, P., Lewison, D., & Thoms, M.L. (1981). Factors affecting nurse staffing in acute care hospitals: A review and critique of the literature (DHEW publication No. HRA 81-10, HRP 0501801). U.S. Department of Health and Human Services, Hyattsville, MD.
- Yuska, C., Crabtree-Tonges, M., & Schaps, M. (1984). Staff nurse weekend program proves cost effective. Nursing Administration Quarterly, 8 (2), 62-73.

Appendix A

CITATIONS OF STUDIES USED TO DEVELOP TABLE 1.1

- Bajnok, I. (1975). It's good for nurses but is it good for patients? Hospital Administration in Canada, 17(10), 25-26.
- Bauer, J. (1971, November-December). Clinical staffing with a 10-hour day, 4-day work week. Journal of Nursing Administration, 1, 12-14.
- Boyariski, R.P. (1976, July). Nursing workweek equalizes shifts, time off. Hospital Progress, 36-45.
- Burrow, E., & Leslie, E. (1972, July). The 4-day, 40-hour week one year later. Hospital Progress, 53(7), 33-41.
- Cales, A. D. (1976). Twelve hour schedule experiment. Supervisor Nurse, 7(6), 71-76.
- Colt, A., & Corley, T. (1974, February). What nurses think of the 10-hour shift. Hospitals, Journal of the American Hospital Association, 48,134-142.
- Crump, C. K. (1974). The twelve-hour shift in nursing services. The University of Western Ontario, School of Business Administration, Working paper series number 112, London, Ont.
- Deans, J.H., & McSwain. (1972, June), Nurses have more time on, more time off with seven-day week scheduling. Modern Hospital, CXVIII, 107-108.
- DeMarsh, K.G., & McLellan, E.I. (1972, January). The seven-day fortnight. The Canadian Nurse, 37-38.
- DeMarsh, K.G., & Mc Lellan, E.I. (1972, October). The 7-day fortnight--18 months after. Hospital Administration in Canada, 14(10), 33-34.
- Eaton, P., & Gottselig, (1980, August). Effects of longer hours, shorter week for intensive care nurses. Dimensions in Health Service, 57,(8), 25-27.
- Fraser, L.P. (1972, September, October). Ther reconstructed work week: One answer to the scheduling dilemma. The Journal of Nursing Administration, 12-16.
- Ganong, W.L., Ganong, J.M., & Harrison, E.T. (1976). The 12-hour shift: Better quality, lower cost. Journal of Nursing Administration, 6, 17-29.
- Hibberd, J.M. (1972). Compressed work week for nursing staff: A field experiment. Unpublished master's thesis, The University of Alberta, Edmonton, Alberta.
- Jennings, E.M. (1981). Shift work and well-being. Unpublished master's thesis. The University of Calgary, Alberta.
- Kent, L.A. (1972). The 4-40 workweek on trial. American Journal of Nursing, 72(4), 683-686.

- Larsen C.A. (1973). A four-day week for nurses. Nursing Outlook, 21(10), 650-651.
- McGillick, K. (1983). Modifying schedules makes jobs more satisfying . Nursing Management, 14(12), 53-55.
- Meier, P., & Todd, C. (1983, May , June). Four-day, forty -hour workweek for neonatal intensive care nurses. JOGN, 12(3 Suppl.), 89s-95s.
- Metcalf, M.L. (1982). The 12-hour weekend plan - Does the nursing staff really like it? Journal Nursing Administration, 12(10), 16-19.
- Mills, M.E., Arnold, B., & Wood, C. M. (1983). Core-12: A controlled study of the impact of 12-hour scheduling. Nursing Research, 32(6), 356-361.
- Minor, Sister Mary Ann, & Heldstab, Betty. (1971, July). 10- and 6-hour nursing shifts solve staffing problem. Hospital Progress, 52, 62-63, 66.
- Price, C.A., Niemeier, D., & Healy, S. (1984). The 12-hour Shift: Is it viable? Nursing Outlook, 32(4), 193-196.
- Ryan, S.M., (1975, July-August). The modified work week for nursing staff on two pediatric units. Journal of Nursing Administration, 5(6), 31-34.
- Shaw, P. (1978). The 10 hour day in the four day week. Supervisor Nurse, 9(9), 47-56.
- Staples, S., & Curtis, B.L. (1975). Extended workday-two years later. Hospital Administration in Canada, 17(1), 32-34.
- Stinson, S.M., & Hazlett, C.B. (1975). Nurses and physician opinion of a modified work week trial. Journal of Nursing Administration, 5(7), 21-26.
- Underwood, A. B. (1975). What a 12-hour shift offers. American Journal of Nursing, 75(7), 1176-1178.
- Vik, A.G. (1979). A comparative study of the quality of care received by patients from nurses who work a 12-hour shift versus nuses who work an 8-hour shift, Unpublished master's thesis, Dalhousie University, Halifax, Nova Scotia.

