

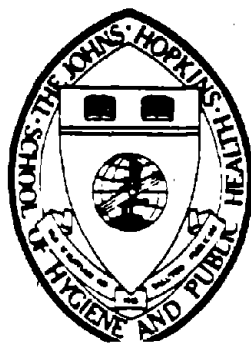
LOW BACK INJURIES AMONG NURSING PERSONNEL



AN ANNOTATED BIBLIOGRAPHY



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PUBLIC HEALTH

REPORT DOCUMENTATION PAGE	1. REPORT NO.	2.	3. Recipient's Accession No. PB89 186498/AS			
4. Title and Subtitle Low Back Injuries among Nursing Personnel. Annotated Bibliography	5. Report Date 00/00/00		6.			
	7. Author(s) Jensen, R. C., D. Nestor, A. H. Myers, and J. Rattiner		8. Performing Organization Rept. No.			
8. Performing Organization Name and Address Division of Safety Research, NIOSH, Morgantown, West Virginia	10. Project/Task/Work Unit No.		11. Contract (C) or Grant(G) No. (C) (G)			
	12. Sponsoring Organization Name and Address					
12. Sponsoring Organization Name and Address	13. Type of Report & Period Covered		14.			
	15. Supplementary Notes					
16. Abstract (Limit: 200 words) This annotated bibliography was been prepared on research concerning low back injuries among nursing personnel. It included abstracts of 90 documents, including four articles that provide a synthesis of multiple studies on a particular issue, 12 state of the art reviews, and 74 articles that report original research on the topic. The studies reported were summarized in terms of five categories: type of investigation, workers studied, measurement methods, findings about suspected risk factors, and findings about programs for reducing risk. There were four major types of investigations including cross sectional surveys, longitudinal studies, laboratory experiments, and field studies. One subject area in which there was very little research was home health care nursing. Measurement methods employed included surveys or consulting employer records of injuries and compensation claims. Inconsistent results were obtained by studies on risk factors; personal factors such as age and gender were the most widely studied. Approaches for reducing the risk have included training in patient handling and/or body mechanics.						
17. Document Analysis a. Descriptors b. Identifiers/Open-Ended Terms NIOSH-Publication, NIOSH-Author, Epidemiology, Back-injuries, Musculoskeletal-system-disorders, Safety-research, Accident-prevention, Accident-analysis, Health-care-personnel c. COSATI Field/Group						
18. Availability Statement	19. Security Class (This Report)	21. No. of Pages 1				
	22. Security Class (This Page)	22. Price				

ACKNOWLEDGMENTS

The authors wish to express their appreciation to several organizations that helped with the project. Funding was provided by the National Institute for Occupational Safety and Health (NIOSH). The Association of Schools of Public Health (ASPH) provided the administrative mechanism for establishing the cooperative agreement that made this project feasible. Finally, the Injury Prevention Center at The Johns Hopkins University provided invaluable support throughout the project as well as serving as publisher and distributor.

A number of individuals made valuable contributions to the project. Dr. Murray Cohen of NIOSH's Division of Safety Research was the primary driving force that led to the establishment of the cooperative agreement between NIOSH and The Johns Hopkins School of Public Health. The authors are also indebted to the following individuals who provided insightful reviews of the draft manuscript: Monique Lortie, Sc.D., University of Quebec at Montreal; Bernice Owen, Ph.D., University of Wisconsin - Madison; and Jacqueline Agnew, Ph.D., The Johns Hopkins University. Extremely valuable editorial support was provided by Susan Shock with the Injury Prevention Center at The Johns Hopkins University. And last, but not least, the authors thank the secretaries who typed the manuscript and cheerfully dealt with the numerous revisions, Polly Fiorini with NIOSH and Monica Helmbrecht with The Johns Hopkins University.

