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Review of a cost variable in nursing research

Jean Marie Hopkins Chrisco
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San Jose State University, 1993

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REVIEW OF A COST VARIABLE IN NURSING RESEARCH

A Thesis

Presented to

The Faculty of the Department of Nursing

San Jose State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

by

Jean Marie Hopkins Chrisco

December, 1993

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ABSTRACT

REVIEW OF A COST VARIABLE IN NURSING RESEARCH

By Jean Marie Hopkins Chrisco

The purpose of this quantitative review was to determine the status of a cost variable in nursing research published between 1984-1989. The American Nurses Association's Social Policy Statement (1980), and concepts from meta-analysis theory formed the conceptual framework. The inclusion criteria, data collection, and coding techniques were designed by Cruise, Alderman, and Gorenberg (1989). The final data set numbered 25 research studies, a number comparable to the study populations of other meta-analytic nursing reviews. Fourteen methodological and 5 substantive variables were analyzed.

The data from the individual research studies were statistically combined and produced a mean cost savings of 34%. The 5 studies containing data needed to calculate Glass's Delta effect size measure produced a mean effect of -.18. This cost reducing effect is small, but significant at a .05 level of significance. This study found that a majority of studies lacked standard scores and reported research findings in a variety of methods. Standardizing research methods would expand the scientific knowledge base for nursing, and may increase the use of research results.

ACKNOWLEDGEMENT

I wish to thank my father
for his unwavering support.

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Chapter 1

INTRODUCTION

Background

Traditionally, the financing and delivery of health care in the United States was provided by charitable public service organizations. National and regional health care chains, operating for profit, are increasingly taking over these functions (MacPherson, 1989; Smeltzer & Hyland, 1989). The federal government and insurance companies are urging tighter control over health care spending. The cost of health care is rising faster than most other costs of living. In 1960, health care costs totaled \$30 billion and amounted to approximately 5.5% of the Gross National Product (GNP). By 1980, health care costs totaled \$250 billion and increased to 9.5% of the GNP. During this 20-year period, hospital room rates increased by more than 600%, and the cost of health insurance premiums increased between 20-40%. In addition, federal per capita outlays for health care alone grew 54% in the 1980's (Curtin, 1992).

Concerned groups are demanding cost containment on the part of health care providers. Employers report they cannot increase salaries and pay the increasing cost of company-sponsored health care plans. Taxpayer groups are working to fight tax increases proposed to cover increasing

health care costs, and labor unions report their members are losing benefits due to the high cost of health care coverage (Curtin, 1992).

As costs continue to rise, and pressure to control government spending increases, the number of people receiving benefits and the benefits available to them will decrease. This will result in a greater number of people without any insurance coverage. In addition, due to low reimbursement levels, individuals covered by federal and state programs already have difficulty finding a health care provider (Sharp, 1991). Consequently, more people must rely on overcrowded emergency rooms to get necessary health care. Under these conditions, patients are seen later; their medical problems are complicated, and they have more advanced health problems (Curtin, 1992). Taxpayers, insurance companies, and consumers are demanding that health care providers make cost effective changes in the health care system (Sharp, 1991).

Scientific reviews of nursing research, prior to 1983, reveal a lack of studies reporting a cost reduction variable (Cruise, Alderman, & Gorenberg, 1989; Smith, 1989). Since then, two federal acts increased the pressure on the health care industry to reduce costs--the Tax Equity and Fiscal Responsibility Act of 1982, which changed MediCal and Medicaid to a limited reimbursement system, and the Social Security Amendment Acts

of 1983, which established the diagnosis related grouping (DRG) payment system (Shaffer, 1984). Unfortunately, these government regulations, designed to control health care costs, have been expensive to enforce and largely ineffective (Mechanic, 1989). Despite DRGs and freezes on physician fees, Medicare spending increased 12.2% every year during the 1980s. Economists predict Medicare and Medicaid costs will constitute 85% of the growth in entitlement spending between 1993-1997 (Curtin, 1992).

Reducing the cost of patient care is an increasing part of the nursing profession's responsibility. Nurses are the largest group of caregivers, providing 24-hour bedside and direct outpatient care. Nurse professionals are often responsible for implementing new cost reduction policies and making decisions about how facilities, supplies, and equipment are used (Nelson, 1986). For example, after careful research on infection rates, nurses now replace intravenous infusion sets every 48 hours instead of every 24 hours (Nelson, 1986). Also, insurance companies have begun to reimburse nurse practitioners staffing primary care clinics, because they provide safe, cost effective health care (Sharp, 1991).

Health care reforms are inevitable; the role nurses will play in the future will be determined by administrators who must make cost effective decisions. Nursing leaders will be required to provide data which show

patient care provided by nurses is safe and cost effective (Sharp, 1991). For these reasons, a greater number of nursing care studies reporting cost variables were anticipated .

Problem Area

The lack of cost data in previous literature reviews (Cruise, Alderman, & Gorenberg, 1989; Smith, 1988) suggests missed opportunities to make improvements in cost reduction. This study examines cost reduction variables in selected research from 1984-1989 and reports a cumulative experimental effect from cost reducing methods.

Research Questions

Meta-analysis techniques allow research consumers to form general conclusions from large bodies of research. The following research questions provided a guide for the data collection process and the formation of general conclusions:

1. How frequently was cost reduction reported as a variable in selected research published between 1984-1989?
2. What variables were reported in selected cost reduction research published between 1984-1989?
3. What data were provided in selected cost reduction research that show a positive experimental effect?

Definition of Terms

For this study, the following definitions applied:

1. Nursing is the diagnosis and treatment of human responses to actual or potential health problems. This study did not target specific areas within nursing, such as clinical nursing versus administrative nursing or acute care versus home care. The target was the general type of nursing which should be available to people wherever they may be at a given point in time and whatever may be their situation in terms of health, disease, illness, or injury at the time (American Nurses Association [ANA], 1980).

2. Nursing phenomena are any observable manifestation, need, condition, concern, event, dilemma, difficulty, occurrence, or fact that can be described or scientifically explained within the target area of nursing practice (ANA, 1980).

3. Selected research refers to published research articles meeting the definitions of cost reduction and nursing.

4. Cost reduction is used to describe a presentation of time or cost comparisons of personnel, methods, products, equipment, or supplies. This term will encompass a variety of terms found in the individual studies: (a) cost effectiveness and efficiency, (b) cost analysis and cost benefit analysis, (c) cost accounting, and (d) cost control and containment.

Summary

Providing quality patient care in a health care system with a profit orientation presents the nursing profession with additional challenges. If nurses fail to address issues of cost related to nursing practice, cost reducing decisions will be made without input from the nursing profession. An analysis and integration of cost reduction research may improve the quality of future research and facilitate research utilization (Cruise et al., 1988). Demonstrating the nursing profession's concern and attention to the needs within the health care environment, i.e., cost reduction and financial limits to the care they provide, will assist them in remaining effective and competitive (Fagin, 1982; Sharp, 1991).