Appendix B

REFERENCE LIST OF ARTICLES USED TO COMPILE TABLE 2.2

- Alivizatos, M.S. (1981, February). A new concept in scheduling for nurses. Supervisor Nurse, 20-22.
- Arnold, B. & Mills, M.E. (1983, July, August). Core-12: Implementation of flexible scheduling. The Journal of Nursing Administration, 9-14.
- Bauer, J. (1971, November-December). Clinical staffing with a 10-hour day, 4-day work week. Journal of Nursing Administration, 1, 12-14.
- Boyarski, R.P. (1976, July). Nursing workweek equalizes shifts, time off. Hospital Progress, 36-45.
- Burrow, E., & Leslie, E. (1972, July). The 4-day, 40-hour week one year later. Hospital Progress, 53(7), 33-41.
- Cales, A. D. (1976). Twelve hour schedule experiment. Supervisor Nurse, 7(6), 71-76.
- Colt, A., & Corley, T. (1974, February). What nurses think of the 10-hour shift. Hospitals, Journal of the American Hospital Association, 48,134-142.
- Curtis, R. A. (1982). The effectiveness of an eight hour/ten hour day shift rotation. AANNT Journal, 9(5), 11-14.
- DeMarsh, K.G., & McLellan, E.I. (1971, November). Nurses sold on shortened work week. Canadian Hospital, 48, 64-66.
- Farrington, M.M., & Perla, G. (1971, October). The 4-day week in nursing service. Supervisor Nurse, 2, 63,66-71.
- Feichtel-Pascuzzo, S.A. (1981). The 12-hour day. Nursinglife, 1 (3), 56-59.
- Hoffman, T., & Fischer, S. (1983). Weekend scheduling: The 12-hour shift. Dimensions Critical Care Nursing, 2(3), 171-173.
- Kellman, D. (1983). The ten-hour schedule. Nursing Management, 14(2), 58-62.
- Larsen C.A. (1973). A four-day week for nurses. Nusing Outlook, 21(10), 650-651.
- Meier, P., & Todd, C. (1983, May, June). Four-day, forty -hour workweek for neonatal intensive care nurses. JOGN, 12(3 Suppl), 89s-95s.
- Metcalf, M.L. (1982). The 12-hour weekend plan - Does the nursing staff really like it? Journal Nursing Administration, 12(10), 16-19.
- Mills, M.E., Arnold, B., & Wood, C. M. (1983). Core-12: A controlled study of the impact of 12-hour scheduling. Nursing Research, 32(6), 356-361.

- Minor, Sister Mary Ann, & Heldstab, Betty. (1971, July). 10- and 6-hour nursing shifts solve staffing problem. Hospital Progress, 52, 62-63, 66.
- Pierce, P.S., Hoffman, J.L., & Pelletier, L.P. (1974, Feb.). The 4 day work week versus the 5- day work week: Comparative use of sick time and overtime by direct-care personnel in an institutional facility for the severely and profoundly retarded. Mental Retardation, 12, 22-24.
- Ryan, S.M. (1975, July-August). The modified work week for nursing staff on two pediatric units. Journal of Nursing Administration, 5(6), 31-34.
- Staples, S., & Curtis, B.L. (1975). Extended workday-two years later. Hospital Administration in Canada, 17(1), 32-34.
- Underwood, A. B. (1975). What a 12-hour shift offers. American Journal of Nursing, 75(7), 1176-1178.
- Ward, R.T., & Fuhs, P.A. (1981, October 16). Change in nursing shift patterns. Hospitals, 64,68.
- Yuska, C., Crabtree-Tonges, M., & Schaps, M. (1984). Staff nurse weekend program proves cost effective. Nursing Administration Quarterly, 8 (2), 62-73.

Appendix C

COMPRESSED WORKWEEK CODING SHEET

Author _____
 Title _____
 Journal [1] _____ Year[2] _____ Vol _____ Page _____
 Dissertation[1] _____ Year[2] _____ University _____
 Unpublished report [1] _____ Year[2] _____ Originated from _____
 Source of reference[3] _____

Intervening Factors

Institution type[4] _____ Size[5] _____ Location:[6] US ___ Can ___

Unit Size (E)[7] _____ (C)[8] _____ Service (E)[9] _____ (C)[10] _____

Idea to introduce CWW came from: [11] Admin ___ HN ___ Staff nurses ___ Union ___?

Input Factors

Was CWW introduced: because of a shortage of nursing staff? [12] Yes ___ No ___ NS ___;

to allow for two consecutive days off & alternative weekends?[13] Yes ___ No ___ NS ___;

to equalize the number of staff working each day?[14] Yes ___ No ___ NS ___;

excessive rota, lack of suitable rest period between rota?[15] Yes ___ No ___ NS ___;

concern for employees' safety traveling to and from work?[16] Yes ___ No ___ NS ___;

other[17] _____

Is the shift [18] 10 hrs ___ 12hrs ___? scheduled [19] 7 days/7 off ___ other ___?

Was the head nurse included in the CWW rotation?[20] Yes ___ No ___ NS ___

Design[21]: XO ___ OXO ___ without a control group[22] _____

Design[21]: XO ___ OXO ___ with a control group[22] _____

No. of measures after change[23] ___ time (see instructs)[24] _____ [25] _____ [26] _____

Are comparisons based on past the institution records?[27] Yes ___ No ___

Experimental Group

[28]Category RN ___ Mixed ___ NS ___

[30]Age 20-25 ___ 26-30 ___ 31-35 ___

36-40 ___ 41-45 ___ 46-50 ___

[32]Single _____

[34]Children _____

Control Group

[29]Category RN ___ Mixed ___ NS ___

[31]Age 20-25 ___ 26-30 ___ 31-35 ___

36-40 ___ 41-45 ___ 46-50 ___

[33]Single _____

[35]Children _____

[36]Briefly describe were the sample selection procedures?