**LOW-BACK INJURIES AMONG NURSING PERSONNEL:
AN ANNOTATED BIBLIOGRAPHY**

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ABSTRACT

Work-related back injuries contribute about 25 percent of all workers' compensation claims. Among the occupational groups with the greatest back injury rates are nursing personnel, i.e., nurses, nursing assistants, nursing aides, and orderlies. In an effort to minimize the risk of back injuries to nursing personnel, health care organizations often establish committees to deal with this problem. One of the first activities of such committees is to search the literature for information about risk factors and approaches for reducing the risk of back injury. These informal literature reviews are performed by dozens of committees each year, and each review is essentially a repetition of work already performed by committees at other health care facilities. To reduce the time and resources spent on reviews, and also aid researchers and other interested occupational health and safety professionals, an annotated bibliography has been prepared on research concerning low-back injuries among nursing personnel. It includes abstracts of 90 manuscripts consisting of four articles that provide a synthesis of multiple studies on a particular issue, 12 state-of-the-art reviews, and 74 articles that report original research on the topic. The studies reported in these articles have been summarized in terms of five categories: type of investigation, workers studied, measurement methods, findings about suspected risk factors, and findings about programs for reducing risk. Some of the most noteworthy patterns and trends are indicated below:

1. The types of investigation used in the studies consisted of cross-sectional surveys (45%), longitudinal studies (34%), laboratory experiments (12%), and field studies (11%).

2. **Workers studied in most of the cross-sectional surveys have emphasized nurses working in hospitals. The retrospective injury data studies have emphasized comparisons between occupational groups including the nursing personnel groups as well as other occupational groups. Workers in the home nursing field have been ignored by researchers.**
3. **The measurement methods used in the epidemiologic studies for assessing health (prevalence or incidence rates) have been based on either surveys or employer records of injuries and workers' compensation claims. A few attempts to measure exposure of nursing personnel to physical stressors on the job have been reported, but there has been little agreement among researchers as to the most appropriate methodology.**
4. **Findings about factors that may affect risk have not been consistent. The most studied personal factors have been age and gender. Of the job factors, exposure to patient handling has been studied most.**
5. **Approaches for reducing risk have been mentioned by many authors, but studied by few. Training in patient handling and/or body mechanics was included in 16 studies. Patient-handling techniques have been compared in seven studies. Only four studies investigated devices for patient handling.**

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INTRODUCTION

Work-related back injuries contribute about 25 percent of all workers' compensation claims (Klein, Jensen, & Sanderson, 1984). These injuries are not distributed evenly among the numerous occupational groups (Jensen, 1987; Magora & Taustein, 1969; Cust, Pearson, & Mair, 1972). Among the occupational groups with the greatest back injury rates are nursing personnel, i.e., nurses, nursing assistants, nursing aides, attendants, and orderlies (Klein et al. 1984).

The research literature on back injuries among nursing personnel has been growing rapidly during the 1980s. This makes it difficult to keep up with the literature. In order to assist others in locating studies on the topic, a project was initiated to develop an annotated bibliography on back injuries among nursing personnel. There are at least two groups of individuals who could benefit by having access to a comprehensive annotated bibliography on the subject: occupational health and safety professionals working with employees in healthcare settings, and researchers.

Committees are often established within hospitals and other health care facilities in an effort to minimize the risk of back injuries to nursing personnel. An example of this approach is described by McKechnie (1985). One of the first activities of such committees is to search the literature for information about risk factors and approaches for reducing risk. These

informal literature reviews are performed by dozens of committees each year, and each such review is essentially a repetition of work already performed by committees at other health care facilities. Clearly, health and safety professionals participating in these committees would benefit from the availability of a comprehensive annotated bibliography. It would serve to both minimize the time spent on these informal literature reviews and extend the scope and depth of these reviews.

A second group of individuals who would benefit from an annotated bibliography are researchers who intend to study some aspect of the nursing back injury problem. A summary of the research literature on back pain among nursing personnel will help researchers identify research methods that have been used in prior studies, as well as helping them determine what has already been learned about particular factors.

METHODS

A list of articles on the topic of low-back injuries among nursing personnel was obtained using searches of computerized literature data bases. The search used NIOSHTIC, CIS, and MEDLINE. The strategy was to find articles having to do with back problems and workers in the health care industry. The earliest article found in these searches was by Peter Buckle (1967). This article indicated a lack of research on nursing and back pain prior to 1967. Consequently, for this annotated bibliography, only articles published during or after 1967 were included.

The computerized literature files are not always current or comprehensive. Consequently, the search was extended to manual reviews of the journals where studies on this topic have typically been published. Personal communication with individuals who have reported studies on the topic also led to the identification of articles and books that were published in 1987 or were accepted for publication in 1987 and scheduled for publication in early 1988. Some of the more recent articles cited older articles that were not found in the computer files. A number of papers published in conference proceedings were also found.