Chapter 2

REVIEW OF LITERATURE AND CONCEPTUAL FRAMEWORK

The conceptual framework for this study combines ideas from several sources. The concepts are first presented individually in the literature review. The literature review begins with articles which critique the American Nurses Association's (ANA) Social Policy Statement (1980). The Social Policy Statement was used to form the definitions and conceptual framework for this study. The second section of this chapter contains the conceptual framework and a step-by-step model demonstrating the relationship between the concepts in the framework.

Review of Literature

The literature review is organized into three sections: (a) the Social Policy Statement (SPS) and its importance to the nursing profession, (b) meta-analysis techniques and a review of studies which have utilized these techniques, and (c) articles which focus concern on the rising cost of patient care.

Social Policy Statement

The SPS defines nursing as well as the phenomena of particular responsibility to nurses. The statement also establishes policies and strategies for the nursing profession based on the needs of contemporary

society (Allen, 1987; Gorenberg et al., 1988). Silva (1983) states that the first section of the SPS gives the nursing profession autonomy over its practice and a moral duty toward society. However, she expresses disappointment in the lack of legal power behind the SPS and presents an example of the courts' refusal to recognize this document and the nursing profession's right to autonomy.

The SPS defines nursing as the diagnosis and treatment of human responses to health problems. However, according to Barnard (1983), many nursing textbooks do not adequately present these human responses. Instead, the textbooks continue to describe physiological signs and medical treatments, sometimes failing to detail the patient's reactions and feelings. She encourages nurses to use the SPS definitions to focus on the practice of nursing and on the patient's responses.

An English professor, Dewitt (1986), provides a layman's point of view of the SPS and makes suggestions for improved utilization of the SPS. According to Dewitt, if this document is truly designed to inform the public, it requires examples and concrete explanations of its purpose. He also recommends simpler illustrations in the document with more information about nursing legislation as well as wider distribution to the public. In spite

of these observations, he believes the SPS is a well organized, thoughtful description of what the nursing community does in the larger health care structure.

Denecke (1983) reports that a survey of nurses conducted in Pennsylvania found the majority of nurses had never heard of the SPS. She offers possible reasons for this: (a) the SPS has not been widely circulated in non-academic circles, (b) the graphics are unattractive and do not capture the message of the statement, and (c) the language does not easily translate into the practice experience. She concludes that to increase the value of the SPS to the nursing profession, work is required to clarify the language and improve packaging, marketing, and the distribution of this document.

The ANA claims that part of the political process includes identifying the public needs, and as service oriented professionals, nurses work for the public good. In evaluating the SPS, Allen (1987) argues that legislation does not always represent the desires of the people. He contends that powerful vested interest groups or small groups within the society may be responsible for passing legislation.

Singer (1986) has raised doubts as to whether the SPS adequately includes the nurse administrator or nurse executive. Gorenberg et al.

(1988) offer a response to this and other criticism of the SPS. These authors state the SPS has the characteristics of a conceptual framework, with a sufficiently broad definition of nursing to describe the profession without omitting any group of practicing nurses. According to Gorenberg, et al. (1989), the definition of nursing provided in the SPS can be operationalized in different areas of nursing, and nursing will still maintain a unified profession. This paper provides examples of how to operationalize the definition of nursing, using the intent of the SPS, and gives examples and possible applications to nursing practice, education, administration, and research.

The SPS was used as a conceptual framework for a text on nursing research written by Woods and Catanzaro (1988). This text uses definitions of nursing, nursing goals, and phenomena found in the SPS to provide continuity. The authors emphasize a need for continuity in nursing from theory to practice and from practice to research; and to the communication of research results back to practitioners, educators, and other researchers. They contend that nursing theory has not directed research, and research results have not directed practice in a proficient manner. This fact has contributed to the research-practice gap.

Meta-Analysis as a Method

First attempts to organize large bodies of research consisted of grouping the research according to whether the outcomes showed statistical importance. The results of such reviews are complex, and contradictory results are not always clarified (Light & Pillemer, 1984). The concept of statistically combining data began with agricultural research in 1931 (Hedges & Olkin, 1985). The use of a different scale of measurement to combine the results of studies in psychology and education was introduced by Glass in 1976 (cited in Hedges & Olkin, 1985). Since 1976, many researchers and statisticians have developed methods of combining study results based upon the concepts presented by Glass.

The need for integration of studies is apparent when the number of independent studies within an area of scientific inquiry becomes large, and conflicting findings make it difficult to reach conclusions. Researchers traditionally have conducted narrative reviews (Duffy, 1989). However, weaknesses in this method include the following: (a) narrative reviews are subjective; (b) narrative reviews may include incomplete, poorly done, or inappropriate studies, making conclusions biased or faulty; (c) narrative reviews lack the formal guidelines basic to scientific methods; and (d) narrative reviews are an inefficient manner of extracting useful information (Light & Pillemer, 1984).

Nursing research frequently consists of small samples producing statistics which may not reach levels of significance (Heater, Becker, & Olson, 1988). However, the number of independent nursing studies is large enough to use quantitative integrative methods (Duffy, 1985). These methods can (a) strengthen conclusions (Smith, 1988), (b) allow practical generalizations to be drawn (Alderman, Gorenberg, & Cruise, 1989), and (c) facilitate professional advancement and increase nursing knowledge (Cruise et al., 1988).

Ganong (1987) performed an analysis of nursing research reviews. He selected reviews from four refereed nursing journals from 1978-1983 and found the sampling methods used to select studies were inadequate, and references to previous reviews were not well developed. The purpose of the reviews was not explained clearly, characteristics of reviewed studies were not identified, and rules for analysis and reporting were too vague. Fifteen of the 17 reviews studied by Ganong did not meet the standards of integrative reviews currently sought in scientific literature. One of the two reviews in Ganong's study which met scientific standards was reported by Devine and Cook (1986). This meta-analysis review provided a stable estimate of the effect of nursing interventions on outcome criteria. Different interventions and different recovery criteria (outcome) were

analyzed from 102 research studies published from 1961-1963. Reduced hospital stay and decreased incidence of postoperative complications were used as cost relevant variables. A positive effect size value confirmed that psychoeducational interventions facilitate recovery of surgical patients and result in decreased costs.

In 1989, another review of nursing intervention research found a lack of data on a cost variable. Cruise et al. (1988) used meta-analysis and qualitative review methods to examine common variables over a 10-year span of studies (1975-1985). The substantive variable was alteration in comfort (pain) and cost. In this review, 124 studies were collected using computer and manual searches. Ten common variables were identified, and a second set of variables was found to be consistently absent. A major finding in this study was the inconsistent manner of reporting funding in nursing research. Out of this sample, only a small number implicitly or explicitly addressed cost as a study variable.

A third study spanning 20 years (1963-1983) of nursing research was completed to produce stronger evidence of the effects of nursing interventions on patient outcomes and served as an model for a nursing text on meta-analysis (Smith, 1988). Out of a population of 595 studies, 42 studies meeting strict criteria for true experimental design were organized

into subsets for analysis. A powerful positive effect of nursing interventions on patient outcomes was found. Further analysis revealed the studies containing larger sample sizes produced greater effect size results. The total number of subjects in the 42 studies was only 2,708, with an average of 62 subjects per study. The primary studies in this review did not report a cost variable, and the effects of the methodological variables were limited by a lack of information.