[37]Were people opposed the new schedule permitted to transfer to another unit?

Output Factors

(1) Quality of care (elements)

Number of observations _____
 Standardized _____ Informal _____
 How measured? Chart audit _____
 Incident reports _____ Med errors _____
 Nsg. care check list _____ Qualpacs _____
 Other _____ Mean _____ s.d. _____

Test _____ df error _____
 Test value _____ df effect _____
 p-level _____ Effect size _____
 Direction of results _____

(1) Quality of care (elements)

Number of observations _____
 Standardized _____ Informal _____
 How measured? Chart audit _____
 Incident reports _____ Med errors _____
 Nsg. care check list _____ Qualpacs _____
 Other _____ Mean _____ s.d. _____

Test _____ df error _____
 Test value _____ df effect _____
 p-level _____ Effect size _____
 Direction of results _____

(2) Quality of care (perceptions)

Sample: Nse _____ Pt. _____ other _____
 Standardized _____ Informal _____
 Mean _____ s.d. _____

Test _____ df error _____
 Test value _____ df effect _____
 p-level _____ Effect size _____
 Direction of results _____

(2) Quality of care (perceptions)

Sample: Nse _____ Pt. _____ other _____
 Standardized _____ Informal _____
 Mean _____ s.d. _____

Test _____ df error _____
 Test value _____ df effect _____
 p-level _____ Effect size _____
 Direction of results _____

(3) Quality of care (perceptions)

Sample: Nse _____ Pt. _____ other _____
 Standardized _____ Informal _____
 Mean _____ s.d. _____

Test _____ df error _____
 Test value _____ df effect _____
 p-level _____ Effect size _____
 Direction of results _____

(c) Quality of care (perceptions)

Sample: Nse _____ Pt. _____ other _____
 Standardized _____ Informal _____
 Mean _____ s.d. _____

Test _____ df error _____
 Test value _____ df effect _____
 p-level _____ Effect size _____
 Direction of results _____

(4,i) Job Satisfaction

Sample: Nse _____ LPN. _____ Aide _____
 Standardized _____
 Informal _____
 Mean _____ s.d. _____

Test _____ df error _____
 Test value _____ df effect _____
 p-level _____ Effect size _____
 Direction of results _____

(4,i) Job Satisfaction

Sample: Nse _____ LPN. _____ Aide _____
 Standardized _____
 Informal _____
 Mean _____ s.d. _____

Test _____ df error _____
 Test value _____ df effect _____
 p-level _____ Effect size _____
 Direction of results _____

(4,ii) Job Satisfaction

Sample: Nse _____
 Standardized _____
 Informal _____
 Mean _____ s.d. _____

Test _____ df error _____
 Test value _____ df effect _____
 p-level _____ Effect size _____
 Direction of results _____

(4,ii) Job Satisfaction

Sample: Nse _____
 Standardized _____
 Informal _____
 Mean _____ s.d. _____

Test _____ df error _____
 Test value _____ df effect _____
 p-level _____ Effect size _____
 Direction of results _____

(4,iii) Job Satisfaction

Sample: LPN. _____
 Standardized _____
 Informal _____
 Mean _____ s.d. _____

Test _____ df error _____
 Test value _____ df effect _____
 p-level _____ Effect size _____
 Direction of results _____

(4,iii) Job Satisfaction

Sample: Nse _____
 Standardized _____
 Informal _____
 Mean _____ s.d. _____

(4,iv) Job Satisfaction

Sample: Aides _____
 Standardized _____
 Informal _____
 Mean _____ s.d. _____

Test _____ df error _____
 Test value _____ df effect _____
 p-level _____ Effect size _____
 Direction of results _____

(4,iv) Job Satisfaction

Sample: Aides _____
 Standardized _____
 Informal _____
 Mean _____ s.d. _____

(5) Shift Satisfaction

Sample: Nse LPN. Aide _____
 Informal _____ Direction of results _____

(5) Shift Satisfaction

Sample: Nse LPN. Aide _____
 Informal _____ Direction of results _____

(6,i) Nurse fatigue (objective data)

Sample: No. ___ Comp _____
 Standardized _____ Informal _____
 How measured? _____
 Mean _____ s.d. _____

Test _____ df error _____
 Test value _____ df effect _____
 p-level _____ Effect size _____
 Direction of results _____

(6,i) Nurse fatigue (objective data)

Sample: No. ___ Comp _____
 Standardized _____ Informal _____
 How measured? _____
 Mean _____ s.d. _____

(7,ii) Nurse fatigue (objective data)

Sample: No. ___ Comp _____
 Standardized _____ Informal _____
 How measured? _____
 Mean _____ s.d. _____

Test _____ df error _____
 Test value _____ df effect _____
 p-level _____ Effect size _____
 Direction of results _____