These articles identified in the initial search were screened to identify those that satisfied four criteria: (1) presented new data or a synthesis of a select group of studies (2) concerned back injuries or back pain, (3) dealt specifically with nursing personnel, i.e., nurses, orderlies, nursing assistants/aides/attendants, student nurses, and workers with other job titles who do similar work such as "ward sisters", and (4) were published between 1967 and 1987. Articles that were marginal in terms of meeting these requirements were included, rather than excluded, in order to help readers with diverse interests. For example, the requirement that the article report new data was interpreted broadly so as not to exclude articles that simply report injury data from a particular hospital, or describe attempts to reduce the frequency of back injuries. Similarly, articles were included if the study concerned the entire back or just the lower back. As to the time of publication, in addition to the years 1967 to 1987 one article known to be in press as of December 1987 was included.

Selected literature summaries were also abstracted. These included articles or books that attempted to describe the state-of-the-art on a topic relevant to nursing and back pain. Only those reviews with substantial documentation were included. Articles that were mainly based on the authors opinions, and simplistic "how-to" articles were excluded.

A procedure for assuring correctness of the abstracts was followed. Each article was abstracted by one of the four authors of this report. Another one of the authors then read the original article and checked the abstract. Those articles that were written in French were subsequently checked by a French speaking researcher who authored several of these papers, Dr. Monique Lortie of the University of Quebec at Montreal.

For purposes of summarizing the quantity of studies that used particular methods or investigated certain factors, a difficulty arose in instances where one study was described in more than one article. To deal with this, the numerical summaries have been based on a count of studies rather than articles. There were two instances in which a single study was described in two articles. The first study was reported as one article concerning the research methodology (Alavosius & Sulzer-Azaroff, 1985) and a second article concerning the effect of the intervention (Alavosius and Sulzer-Azaroff, 1986). The second study was a questionnaire survey that was initially reported with data presented in simple tabular form (Harber et al. 1985), with a subsequent article reporting the results of a more sophisticated statistical modeling analysis (Harber, Billet, Lew, & Horan, 1987). In both cases the dual article reports were counted as single studies. There were four

instances in which one article described two original investigations (Bell, 1984; Dehlin & Jaderberg, 1982; Owen, 1987; and Torma-Krajewski, 1987b). In these latter cases, each article was counted as two studies. The net result of this approach was that there were 74 articles that described 76 studies. A summary is provided in the following tabulation.

<u>DESCRIPTION OF SOURCE</u>	<u>NUMBER OF ARTICLES</u>	<u>NUMBER OF STUDIES</u>
one article, one study	66	66
one article, two studies	4	8
two articles, one study	<u>4</u>	<u>2</u>
Totals	74	76

There were also a few articles in which a researcher provided a synthesis of multiple studies that may have been reported in individual journal articles. These "synthesis" articles were not counted as studies for the purpose of tabulating the number of studies of a particular kind. There were four of these synthesis articles (Gagnon & Lortie, 1987; Lortie, Gagnon, & St-Vincent, 1987; Owen, 1986; Venning, 1987). Also included among the abstracted articles were 12 state-of-the-art review articles. Thus, the 90 abstracted articles consisted of 74 reports of original research, four synthesis papers, and 12 state-of-the-art review articles.

Each article is summarized on a separate page beginning with lines for author(s), title, and publication. Below these lines is a narrative describing the content of the manuscript. For those articles not in English, the original title is followed by an English title in brackets. The research

articles and the synthesis articles are found on pages 27 to 107, arranged in alphabetical order by first author. The state-of-the-art review articles are on pages 107 to 118.

In order to facilitate the identification of articles that used certain methods or investigated certain factors, a taxonomy is used. The taxonomy consists of the following main topics:

- Type of investigation,
- Population studied,
- Measurement methods,
- Findings about suspected risk factors,
- Findings about programs for reducing risk.

Within these five topic areas are specific classification categories. For example, the "type of investigation" may have been an experimental study or an observational study. If it was experimental it may have been an experiment conducted in a laboratory or an experiment conducted in an actual workplace such as a hospital.

The grid on pages 23-26 shows which categories apply to each article. The columns are for the individual articles as denoted by the author(s) and year of publication. The rows of the grid are for the categories. A black circle at the intersection of a row and column indicates that the category applies to the article. As an illustration, consider someone wishing to locate experimental studies conducted in a laboratory. One can quickly search the grid by reading across the "laboratory" row, and for each black circle in the row noting the

author(s) and year of the article as shown at the top of the column. Then the narratives in this bibliography can be read to help determine which articles would be worthwhile to read.