A fourth meta-analysis report demonstrates how it is possible to combine research which may be different in nature but contain common variables. This study demonstrates how the categories of interventions and the categories of outcome criteria are measured and reported as the magnitude of effect, which may be different in nature but contain a similar goal. Heater et al. (1988) used meta-analysis to draw conclusions from a set of data comparing experimental nursing interventions with routine procedural care. Patient outcomes from research studies published from 1977-1988 were grouped into four categories. The analysis showed a greater effect magnitude from research based nursing interventions than from routine procedural care.

Broome, Lillis, and Smith (1989) used meta-analysis to determine responses to painful procedures to establish a descriptive profile of

interventions and the directions and magnitude of their effectiveness in pain management. One hundred twenty-three articles meeting strict criteria for meta-analysis were contained in the corpus of studies. One to three outcome measures for each study were examined. The greatest beneficial effect was found in patients who received both procedural and sensory information. This group, however, did not show significant results for the outcome category involving objective measures. Sensory information alone showed a greater effect on outcome measures of pain perception than procedural information. The researchers concluded the effectiveness of information preparation may be overrated as a pain intervention method with children.

A review by Suls and Wan (1989) was completed to determine the effectiveness of providing patients with procedural versus sensory information. They found previous reviews disagreed on whether procedural or sensory information is more effective with reducing stress and improving coping abilities with painful medical procedures. Using meta-analysis procedures to review research printed between 1967-1984, a sample was obtained using computer and hand search methods. A survey type code sheet was used to review the 21 articles located. The greatest positive effect upon patient's coping abilities was found with patients who received

both procedural and sensory information. This information, again, was not found to have a significant effect upon objective measures, such as length of stay and degree of complications. These reviewers also reported large between-studies variability. However, causes for this variability could not be determined.

Cost Reduction in Nursing

From 1985 through 1989, the nursing journals contain many articles discussing the assignment of cost values to nursing care (time motion and work measurement studies). However, these articles do not have a reduction or containment variable, or a means of comparing methods, supplies, and equipment; therefore these publications did not meet the definition of cost reduction used for this analysis.

A second area of related literature contains nonscientific descriptive articles clarifying the status of cost reduction in the nursing profession. O'Connor (1988) explains how a patient classification system (PCS) was computerized to serve as a cost accounting system. Direct cost of patient care was shown to be 25%; the remaining 75% consisted of departmental and hospital overhead expenses. The system proved effective at associating increased acuity with increased cost. Linder and Hancock (1985) report computer based labor control systems were the only way to measure work in

the complex hospital environment due to the high productivity, labor intensive, high demand variability nature of service work. MacPherson (1989) points to a recent study of registered nurses and the inability of the PCS to measure certain aspects of nursing care. According to MacPherson, nurses' productivity is being studied by new technologies in an attempt to enhance corporate profits.

Offering a different perspective, Fagin (1982) documents the increasingly competitive nature of the health care industry. She describes study results from nurse midwifery, nurse practitioners in clinics and hospice settings, and nurse rehabilitators as examples of the cost benefits of nursing care. Fagin suggests changes in proposals which include competition among a variety of credentialed providers allowing nurses expanded roles in this new competitive system.

Many of the published articles addressing cost reduction are reports of the planning and implementing of programs. These are general descriptive reports and do not provide quantitative data needed for scientific analysis. One article by Smeltzer and Hyland (1989) describes cost reduction measures initiated in an acute care hospital: (a) changing staffing patterns and management organization, (b) using nursing assistants with special hospital training, (c) offering nursing courses on delegating

responsibility, and (d) reducing the number of registries and the use of registry personnel. Monthly savings of \$200,000 were reported.

Conceptual Framework

The conceptual framework for this study was derived from: (a) the American Nurses Association's (ANA) Social Policy Statement (SPS)[1980], (b) meta-analysis theory (Glass et al., 1981; Hedges & Olkin, 1985; Smith, 1988) and (c) concepts from nursing administration (Sharp, 1991). Each of these areas is presented in a separate section. Finally, a model, developed from meta-analysis concepts, is presented, which provides an outline of the sequence of the concepts organizing this research study.

Social Policy Statement

The SPS was designed to serve as the basis for ANA policy, and it describes nursing's relationship to society and social processes (ANA, 1980; Allen, 1987). The SPS is a set of concepts explaining nursing care, and is organized in three sections: (a) Social Context of Nursing, (b) Nature and Scope of Nursing Practice, and (c) Specialization in Nursing Practice. The first two sections contributed to the conceptual framework and the definition of nursing care used for this study.

The SPS attributes the nursing profession's growth and success to an ability to respond to the needs of the society. In addition, as a service

oriented profession, nursing should continue to be responsive to the interests of the society it serves. The SPS proposes this concept as a reference point for future planning and decision making by the nursing profession (Silva, 1983).

Allen (1987) noted the SPS's reference to special interest groups related to the health care industry. However, to work for the good of all members of society, it is necessary for nurses to be aware of the political process. Identifying the needs of the society is one of the responsibilities of the nursing profession.

The authors of the SPS list current social concerns upon which the nursing profession should focus. First among these concerns is the rising cost of health care. The SPS attributes the 1983 government regulations on health care spending to the sharp rise in health care costs during the 1960's (ANA, 1980). However, the regulations implemented have been expensive to maintain and ineffective. According to the SPS, the nursing profession should take a leadership role in reducing the cost of caring for the sick.

The SPS specifies that nursing is an applied science and utilizes knowledge from other sciences. Again, nurses must act responsibly on behalf of the society they serve; society expects nursing decisions to be supported by research based knowledge (ANA, 1980).

In summary, the following concepts from the SPS guided the selection of the research questions and variables used in this study:

(a) health care costs have risen to a critical level, (b) the financing of health care should be included among nursing's traditional responsibilities of organizing and delivering care, (c) nursing leadership has the responsibility to be attentive to the financing of health care, (d) nurses use information from many other sciences on the basis of usefulness to nursing practice, and (e) nurses use research-based information to make decisions.

Meta-Analysis

The following concepts from meta-analysis (MA) were important to the conceptualization of this study. A series of studies using different measures of outcomes and variables can be statistically compared (Glass et al., 1981; Hedges & Olkin, 1985). The integrative methods of MA provide more objective research-based answers from a larger number of subjects than any one study or from qualitative review methods (Glass et al., 1981). Basic to the techniques of MA is the concept that use of an index, which does not depend on any one of the measurement devices in the primary studies, provides a "scale-free" index; this index allows the researcher to analyze variation across studies (Glass et al., 1981; Hedges & Olkin, 1985).

Meta-analysis studies both substantive and methodological variables.

The substantive variables are the set of characteristics unique to the phenomena under investigation (Smith, 1988). In this study, cost reduction methods and the outcome of these methods are the substantive variables.