(7,ii) Nurse fatigue (objective data)

Sample: No. ___ Comp _____
 Standardized _____ Informal _____
 How measured? _____
 Mean _____ s.d. _____

(8,iii) Nurse fatigue (objective data)

Sample: No. ___ Comp _____
 Standardized _____ Informal _____
 How measured? _____
 Mean _____ s.d. _____

Test _____ df error _____
 Test value _____ df effect _____
 p-level _____ Effect size _____
 Direction of results _____

(8,iii) Nurse fatigue (objective data)

Sample: No. ___ Comp _____
 Standardized _____ Informal _____
 How measured? _____
 Mean _____ s.d. _____

(9,i) Nurse fatigue (perceptions)
 Sample: Nse ___ Pt. ___ other _____
 Standardized ___ Informal _____
 Mean _____ s.d. _____

Test _____ df error _____
 Test value _____ df effect _____
 p-level _____ Effect size _____
 Direction of results _____

(9,i) Nurse fatigue (perceptions)
 Sample: Nse ___ Pt. ___ other _____
 Standardized ___ Informal _____
 Mean _____ s.d. _____

(9,ii) Nurse fatigue (perceptions)
 Sample: Nse ___ Pt. ___ other _____
 Standardized ___ Informal _____
 Mean _____ s.d. _____

Test _____ df error _____
 Test value _____ df effect _____
 p-level _____ Effect size _____
 Direction of results _____

(9,ii) Nurse fatigue (perceptions)
 Sample: Nse ___ Pt. ___ other _____
 Standardized ___ Informal _____
 Mean _____ s.d. _____

(10,i) Communication
 Sample: No. ___ Comp _____
 How measured? _____

Direction of results _____

(10,i) Communication
 Sample: No. ___ Comp _____
 How measured? _____

(10,ii) Communication
 Sample: No. ___ Comp _____
 How measured? _____

Direction of results _____
 Direction of results _____

(10,ii) Communication
 Sample: No. ___ Comp _____
 How measured? _____

(12,i) Costs
 Sample: _____
 How measured _____
 Total _____

Direction of results _____

(12,i) Costs
 Sample: _____
 How measured _____
 Total _____

(13) Absenteeism: Defined? Yes ___ No ___
 Sample: No. ___ Comp _____
 Measured days? ___ hrs? ___ unstated ___?
 Total _____

Direction of results _____

(13) Absenteeism
 Sample: No. ___ Comp _____
 Measured in days? ___ hrs? ___ unstated ___?
 Total _____

(14) Recruitment: Defined? Yes ___ No ___
 How measured _____
 Total _____

Direction of results _____

(14) Recruitment
 How measured _____
 Total _____

(15) Overtime hours: Defined? Yes ___ No ___
 Sample: No. ___ Comp _____
 Total _____

Direction of results _____

(15) Overtime hours
 Sample: No. ___ Comp _____
 Total _____

(16) Terminations: Defined? Yes ___ No ___ Sample: No. ___ Comp _____ How measured _____ Total _____	(16) Terminations Sample: No. ___ Comp _____ How measured _____ Total _____
---	--

Direction of results _____

(17) Perceptions of the effectiveness of CWW Sample: No. ___ Comp _____ How measured _____ Total _____	Sample: No. ___ Comp _____ How measured _____ Total _____
---	---

Direction of results _____

(18) Perceptions of the effectiveness of CWW How measured _____ Total _____	Sample: No. ___ Comp _____ Sample: No. ___ Comp _____ How measured _____ Total _____
---	---

Direction of results _____

(19) Did the unit return to the 8-hour schedule after a trial period? Yes ___ No ___

(20) If the answer to 19 is yes, briefly explain the rationale for the change.

(21) Please list confounding variables and there potential effect on results.

(22) Is there evidence that results might be biased by samples expectations?

Appendix C continued

CODE SHEET INSTRUCTIONS

If the report does not contain requested information please mark the area with an X.

[1] and [2] are straight forward. Please ignore [3] as I have filled it in.

[4] refers to type of institution, eg. general hospital, nursing home etc.

[5] give size of hospital in terms of the number of beds.

[6] if the hospital is in the US, place a √ in the blank. If it is in Canada place a √ and abbreviated name of the Province.

[7] & [8] give the size of the unit in terms of number of beds or cribs.

[9] & [10] Is it a pediatric unit, an ICU, medical, surgical, or mixed unit?

[12] to [16] Please place a √ beside the appropriate answer. NS means the particular item was not given as a reason. In situations where the paper does not give any reasons for introducing CWW cross out the question. Some of the questions ask for more than one fact. If one of the answers in a question is 'yes' the answer to the question should be yes, eg. [15] if the article states that CWW was introduced to provide staff with alternate weekends off without mentioning provision for two consecutive days off-'Yes' should be checked.

[17] Please briefly note any other reasons given for adopting CCW.

[18] asks for the approximate number of hours within a shift.

[19] asks for one of two schedules. Mark everthing that is not 7 days on followed by 7 days off as other.

[20] If the head nurse started out in the new schedule and then switched back to 8-hours place a √ beside yes and a √ beside NS (not stated space). If the head nurse started out on the 8-hour rota and then switched to CWW hours place a √ beside no and a √ beside NS.

[21] X means the introduction of CWW, O means observations were made and recorded. You may note that more than one observation/measurement was taken after the change to CWW. If this is the case: record the number of observations made beside [18] and time lapse between implementation and observation 1 in [19], time between observation 1 and observation 2 in [20] and time between observation 2 and observation 3 in [21]

[22] & [23] please fill in the number of persons in each category of worker. If categories of workers are not given fill the total sample number beside NS.

The Experimental Group is the group working CWW. The Control Group is the group working the 8-hour shifts.

[30] through [35] want demographic data on participants. Single refers to a person without a 'live in' adult partner.

Appendix D

REVISED CODING SHEET AND DIRECTIONS

Coding Directions

The studies/articles included in the literature review had to: be written in English, involve nursing staff working the compressed workweek, and indicate that the dependent variables were measured. The application of these three criteria to the relevant literature has resulted in variations of research quality among studies included in the review sample. This variation is of concern to the coder. First the variables in a particular study must correspond to the variables as defined in the literature review. Second, the reports must indicate that the variable under consideration has been measured by survey, interview or direct observation of records or activities.

The code sheet is divided into three sections. The first and second sections provide a guide for the collection of demographic data and results from each study. The third section contains a list of variables and definitions pertinent to the literature review.

The coder is asked to complete:

1. One copy of the first section of the code sheet for each study.
2. One copy of the second section for each measurement of a given variable. For example, if a study contains two measures of the impact of CWW on shift satisfaction and three measures on absenteeism, the coder will complete five forms - one for each variable measured. Please be sure to enter the study number on each completed section.

Section I: Demographic Data

The section entitled 'Intervening factors' seeks information concerning the location of the study. The letter E refers to the experimental group, which is the group working the compressed workweek schedule (CWW) while C refers to the control group, working the traditional 8-hour rotation. Please express unit size in terms of bed count. The letters 'NS' stand for 'not stated' meaning that the information is not available in the report.

The information requested under the heading 'Input factors' pertains to the hours of

work and the scheduling of those hours. Most of the articles deal with 10- and 12-hour shift rotations, if an articles discusses other forms of CWW please note the characteristics of the work hours along the side of the page. The scheduling of the work hours reads 7 on/7 off and other. Please check the 7 on/7 off space when the experimental group is schdeuled to work seven consecutive shifts followed by seven consecutive shifts off. If the staff are working any other arrangement of hours place a check beside the word 'other'.

Information requested under the heading 'Research Study' relates to the characteristics of the study itself. The letters XO and OXO ask if the CWW was introduced and then evaluated (XO) or if observations were made prior to and following implementation of the new work schedule (OXO). The coder is also asked to note whether a control group was used, the length of time between the introduction of the CWW and the succeeding observations, sample selection procedures, as well as anything that may have influenced findings reported in the study.

Section II: Study Results

1. Please place a $\sqrt{\quad}$ beside the appropriate variable. The definitions of these variables are located in Section III of the code sheet.
2. There are three common samples listed as sample categories. If the sample involves patient charts, payroll records, physicians, etc. please enter the name beside the word 'other'.
3. A standardized measure is a recognized acceptable measure. An informal measure is a measure developed or adapted for a given study. The measurement method refers to the means used to collect the data eg. survey, interview, direct observation.
4. If the study does not contain statistical data please note the direction of results. The direction of results are to be recorded in terms of the CWW. For example, if the quality of care provided by 8-hour nurses is better than that provided by 12-hour nurses the direction of results is negative (-).
5. The recording of statistical data:

a) When the investigator reports no significant change and provides no further statistical data assign a p-value of .5, a Z of 0, and an r of 0.

b) When the mean and standard deviation (s.d.) of both the experimental and control group are available pool the s.d. and calculate a Hedge's g. For example

$$\begin{aligned} n_1 &= 12 \\ \text{Ex mean} &= 27.4 \\ \text{s.d. Ex} &= 6.26 \end{aligned}$$

$$\begin{aligned} n_2 &= 16 \\ \text{Con mean} &= 25.7 \\ \text{s.d. Con} &= 5.09 \end{aligned}$$

$$\text{s.d. pooled} = \sqrt{\frac{(n_1-1)s.d_1^2 + (n_2-1)s.d_2^2}{n_1 + n_2 - 2}}$$

$$\text{s.d. pooled} = \sqrt{\frac{(12-1)6.26^2 + (16-1)5.09^2}{12 + 16 - 2}} = 5.6148$$

$$\text{Hedges } g = \frac{\bar{X}_1 - \bar{X}_2}{\text{s.d. pooled}} = \frac{27.4 - 25.7}{5.6148} = .3028$$