Methodological variables provide information about characteristics of research which may influence results. Measurement of factors which contribute to the effect size is an important aspect of meta-analysis. Identifying these variables improves the quality and utilization of research. For example, the year in which a study was reported could be an interesting property of studies in a field subject to trends and fads (Glass et al., 1981, pp. 77-79). Methodological variables in this study include the usual ones studied in MA: (a) information about authors, (b) subjects, (c) research funding, (d) location of the research, and (e) sources of articles. Meta-analysis also demonstrates how both substantive and methodological variables are important to a complete, thorough analysis of research, providing statistical description of the findings of a collection of studies and how the findings vary from one type of study to the next.

Two meta-analytic concepts are: (a) meta-analysis seeks to make general conclusions based on a large amount of information, and (b) that clearly defined variables determine the validity of these conclusions

(Glass et al., 1981, pp. 73, 79). These concepts were used in developing the definition for the general type of nursing practice selected from the SPS. This definition was used, because it is well suited to studies using meta-analysis techniques (Gorenberg, Alderman, & Cruise, 1988).

Nursing Administration

The value of studying cost reduction using this framework was supported from two concepts presented in literature from the area of nursing administration. These concepts are: (a) the current economic state is a reality with which the nursing profession must work (Fagin, 1982; MacPherson, 1989; McConnell, 1986; Shaffer, 1984), and (b) nurses and nurse managers play a key role in health care cost containment (McConnell, 1986; Nelson, 1986).

Summary

The literature reflects increased interest in reducing patient care costs. However, the status of research-based cost reducing methods in nursing is not clear. The advantages of using meta-analysis to review research has been presented in this section. Using meta-analysis to integrate research results will provide a clearer picture of what has been accomplished and may provide a focus on what needs to be done.

The model in Figure 1 summarizes the conceptual process used. The model demonstrates in step-by-step fashion how the research questions were formed from initial observations. The arrows show how the statistical data led to answers to the research questions and conclusions about the status of cost reduction efforts in the nursing profession.

Conceptual Model

Figure 1. Model of conceptual framework for meta-analysis study of cost reduction (Chrisco, 1993).

Chapter 3

METHODOLOGY

Research Design

The design for this study was a non-experimental quantitative review method of meta-analysis described by Glass et al. (1981). Meta-analysis is the integration of numerous and diverse findings by recording the properties and findings of studies. The basic procedure consists of collecting studies appropriate to a particular interest, in this case, cost, and then treating the summary statistics from each study as the units of analysis. The data were then analyzed and statistically tested for treatment effects and significance (Light & Pillemer, 1984).

A group of studies containing the common variable, cost, were used to answer the following research questions:

1. How frequently was cost reduction reported as a variable in selected research published between 1984-1989?
2. What variables were reported in selected cost reduction research published between 1984-1989?
3. What data were provided in selected cost reduction research that show a positive experimental effect?

Data Set

The population of this study was the body of research published from January 1, 1984, to December 31, 1989. These publications were assessed using the operational definitions for cost reduction and nursing. The research reports were photocopied from primary archival sources, such as professional journals and books. A list of citations of possible research reports was prepared from computer searches, manual searches of the nursing index, card catalogs, and examination of the reference lists of classic and review articles. Computer searches included National Library of Medicine (MESH or MEDLINE), Nursing and Allied Health, (NAHL), the American Psychological Association (PSYCINFO) and the Government Printing Office Monthly Catalog (GPOM) indexes. The following key words were used in the computer searches: (a) patient care; (b) cost efficiency, control, containment, reduction, analysis; and (c) nursing, nurses. The words, drug and surgery, were excluded as these refer to specialty areas in the field of nursing. A general definition of nursing was used.

All studies were then placed in alphabetical order by author and checked for duplication. Due to the large number of science publications, there were some citations which could not be obtained. Fugitive literature is the term used for literature which is difficult or near impossible to obtain

(Glass et al., 1981). At this point, the reference lists of the articles were reviewed, and a second list of possible research articles was formed. Collection of these research articles and any fugitive articles was then completed and filed, again checking for duplicates (See Appendix A).

Data Collection

Sorting and Coding the Sample

Once all possible studies were obtained, they were sorted using the operational definitions taken from the conceptual framework and the criteria described by Glass et al. (1981). A sorting sheet, similar to that used by Alderman et al. (1989), was used to determine initial inclusion/exclusion criteria (Appendix B). To be included in the first sorting round, the study had to meet the following criteria:

1. Research design can be determined.
2. The findings and sample description are present.
3. The study meets the definition of nursing care.
4. The study meets the definition of cost containment.
5. The study contains data yielding frequencies and percentages.

The second round of sorting was completed to determine which studies had the required criteria for calculation of an effect size (see Appendix C):

1. The study has an experimental or quasi-experimental design.
2. A means of measuring the dependent variable is described.
3. The sample size is greater than 10.
4. The study contains either a mean and standard deviations, or a probability value, or a correlation co-efficient.

After sorting, the remaining sample was again placed in alphabetical order. Coding worksheets (Appendix D) were attached, and subject numbers assigned to each study. This sample was then coded for each variable on the worksheet.

Instrument

The coding worksheets used in this study were adapted from the code sheet used in the study on pain interventions by Cruise et al. (1988). Collecting and reporting data about the methodological and substantive variables from the individual studies included in the review can help to identify whether the findings differ depending on certain characteristics of the studies (Glass et al., 1981). The methodological variables are selected to add to general knowledge about research and to identify study characteristics which may have an effect on the results. The methodological variables are often the same in different meta-analysis reviews. The substantive variables are more specific to the main research problem. The variables are presented in the same order as the coding worksheet (Appendix D).

Study Variables

Methodological Variables

1. Publication Year - Research reviews cover different spans of time. Some meta-analysis reviews cover a 20-year period of research. It is valuable to the reader of the review to know the publication year for a majority of the studies included in the review.

2. Discipline of the Journal and Journal Type - Different journals have different standards and different philosophies behind the selection process for studies they publish. Reporting the discipline of the journals utilized may provide insights into the results of a review of studies.

3. Research Question Type - This type of quantitative review allows the researcher to extract data from the individual research studies. The review topic may be explicitly or implicitly addressed in the individual research studies. Data collected from the individual study may be directly reported or calculated from the available data reported. Knowing whether the review topic was explicitly or implicitly addressed in the individual studies clues the reader of the review about the degree of abstraction the researcher made to collect the data.

4. Number of Authors, Author's Education and Discipline - These data are valuable for two reasons; they add to general research information and understanding of the research process, and give information about the motivation which may affect research design and results. It is useful for nurses to know whether clinicians, nurse managers, business managers, or time management engineers are performing cost studies on nursing care.

5. Funding for the Study - This is general knowledge which contributes to the body of information about research.

6. Research Location and Setting - Coding the geographical location for the research studies locates areas where cost is a focus of study. The 1991 U.S. census map was used as a reference for four geographic locations (Rand McNally, 1992). The research setting identifies the type of patient care environments being studied.

7. Subjects' Socioeconomic Status - Information is collected about research subjects to identify more about study populations. In order to draw conclusions and apply research data, it is important to identify the study population. Research studies may not include a cross section of the appropriate population.

8. Caregivers' Discipline - The caregivers' discipline identifies another aspect of nursing, for example, is the care being provided by nursing assistants or family members?