Now convert the g to an r

$$r = \sqrt{\frac{g^2 n_1 n_2}{g^2 n_1 n_2 + (n_1 + n_2) df}} \quad df = (n_1 + n_2) - 2$$

$$r = \sqrt{\frac{(.3028)^2 (12)(16)}{(.3028)^2 (12)(16) + (12+16)26}} = 0.1537$$

$$Z = r \sqrt{N} = .1537 \sqrt{12+16} = .8133$$

c. When t is given $r = \frac{t^2}{\sqrt{t^2 + df}}$ and $Z = r \sqrt{N}$

d. When Chi-square $df = 1$ is given $r = \sqrt{\frac{X^2(1)}{N}}$

e) When proportions are given $r = p_1 - p_2$

eg. 95% of the CWW group ($n = 15$) and 35% of the 8-hour group ($n = 15$) preferred working the 12-hour shift.

$$r = .95 - .35 = .6 \quad \text{and } Z = r \sqrt{N} \quad \text{therefore } Z = .6 \sqrt{30} = 3.2863$$

Note: A nurse currently works 2015 hour a year. The annual hours of work can be used as the denominator when calculating proportions for overtime or absenteeism hours

f) When one proportion is given Z is calculated as follows:

$$Z = \frac{\hat{p} - .5}{\sqrt{\frac{.5(.5)}{n}}}$$

Example: 25% of the nurses ($n=15$) indicated that the quality of care provided by CWW nurses was better than that provided by 8-hour nurses.

$$Z = \frac{.25 - .5}{\sqrt{\frac{.5(.5)}{15}}} = -1.9365 \quad r = \frac{Z}{\sqrt{N}} \quad r = \frac{-1.9365}{\sqrt{15}}$$

g) When an investigator supplies a p-value, such as, the findings were significant at a p of .001 go to the Table of Areas under a Normal Curve, find the Z-score, then calculate the r-index.

Be sure to enter the study number on each variable sheet!

COMPRESSED WORKWEEK CODING SHEET
Section I: Demographic Data

Author _____
 Title _____
 Journal _____ Year _____ Vol _____ Page _____
 Thesis _____ Year _____ University _____
 Unpublished report _____ Year _____ Originated from _____

INTERVENING FACTORS

Institution type _____ Size _____ Location: US _____ Can _____
 Unit Size (E) _____ (C) _____ Service (E) _____ (C) _____

INPUT FACTORS

Is the shift 10 hrs _____ 12hrs _____? scheduled 7 on/7 off _____ other _____?
 Was the head nurse included in the CWW rotation? Yes _____ No _____ NS _____
 Idea to introduce CWW came from: Admin _____ HN _____ Nurses _____ Union _____ NS _____?
 Were people opposed the new schedule permitted to transfer? Yes _____ No _____

RESEARCH STUDY INFORMATION

Design: XO _____ OXO _____ with control group Yes _____ No _____
 No. of measures after change _____ time between X and O1 _____; O2 _____; O3 _____
 Are comparisons based on past the institution records? Yes _____ No _____

EXPERIMENTAL GROUP (CWW)

Category RN _____ Mixed _____ NS _____
 Age (mean or median) _____
 Single _____
 Children _____

CONTROL GROUP (8-hour shift)

Category RN _____ Mixed _____ NS _____
 Age (mean or median) _____
 Single _____
 Children _____

Briefly describe the sample selection procedures?

Please list confounding variables and their potential effect on results.

Section II: Study Results

Study number _____

Variable: Place a \sqrt beside the appropriate variable

Absenteeism _____	Fatigue (objective) _____	Quality of care (elements) _____
Communication _____	Fatigue (perceptions) _____	Quality of care (perceptions) _____
Continuity of care _____	Job satisfaction _____	Recruitment _____
Costs _____	Nurse wellbeing _____	Shift satisfactaion _____
	Overtime _____	Terminations _____

Comments _____

Results:

Category: RNs _____; mixed nursing _____; patients _____; other _____

Number of observations: Experimental _____ Number of observations: Control _____

Measure: Standardized _____ Informal _____ Measurement method _____

Ex. Mean _____ s.d. _____ Cont. Mean _____ s.d. _____

P1 _____ P2 _____

Test _____

Test value _____ df effect _____

p-level _____

Z _____ r _____

Direction of results _____

Study number _____

Variable: Place a \sqrt beside the appropriate variable

Absenteeism _____	Fatigue (objective) _____	Quality of care (elements) _____
Communication _____	Fatigue (perceptions) _____	Quality of care (perceptions) _____
Continuity of care _____	Job satisfaction _____	Recruitment _____
Costs _____	Nurse wellbeing _____	Shift satisfactaion _____
	Overtime _____	Terminations _____

Comments _____

Results:

Category: RNs _____; mixed nursing _____; patients _____; other _____

Number of observations: Exp. _____ Number of observations: Con. _____

Measure: Standardized _____ Informal _____ Measurement method _____

Ex. Mean _____ s.d. _____ Cont. Mean _____ s.d. _____

P1 _____ P2 _____

Test _____

Test value _____ df effect _____

p-level _____

Z _____ r _____

Direction of results _____

Section III: Variables and Definitions

1. Compressed workweek: a work schedule that compresses regular full-time hours of work into less than five days per week (Nollen, 1979).
2. Nursing practice is a term used to represent all the dependent variables in the literature review.
3. Patients: individuals who consume nursing services within an institutional setting.
4. Nursing staff: registered nurses and licensed practical nurses employed to provide nursing care in an institutional setting.
5. Health care institutions are acute care or chronic care facilities that use nursing services.
6. Quality of care: "the essential character of care, considered in the context of grade or degree of merit" (Jelinek & Dennis, 1976, P. 183) Quality, thus, includes the elements of care as well as a value judgement made by patients, nurses, and physicians.
7. Continuity of care: "the assignment of one member of the nursing staff the responsibility for the direct care of an individual patient on the morning shift for at least two consecutive days" (E.M. Price, 1970, p.76).
8. Communication: "the degree to which information is transmitted among the members of a social system" (J.L. Price, 1972).
9. Fatigue: weariness from bodily or mental exertion, measured by a variety of operations and as perceived by nursing staff.
10. Job satisfaction: "degree to which the members of a social system have a positive affective orientation toward membership in the system" (J.L. Price, 1972, p. 56).
11. Shift satisfaction: the degree to which nursing staff have a positive orientation toward their working hours.
12. Wellbeing: "a satisfactory state of physical, mental and social health..." (Jennings, 1981, p.7).
13. Costs: "refers to costs incurred by the hospital through provision of nursing salaries and fringe benefits..." (Hibberd, 1972, p.7).
14. Absenteeism: "the degree to which the members of a social system fail to report for work at the time they are scheduled to work" (J.L. Price, 1972, p.14).
15. Recruitment: the enlistment of new nursing staff members.
16. Terminations/Turnover: when a person "leaves an organizational role for another role within a different organization-moves across the membership boundary of the organization" (J.L. Price, 1972, p. 185).
17. Overtime hours: time in excess of a prescribed work period.

Appendix E

REFERENCES: LITERATURE REVIEW SAMPLE

(Note: References to published and unpublished material which is based on the same research data are grouped together.)

- Bajnok, I. (1975). A comparison of the quality of care provided by registered nurses working the twelve-hour shift and those working the eight-hour shift in a large general hospital. Unpublished master's thesis, University of Western Ontario, London, Ontario.
- Bajnok, I. (1975). It's good for nurses but is it good for patients? Hospital Administration in Canada, 17(10), 25-26.
- Beach, L.L. (1986, January-February). Design and implementation of a ten-hour work schedule for an ED nursing staff. Journal of Emergency Nursing, 12(1), 30-34.
- Boyarski, R.P. (1976, July). Nursing workweek equalizes shifts, time off. Hospital Progress, 36-45.
- Blanchflower, S. (1986, March). Alternative rota systems. Nursing Times, 82(10), 55-58.
- Burrow, E., & Leslie, E. (1972, July). The 4-day, 40-hour week one year later. Hospital Progress, 53(7), 33-41.
- Cleveland, R.T., & Hutchins, C.L. (1974, August). Seven days' vacation every other week. Hospitals, 48, 81-85.
- Colt, A., & Corley, T. (1974, February). What nurses think of the 10-hour shift. Hospitals. Journal of the American Hospital Association, 48, 134-142.
- Crump, C. K. (1974). The twelve-hour shift in nursing services. The University of Western Ontario, School of Business Administration, Working paper series number 112, London, Ont.
- Crump, K. C., & Newson, P. (1975). Implementing the 12 hour shift: A case history. Hospital Administration in Canada, 17(10), 20-24.
- Curtis, R. A. (1982). The effectiveness of an eight hour/ten hour day shift rotation. AANNT Journal, 9(5), 11-14.
- Deans, J.H., & McSwain. (1972, June), Nurses have more time on, more time off with seven-day week scheduling. Modern Hospital, CXVIII, 107-108.
- DeMarsh, K.G., & McLellan, E.I. (1971, November). Nurses sold on shortened work week. Canadian Hospital, 48, 64-66.
- DeMarsh, K.G., & McLellan, E.I. (1972, January). The seven-day fortnight. The Canadian Nurse, 37-38.
- DeMarsh, K.G., & McLellan, E.I. (1972, October). The 7-day fortnight--18 months after. Hospital Administration in Canada, 14(10), 33-34.
- Eaton, P., & Gottselig, (1980, August). Effects of longer hours, shorter week for

- intensive care nurses. Dimensions in Health Service, 57,(8), 25-27.
- Farrington, M.M., & Perla, G. (1971, October). The 4-day week in nursing service. Supervisor Nurse, 2, 63,66-71.
- Feichtel-Pascuzzo, S.A. (1981). The 12-hour day. Nursinglife, 1 (3), 56-59.
- Fortin, A. (1973). Extended day in critical care unit. Canadian Nurse, 69(4), 4-5.
- Fraser, L.P. (1972, September, October). The reconstructed work week: One answer to the scheduling dilemma. The Journal of Nursing Administration, 12-16.
- Ganong, W.L., Ganong, J.M., & Harrison, E.T. (1976). The 12-hour shift: Better quality, lower cost. Journal of Nursing Administration, 6, 17-29.
- Harrison, E.T. (1974). A study of of the twelve-hour nursing shift. Unpublished master's report, Duke University.
- Hibberd, J.M. (1972). Compressed work week for nursing staff: A field experiment. Unpublished master's thesis, The University of Alberta, Edmonton, Alberta.
- Hibberd, J. M. (1973, January). 12-hour shifts for nursing staff: A field experiment. Hospital Administration in Canada, 15, 26-30.
- Jennings, E.M. (1981). Shift work and well-being. Unpublished master's thesis. The University of Calgary, Alberta.
- Jennings, E.M., & Rademaker, A.W. (1987). Eight- and twelve-hour shifts and well-being among hospital nurses. Nursing Papers, 19(1), 31-44.
- Jones, J.J., & Brown, R.M. (1986, May). A survey of the 12-hour nursing shift in 25 Nort Carolina hospitals. Nursing Management, 17(50), 27-28.
- Kellman, D. (1983). The ten-hour schedule. Nursing Management, 14(2), 58-62.
- Kent, L.A. (1972). The 4-40 workweek on trial. American Journal of Nursing, 72(4), 683-686.
- Libre, E. (1975). The good & bad of 12-hour shifts. RN, 38(9), 47-52.
- McCull, C. M. (1982). Twelve-hour shifts, a way to beat the "prime time" blues. Canadian Nurse, 78(11), 28-31.
- McGillick, K. (1983). Modifying schedules makes jobs more satisfying . Nursing Management, 14(12), 53-55.
- Meier, P., & Todd, C. (1983, May , June). Four-day, forty-hour workweek for neonatal intensive care nurses. JOGN, 12(3 Suppl.), 89s-95s.
- Metcalf, M.L. (1982). The 12-hour weekend plan - Does the nursing staff really like it? Journal Nursing Administration, 12(10), 16-19.
- Mills, M.E.,& Arnold, B. (1983). The impact of 12-hour scheduling on recruitment and retention. Focus on Critical Care, 10(6),37-41
- Mills, M.E., Arnold, B., & Wood, C. M. (1983). Core-12: A controlled study of the impact of 12-hour scheduling. Nursing Research, 32(6), 356-361.

- Niemeier, D., & Healy, S. (1984). The 12-hour Shift: Is it viable? Nursing Outlook, 32(4), 193-196.
- Nursing staff of the intensive care and renal units. (1974, July, 1975, April). Trial of the extended work day. Unpublished report, Foothills Hospital, Calgary, Alberta.
- Pierce, P.S., Hoffman, J.L., & Pelletier, L.P. (1974, Feb.). The 4 day work week versus the 5- day work week: Comparative use of sick time and overtime by direct-care personnel in an institutional facility for the severely and profoundly retarded. Mental Retardation, 12, 22-24.
- Prendergast, M.B., Foxen, M.B., Leonard, J.L., Todd, S.E., & Shiro A.G. (1986, March- April). An analysis of the implementation of a 10-hour day framework for staff education. Journal of Continuing Education in Nursing, 17(2), 54-58.
- Price, C.A. (1984). The 12-hour Shift: Is it viable? Nursing Outlook, 32(4), 193-196.
- Reid, D. (1983, July). Examination of staff nurse satisfaction with the 12 hour shift. Unpublished manuscript, Royal Alexander Hospitals, Edmonton, Alberta.
- Ricci, J.A. (1984, Jan.). 10 hour night shift: Cost vs cost savings. Nursing Management, 15(1), 34-35, 38-42.
- Sellers, T.V. (1973, Sept.1). The 4/40: Does it raise personnel costs? Hospitals, 47, pp. 94,96,100,101.
- Shaw, P. (1978). The 10 hour day in the four day week. Supervisor Nurse, 9(9), 47-56.
- Stanton, M.P., Laughlin, J.A., & Wheeler, C.E. (1983, Oct.). Do extended shifts satisfy nurses more? Nursing Management, 14(10), 49-52.
- Staples, S., & Curtis, B.L. (1972, September- 1974, August). Hours of work study. Unpublished manuscript, Saint Paul's Hospital, Vancouver, B.C.
- Staples, S., & Curtis, B.L. (1975). Extended workday-two years later. Hospital Administration in Canada, 17(1), 32-34.
- Stinson, S.M., & Hazlett, C.B. (November, 1973). Research Report: Nurse and physician surveys of the modified work week trial. Unpublished manuscript, University of Alberta Hospital.
- Stinson, S.M., & Hazlett, C.B. (1975). Nurses and physician opinion of a modified work week trial. Journal of Nursing Administration, 5(7), 21-26.
- Underwood, A. B. (1975). What a 12-hour shift offers. American Journal of Nursing, 75(7), 1176-1178.
- Varughese, A. (1984). Levels of job satisfaction among registered nurses working two alternative shift patterns. Unpublished master's thesis, Texas Woman's University, Denton, Texas.
- Vik, A.G. (1979). A comparative study of the quality of care received by patients from nurses who work a 12-hour shift versus nuses who work an 8-hour shift. Unpublished master's thesis, Dalhousie University, Halifax, Nova Scotia.
- Vik, A. G., & MacKay, R. C. (1982, January). How does the 12-hour shift affect patient

care? The Journal of Nursing Administration, 11-14.

Ward, R.T., & Fuhs, P.A. (1981, October 16). Change in nursing shift patterns. Hospitals, 64,68.

Yuska, C., Crabtree-Tonges, M., & Schaps, M. (1984). Staff nurse weekend program proves cost effective. Nursing Administration Quarterly, 8 (2), 62-73.