Substantive Variables

The substantive variables focus on the problem being studied and relate directly to the research questions. Details about the independent variables are identified by studying the substantive variables. The broad variable, cost reduction, was separated into 6 substantive variables.

1. Reduction in time - Cost can be related to time measurements. Recording the time required to care for patients is an ongoing process in the health care industry. To plan staffing, nurses must estimate and report the time required to care for a certain number of patients. Nurses also record the time required to complete certain procedures. Some studies keep track of the number of minutes devoted to certain patients over one month, and the number of minutes devoted to certain tasks over one month. The nursing time required to complete tasks and provide care is considered part of the cost of care. Studies involving methods which reduce the time patient care requires are coded in this variable.

2. Supplies - Supplies are evaluated in terms of amounts needed and reduced prices. The supplies include all used and discarded items needed

for patient care. Studies which review methods to reduce the amount of supplies required and product comparisons with price reduction data are coded in this variable.

3. Equipment - Patient care locations require special equipment for transporting, monitoring, and protecting patients. Studies which demonstrate ways to reduce equipment costs are coded in this variable.

4. Change in Caregiver - A current trend in the health care industry is to reassign tasks done by highly trained employees to employees with less training. For example, care provided by physicians is now done by nurses and nurse practitioners, and tasks formerly done by registered nurses are now being done by nursing assistants (Sharp, 1991.) Studies reporting the cost reducing effect of such changes are coded in this variable.

5. Method - Methods are also reviewed in terms of a change which results in cost savings. Any nursing intervention or method for patient care which resulted in reduced cost is coded under this variable. After coding the research articles, a tally of each variable was taken.

Data Analysis

A continuous tally of the number of studies retained in the sample was recorded at each step of the process of forming the final sample. To determine the frequency of cost research in the area of nursing care, the

final number of studies in the sample population of studies for this review was compared with the number of studies in similar meta-analytic reviews. A table with the population sample numbers from 6 other meta-analytic reviews was prepared for the purpose of this comparison. A tally for each of the 19 variables from the worksheets was completed. Each variable and item count was reported separately, and these data are reported in frequencies and percentages.

The cost savings from each study was recorded, if available, or calculated by the researcher. A table of the individual studies was prepared with the independent and dependent cost variable and the percentage of cost reduction as a result of the independent variable. To analyze these data, a graph was prepared showing the percentage of cost savings from each study. A simple overall mean of cost savings was calculated.

Glass's Delta effect size measure was calculated for those studies containing the criteria presented on the sorting sheet, Round B. A cumulative effect size measure and an overall test of significance for this average effect size was calculated using Wolf's (1986) formula.

Chapter 4

FINDINGS AND INTERPRETATION

The purpose of this study was to determine how frequently nursing research addressed the issue of cost reduction and what methods were utilized in the selected research. The study was designed to provide quantitative data to identify the common study variables included in the research. In addition, the data from the individual research studies were statistically combined to report a cumulative cost reducing effect.

The data in this chapter are presented in four parts: (a) the frequency of a cost reduction variable in selected research, (b) the type of variables being reported in this population of selected research, (c) a percentage of cost savings reported from the individual studies, and (d) the effect size of the combined interventions and the significance of that amount.

Cost Reduction Variable

The initial computer index list contained 168 citations of published articles reporting the words cost and patient care. The abstracts for each citation were reviewed for a nursing care focus, cost data, and a report format. Fifty-nine of these citations were eliminated, because they did not meet those criteria or because they were editorial, commentary, or rejoinder articles. Using these same criteria to save the cost of unnecessary photocopying, the remaining 109 articles were reviewed at the library, and

approximately 40 articles were collected. The reference lists from these studies provided 55 additional citations of possible research reports which were not on the computer index. These 55 studies were located and reviewed, and the acceptable studies were photocopied and added to the sample. The final attempt to collect fugitive studies was completed, and a total of 62 research studies formed the initial sample population.

Thirty-seven of these 62 research studies were rejected based on the sorting criteria used in the first round of sorting. Six of the rejected studies had sample sizes smaller than 10. After careful reading, 7 of the 37 studies did not meet the definition for nursing, and 4 were actually review type articles. The majority, 21 studies, of this last group of rejected articles did not contain cost research. These articles contain detailed quotes of some portion of the cost of patient care; however, they did not contain a comparison of the cost variable in a research study format.

After the final sorting, 25 studies on cost reduction remained to form the corpus of studies, that is, the final sample population for this type of quantitative scientific review. All of these studies contained descriptive statistics which could be easily combined. Five of the 25 studies contained information to calculate the Delta effect size measure described by Glass (1976). In all, these 25 studies included 10,118 subjects.

Overall, this appears to be a small number of studies over a 5-year period. To determine how frequently nursing research includes a cost variable, it is helpful to compare the number of studies located in this review with similar nursing reviews. Table 1 shows the sample population numbers from 6 meta-analysis reviews of nursing research. Three of the reviews include multiple types of nursing interventions, and 3 reviews focus on a specific variable within nursing. All of these reviews utilized similar techniques for collecting and sorting the sample population of studies. However, the number of years of research included in these reviews differ in a 5 to 20 year span of research. To compare the findings, the last column of Table 1 shows the number of studies per year.

This review on cost reduction included 5 studies with effect size calculations over a 5-year period, averaging one study per year. This is similar to the other nursing reviews with a specific topic, which reported samples sizes ranging from .7 to 2.2 studies per year. If the number of studies in this review on cost reduction are compared with the number of studies in nursing reviews with a single topic, cost reduction has been studied as frequently as other specific topics within nursing.

Variables Included in Cost Reduction Research

Methodological Variables

The following data were collected by tabulating the individual worksheets (Appendix D). The methodological variables provide details

Table 1

Number of Individual Research Studies Included in 6 Meta-Analysis Reviews

	Studies	Meta ^a	Meta Study ^b Per Year
<u>Multiple Nursing Interventions</u>			
Smith (1988)	298	42	2.1
Heater (1988)	--	84	12.0
Abraham (1992)	293	293	20.3
<u>Specific Nursing Interventions</u>			
Broome (1989) ^c	43	22	2.2
Alderman (1989) ^d	215	7	.7
Suls (1989) ^e	--	21	1.2

Note. Dash represents data not reported. ^aNumber of studies with data needed for quantitative meta analysis calculations. ^bThe number of meta studies divided by the number of years included in the review. ^cPain. ^dUrinary incontinence. ^eInformation and coping.

about the research studies included in a quantitative review and are analyzed in terms of trends. These data provide insights into factors which could affect the final results of the review.

1. Publication Year - Twelve (48%) of the studies were published in 1989; each preceding year added fewer studies. This is a common finding in research reviews and probably does not indicate that cost-reduction studies increased in number in 1989. The older citations are more difficult to locate because the libraries sometimes discontinue certain journals over time, and older volumes are more likely to be missing from the shelves.

2. Source of the Study and Journal Discipline - All 25 studies were photocopied from professional journals; 12 (48%) of the studies were from nursing publications, 6 (24%) from various medical journals, and 4 (16%) were obtained from epidemiology publications. The remaining 3 studies were obtained from various social science journals. The main topics for this review were patient care and cost; the qualifications for inclusion were basic experimental design, organized methods for data collection, and thorough data reporting. The 4 studies which came from one division of medicine, epidemiology, probably demonstrate the research experience in this field.

3. Type of Journal and Research Setting - Twenty-one (84%) of the studies were copied from journal publications with a clinical focus, and only 3 studies came from administrative journals. The administrative journals

contained a large number of articles discussing cost. However, they did not contain actual research studies with complete data reports. Therefore, the majority of research studies, even on the cost variable, were located in the clinical journals. Twenty-three (92%) of the research studies were conducted in hospital settings. To do precise cost comparisons, and collect data for cost analysis, control over the methods are necessary. It is more difficult to institute controls in a home care or outpatient setting than in an institutional setting such as a hospital.

4. Question Type - The question type, either implicit or explicit, was determined by how clearly the cost variable was addressed in the research design. Some of the studies included enough information about the cost of care and supplies to calculate a percentage of cost savings, but the focus of the research was not always cost. Fourteen (56%) of the studies clearly addressed cost in the research question, and therefore the research question was coded as explicit. Eleven (44%) of the studies included cost information, but cost was not part of the main research question; therefore, these study were coded as implicit.

5. Number of Authors and Authors' Education and Discipline - The majority of these studies, 19 (76%), listed more than 3 authors. The first-listed author's discipline included 10 medical physicians and 7 nurses. The remaining research studies first-listed authors came from a variety of other

disciplines. Seventeen (68%) of the first-listed authors held doctorate degrees, and 4 held master of science degrees. These are not unusual findings for health care research.

6. Funding for the Study - Eleven (44%) of the studies reported the source of funding for the study. The remaining studies did not provide information about funding, and the reader must assume the researcher or institution funded the study. With increasing economic pressure surrounding the health care industry, those professionals who depend upon research results will require funding information to determine possible motivation behind cost research.

7. Location of Research and Subjects' Socioeconomic Status - This review did not locate a center where cost is a focus for research; the research locations were spread evenly throughout the United States. The socioeconomic status of the research subjects was not reported in any of the research studies.

Substantive Variables

The substantive variables focus on a particular aspect of cost reduction. For this study, the substantive variable, cost, has been further divided into 5 categories. The separate categories provide a means of studying this variable in greater detail. The five categories are:

1. Reduction in time - Two (8%) of the studies reported the benefits of providing more care "time" for patients recovering from illness. Both studies found providing more care early in the illness period ultimately resulted in improved patient status and cost savings. This is an example of nursing knowledge, learned by trial and error, and taught in nursing schools for years. These studies provide scientific data showing that early interventions are cost effective.

2. Supplies - Five (20%) of the studies evaluated patient care supplies. The average savings reported for these 5 studies is 34%, and range from 12% to 71%. Even the smallest reported savings of 12% would be considered remarkable by industrial standards. These studies demonstrate the possible contributions nursing research could make toward reducing patient care costs.

3. Equipment - One study (4%) reported a 71% savings by cleaning transducers with alcohol versus ethylene gas. Differences in infection rates were not significant.

4. Change in caregiver - None of the studies examined the cost benefits of a change in caregiver. Several studies in the original sample of 68 reported the cost benefits of using nurse practitioners, but those studies lacked certain criteria for inclusion in this review.

5. Methods - Twelve (48%) of the studies examined methods. Nine of these studies compared the cost of the intervention versus not providing the intervention. Seven of the 9 studies then evaluated outcome criteria related to treatment versus no treatment. Two studies concluded that the "no treatment" condition resulted in cost savings: however, both of these studies ignored the ethical and quality of life issues. For example, one study concluded society could save money if it incurred the judicial, and medical expense of drug addiction versus the cost of drug rehabilitation programs. The study failed to include the cost of caring for the children and family members of drug addicts or consider other problems associated with drug addiction. Seven of the 9 studies examining treatment versus no treatment demonstrated that providing the intervention ultimately resulted in cost savings. Outcome criteria included long term cost comparisons, comparing the length of the hospital stay and functional ability tests.

Three of the studies coded under "methods" examined new criteria for making decisions about admissions and treatment modes. They found standardized decision models reduced the unnecessary use of some treatments, i.e., oxygen in the emergency room, and intensive care admissions in the pediatric setting and serial electrocardiogram tracings.

Percentage of Cost Savings

The dependent variables were reported in a variety of ways in the individual reports. Reported cost savings were calculated in a percentage of

decrease cost or cost savings from each study. Table 2 presents each of the 25 studies with its independent and dependent variable and percentage of reported cost saving.

Figure 2 shows a bar graph of percent savings of the studies listed by subject number and Figure 3 depicts the percentage range. Eight of the studies reported a savings between 10% and 20% as a result of the research intervention and are shown in Figure 3. Four of the studies reported a cost savings between 70% and 80%. The mean percent savings for the 25 studies is 34%.

Effect Size Calculations

Five studies contained the necessary data for collection of Glass's effect size measurement named Delta. This formula is:

$$\text{Delta} = \frac{(\text{mean of experiment group}) - (\text{mean of control group})}{\text{standard deviation of control group}}$$

Table 3 shows the calculations for the Delta effect size for the 5 studies for this review. The negative sign reported indicates the effect on cost was a negative effect or a cost reducing effect. To determine a cumulative effect from the 5 studies, a simple mean of the 5 Delta scores was calculated. Therefore, the cumulative negative effect upon cost from these 5 studies is .18. Generally, any effect size less than .20 is considered small.

Glass's Delta effect size score or unit of measure is a standard deviation score. To analyze this score, one can refer to a normal

Table 2

Independent and Dependent Variables and Cost Savings (N = 25)

Subject Number	Independent and Dependent Variables	Cost Savings
1.	Studied the cost of drug treatment versus the cost of patient's negative behaviors.	27% savings if drug treatment program is closed.
2.	Studied current guidelines for administering oxygen versus new guidelines.	22% savings using new guidelines.
3.	Studied nurses overtime hours with traditional shift rotation versus flexible schedules.	29% savings in overtime pay with flexible shift schedules.
4.	Studied a decrease in patient's length of stay when self-care is a focus versus traditional nursing care.	6% decrease in the length of stay for the number of patients with hospital stays longer than 8 days.
5.	Studied the cost of a lifetime of exercise versus cost of heart disease treatment.	38% savings by paying cost of treatment versus cost of exercise program.
6.	Studied the correlation between amount of nursing care time with patient's subsequent improved functional status and cost savings.	9% cost savings from reduced labor costs by giving more unskilled labor in Period II compared to Period I.

Table 2 (Continued)

Subject Number	Independent and Dependent Variables	Cost Savings
7.	Studied the length of stay with traditional treatment for heart attack patients versus the length of stay with Streptokinase therapy.	9% decrease in the length of stay with Streptokinase versus length of stay for patients with traditional treatment.
8.	Studied cost and effectiveness of subcutaneous versus intramuscular vaccine.	76% savings using subcutaneous.
9.	Studied cost of EKG tracing for diagnosis versus algorhythm and enzyme studies.	47.2% fewer labor hours using algorhythm and enzymes studies.
10.	Studied cost of mammography screening versus cost of later treatment.	73% cost savings by use of screening.
11.	Studied the present practice for discharging patients versus use of a new discharge protocol.	13% savings on hospital costs using new discharge protocol.
12.	Studied the cost of care for children who viewed surgery preparation video versus cost of care for children who did not view video.	11.9% savings in cost of care for children who viewed video.

Table 2 (Continued)

Subject Number	Independent and Dependent Variables	Cost Savings
13.	Studied cost and effectiveness of cleaning transducers with alcohol versus cleaning with ethylene oxide.	71% savings cleaning with alcohol versus ethylene oxide.
14.	Studied cost of seal-junction catheter plus prophylactic antibiotic versus cost of treating infections.	32% savings using seal-junction and prophylactic antibiotics.
15.	Studied the present system of admission to Pediatric Intensive Care Unit to a new set of admission guidelines.	18.15% savings in patient care costs using new admission guidelines.
16.	Studied the length of stay when physical therapy which was available only 5 days per week versus it was available 7 days per week.	16% savings in hospital costs when physical therapy was available 7 days per week.
17.	Studied rigid disposal system versus present cardboard box disposal system.	71% savings in cost associated with needlestick injuries.
18.	Studied non-sterile glove costs for non-invasive procedures versus sterile glove costs for burn patients.	42% savings using non-sterile gloves.

Table 2 (Continued)

Subject Number	Independent and Dependent Variables	Cost Savings
19.	Studied costs using present standards for disposal of multi-use medication vials with new disposal standards.	12% savings using new standards for disposal.
20.	Studied the cost of four intravenous drug delivery systems.	13.8% savings using "CRIS" delivery system.
21.	Studied current use of prophylactic antibiotic with gynecological procedures with new guidelines for single use regimen.	63% savings by restricting certain procedures to single dose regimens.
22.	Studied cost difference between first screening versus just vaccinating all hospital employees.	13% savings in certain hospitals using screening first.
23.	Studied the difference in length of hospital stay between patients who received routine nutritional support versus specialized nutritional support.	17% savings in hospital costs by providing specialized nutritional support.
24.	Studied patient care costs for patients who had services of utilization review versus patients who did not have services of utilization review.	40% savings in patient care costs for patients who had utilization review services.
25.	Studied cost of ova and parasite studies plus bacterial stool cultures versus clostridium difficile culture only in cases of nosocomial diarrhea.	60% savings reported by eliminating ova and parasite and routine bacterial cultures for nosocomial diarrhea.

Note. See Appendix A for a list of studies with subject numbers.

Figure 2. Percentage of Savings Reported in Individual Research Studies.

Figure 3. The number of studies are graphed by a percentage range.

Table 3

Glass's Effect Size Calculations (n = 5)

Subject Number	Author of Study	Effect Size Calculation	Glass's delta
4	Friedman (1988)	$d = \frac{5.30-5.23}{3.07} =$	.02
7	Hopkins (1989)	$d = \frac{9.8-11.0}{3.9} =$	-.31
16	Rapoport (1989)	$d = \frac{14.6-17.5}{23.0} =$	-.13
24	Weinsier (1985)	$d = \frac{39-36}{19} =$	-.37
25	Wickizer (1989)	$d = \frac{6.0-6.4}{4.2} =$	-.10

Note. The negative sign means that the interventions resulted in a decrease in cost or a negative effect on cost.

distribution or Z table. A Z score of .18 falls at the 43rd percentile.

Therefore, the average cost of a group receiving the research interventions was at the 43rd percentile, or the interventions moved patient costs from the 50th percentile (baseline) to the 43rd percentile. In other words, if the average group would fall at the 50th percentile in terms of cost, with the research interventions the same group would fall to the 43rd percentile of a non-intervened group.

Test for Significance

Wolf's (1986) formula for calculation of the overall test of significance was used for the average effect size. The formula for the confidence interval is: $\text{interval} = \text{mean} \pm 1.96 \times \text{standard error of the mean}$. For this study the calculation is: Confidence interval = $-.18 \pm 1.96 \times .07$, producing a confidence interval of $-.32$ to $-.04$. This interval does not span zero at the .05 level, and therefore the mean cost-reducing effect of these interventions is considered significant. Using this formula, one can be 95% confident that the cost-reducing effect found for this sample is the result of the interventions and not random sampling error. So, even though this cumulative cost reducing effect of $-.18$ is small, one can be 95% confident that it is the result of the research interventions.

One can conclude that research based solutions for reducing health care cost are available. In fact, there are approximately the same number of studies including a cost variable as studies addressing other specific topics within the area of nursing care. This study also found the cost-reducing effects proven by research techniques to be on the average, small, but statistically significant.

Chapter 5

CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to determine the status of a cost reduction variable in the selected body of nursing research. The quantitative methods of meta-analysis were used to combine results and determine a cumulative effect size. In addition, variables included in the selected research were examined for trends.

Scope and Limitations

The definitions of coded or measured variables partly determine the scope and limitations in a meta-analysis study. The operational definitions in this study were developed from the conceptual framework. A broad definition of variables gives the researcher fewer limitations. However, the results may not be applicable to the full population. For example, this review included studies from the entire field of nursing, but the mean cost savings cannot be applied to the entire field. Taking a sub-set of studies, such as hospital studies, makes better sense when discussing the application of the cost saving effect.

A review of studies does not allow the researcher to expand the scope of the research. The limitations found in the primary studies are incorporated into the meta-analysis (Smith, 1988). The data analysis refers

to this particular set of studies and cannot be generalized to other data sets (Glass, 1981).

The independent variables in meta-analysis are characteristics the researcher believes are related to the experimental outcome. Therefore, these variables reflect the perspective of the researcher conducting the meta-analysis review (Smith, 1988). This study did not evaluate the quality of the dependent variables. The outcome measures utilized by the primary researchers are considered equal in this review.

The question of equivalence between published and unpublished research must be considered. Publication bias is the term used to discuss differences between published and unpublished research. There is evidence that research studies producing support for the favored hypothesis are more frequently selected for publication than those studies which support the null hypothesis (Glass et al., 1981, p. 64). A publication bias was accepted in this study, the results represent material available to the majority of clinical nurses.

Integrating and analyzing data is valuable in designing future research and evaluating the quality and utility of present research (Glass et al., 1981, pp. 12, 23). This generalized picture of cost containment research is useful to individuals working with the financial aspects of nursing care.

Conclusions

This review showed cost reduction has been addressed as frequently as other specific topic variables in the field of nursing. This is a different conclusion from two previous meta-analytic reviews in nursing. Probably the best explanation for this difference in findings is the difference in defining the subject topic between the three studies. Smith (1988) studied multiple nursing interventions and reviewed cost as a possible variable among that set of data. Cruise et al. (1989) reviewed research on urinary incontinence and included cost as a possible variable. Nursing interventions and urinary incontinence are both variables which define or limit the body of research being reviewed. The variable, cost, spans the field of nursing to a greater extent than other specific topics. This review included any aspect of patient care with which nurses are involved and about which they make decisions. Administrative studies involving nursing hours and overtime costs, program evaluations and specimen collection modes are examples of studies included in this review which would not be grouped with a more narrow selection of research. If the variable, cost, does cover a broader span of research than other topics, it could be argued that the 25 studies in this review are actually a very small number of studies. Again, it is necessary to consider that the subject topic, cost, is not a traditional topic of study in nursing. Interest or concern over the cost of nursing care was not

introduced into nursing schools until after 1978. It is unlikely that clinical nurses and nurse researchers practicing during the 1980's would have viewed cost as a subject variable in the same way as would nurses educated and practicing today.

Another area where this set of meta-analytic research may differ from other nursing research reviews is in the number of authors. Abraham et al. (1992) noted the majority of reports on nursing intervention studies included in that review had single authors, and seldom did the number of authors exceed three. Nineteen (76%) of the studies included in this review listed more than three authors. This may be due to the extra variable cost needed for inclusion in this review. Adding an additional variable, such as cost, to a research topic does increase the work of data collection and analysis. This added component of data collection and reporting may be excluded from studies conducted by a single researcher.

It is noteworthy that several of the interventions studied in this body of research are now the accepted practice in the clinical setting. Examples of study interventions which are in common practice include flexible schedules for nurses, mammography screening, hard plastic needle disposal systems, and non-sterile gloves in burn units.

This review includes data from studies conducted in outpatient settings and inpatient hospitals. Because these studies cover the entire field

of nursing, one cannot logically apply the mean savings to one patient care environment. However, if one takes a sub-set of the 20 studies which are hospital based, there is a mean savings reported at 30%. A hospital which instituted these 20 cost saving interventions could save 30% in these areas. In some cases, this might be a 42% reduction in the cost of gloves and 22% reduction in the cost of oxygen tubing in the emergency room. However, application should not be the only rule for evaluating research results. A major problem with this body of research is the lack of a standard reference point for the results. Twenty (80%) of these cost studies did not provide standard scores or data to calculate a standard score. Thus, it is not possible to know whether a 22% savings in the cost of oxygen tubing in the emergency room is a large or a small savings. To make decisions, administrators need greater detail and a standard of reference.

The fact that 21 of the original 68 studies failed to contain research design data needed for this review is of concern. Failure to use scientific design for data collection and the lack of critical data greatly limits the use of research findings, and this limits the interpretations which can be made. Nursing has an increasing number of professionals able to conduct research; it would be helpful to establish detailed standards for conducting research. Setting professional standards for data collection and reporting would improve quality in this area of research. Following such standards would

facilitate methodological verification and replication of this type of study by other investigators.

Recommendations

Reducing the cost of care is a focus for health care consumers today, and therefore important to the nursing profession. Adding a cost variable to future research projects could accomplish a great deal toward building research based answers to cost reducing problems. Exploring the methods of cost research conducted by other disciplines appears to be a logical step at this point. Nurse researchers may want to take advantage of expertise outside of nursing. Disciplines such as industrial engineering, business accounting, and marketing development may have helpful experience in researching cost reduction. However, the intimate knowledge of patient care and access to the patient care environment should remain with the nursing profession, and patient care research should be completed by nurse researchers.

The nursing profession can strengthen the research base by establishing standards for conducting such research and reporting the data. Individual nurses can continue to replicate and conduct small studies. While nurse researchers with greater research knowledge and statistical expertise quantitatively combine these small research projects, and increase the research base for nursing practice at a faster pace.

Finally, the storage and management of nursing research data needs to be compiled in a national library computer system. Once computer access of research data is accomplished, combining data on research variables will be simplified.

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APPENDIX A

List of Subjects

Appendix A

Subject N.

List of Subjects

1. Anglin, M., Speckart, G., Booth, M., & Ryan, T. M. (1989).
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APPENDIX B
Sorting Worksheet Round A

Appendix B

Sorting Worksheet Round A

Inclusion and Exclusion Criteria

Round A Studies accepted in Round A will be kept in the data set.

- 1A. Research design can be determined.
- 2A. The findings and sample description are present.
- 3A. Study meets the definition of nursing care.
- 4A. Study meets the definition of cost containment.
- 5A. Study contains data to calculate frequencies and percentages.

Studies accepted in Round B will be kept to form the corpus of studies for this review. Quantitative data from each study on both methodological and substantive variables will be prepared from this set of studies.

APPENDIX C
Sorting Worksheet Round B

Appendix C

Sorting Worksheet Round B

Round B Criteria for effect size calculations.

- 1B. Quasi or experimental design
- 2B. A means of measuring the dependent variable
- 3B. Sample size is greater than 10
- 4B. Contains either probability, mean and standard deviations, correlation
co-efficient

A - Accept

R - Reject

Studies meeting these criteria will have Glass's Delta effect size measure calculated. A cumulative effect and an overall test of significance will be prepared.

APPENDIX D
Coding Worksheet

Coding Worksheet

Missing data - 999

Variables
Code

Comments

Ref Citations (APA format)SubnoMETHODOLOGICAL VARIABLES

1. Publ Year	1. 1985 2. 1986	3. 1987 4. 1988	5. 1989
2. Source	1. Professional Journal	2. Book	
3. JRNLDISC Education Discipline of the journal	1. Engineering 3. Business 5. Nursing 7. Other	2. Health 4. Medicine 6. Sociology	
4. JRNLTYF Journal type	1. Clinical 3. Research	2. Administration 4. Other	
5. QUESTYP Research Question Type Type	1. Implicit 3. Not reported	2. Explicit	
6. AUTHED Author's Education	00. Not available 1. Bachelors 3. PHD	2. Masters 4. Other	
7. AUDISCP Author's Discipline Education	1. Engineering 3. Business 5. Medicine	2. Nursing 4. Health	
8. NAUTH Number of authors	1. One 3. Three or more	2. Two	
9. FUND Funding for study	1. Yes 3. Unknown	2. No	

10. RSLOCLE Location of Research	1. Northeast 3. Midwest	2. West 4. South
11. RESSET Research Setting	1. Hospital 3. Clinic 5. Other	2. Home 4. Laboratory
12. SES Subjects Socioecon Status	1. Under 10,000 3. 30,000-49,999 5. 70,000+	2. 10,000-29,999 4. 50,000-69,999 6. Not reported
13. DSCPCAR Discipline of caregiver	1. MD 3. NA 5. Family	2. RN 4. Self 6. Other

SUBSTANTIVE VARIABLES Code

14. TIMRED Reduction in time care	00. Not applicable 1. More hours of care	2. Less hours of
15. SUP Supplies	00. Not applicable 1. Easier to use 3. Decreased amount	2. Decreased 4. Other
16. EQUMNT cost Discipline of	00. Not applicable 1. Easier to use 3. Decreased amount	2. Decreased 4. Other
17. CNHCARGV Change in caregiver	00. Not applicable 1. MD RN 3. RT PT OT RN	2. Other Med Assistant
18. EQUITYPE Equipment type admin.	00. Not applicable 1. Monitoring 3. Comfort 5. Maintain sterile	2. Therapy 4. Med. Nur. 6. Wound care
19. METHOD Method change	00. Not applicable 1. Change in amount 3. New method	2. Other