RESULTS

Results of the analyses of the research articles are summarized in the following text in terms of five categories: 1) type of investigation, 2) workers studied, 3) measurement methods, 4) findings about suspected risk factors, and 5) findings about programs for reducing risk. After the text is the four page grid (pages 23-26) showing the cross-tabulation of the articles and the information in the articles.

Type of Investigation

The type of investigation used in each study was categorized as either experimental or observational. Investigations were classified as experimental if the investigator or employer presented subjects with certain new conditions and effects were measured. Within the experimental category the studies were further classified as either laboratory or field experiments. The laboratory category applied to experiments in which an attempt was made to simulate some aspect of the job in a place other than the subjects' regular workplace. The experiment was classified as a field experiment if it was conducted in a real worksite where the investigator or employer changed at least one factor and attempted to assess the effect of the change.

The observational category was used for investigations in which conditions were not changed by the investigators or an employer. These studies were classified as cross-sectional or longitudinal. Cross-sectional studies were defined as those in which the data about each individual were collected at one point in time. Longitudinal studies were defined as investigation in which the data were collected from either (a) historical records kept before the investigators identified the individuals in the study population (retrospectively) or (b) during a period of follow-up after identifying the individuals in the study population (prospectively). Figure 1 summarizes the categories and shows the number of studies in each investigation category.

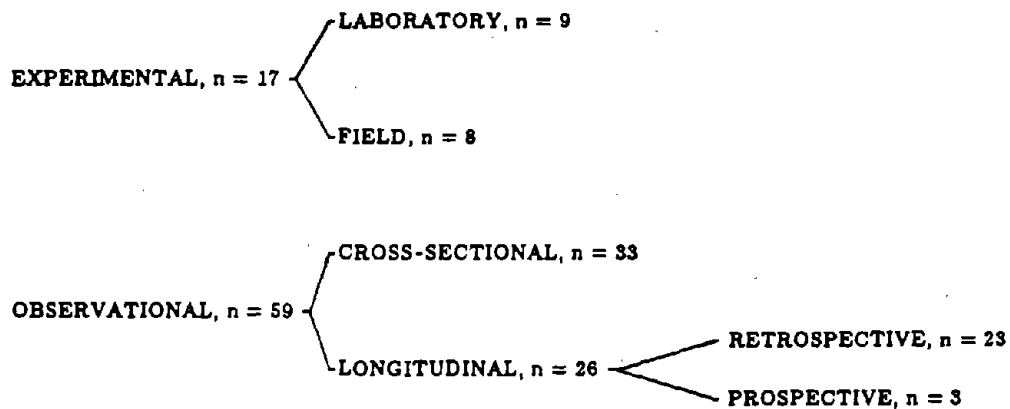


Figure 1. Number of studies utilizing particular types of investigation.

There were seventeen experimental studies. Of these, nine were performed in a laboratory, and eight were conducted in a health care facility. Those performed in laboratories evaluated the effects of training in procedures for patient-handling (Bell, 1984; Dehlin, 1982; Troup & Rauhala, 1987), and compared different patient-handling procedures in terms of biomechanical stressors (Dehlin & Linberg, 1975; Gagnon, Sicard & Sirosis, 1986; Gagnon, Chehade, Kemp & Lortie, 1987; Owen, 1985; Poll, 1987; Stubbs, Buckle, Hudson & Rivers, 1983).

The experimental studies conducted in health care facilities attempted to evaluate the effects of selected safety programs. Effect measures included number of back injuries caused by interaction with patients (Wood, 1987), psychophysical judgments of nursing personnel (Dehlin et al. 1978; Dehlin et al. 1981), intra-abdominal pressure (Scholey, 1983), observed patient-handling behavior (Alavosius & Sulzer-Azaroff, 1985, 1986; Klein, 1987; and St-Vincent et al. 1987), and knowledge of the contents of a back care training program (McKechnie, 1985). Programs evaluated were strength training (Dehlin et al. 1978), classroom type training (Dehlin et al. 1978; McKechnie, 1985), ergonomic counseling (Dehlin et al. 1981), physical fitness training (Dehlin et al. 1981), general training that emphasized the straight back, knees bent method of lifting (St-Vincent et al. 1987), personal feedback (Alavosius & Sulzer-Azaroff, 1985, 1986), personal feedback on patient handling technique followed by one-hour classroom program (Wood, 1987), and classroom plus hands-on practice type training in patient-transfer techniques (Klein, 1987; and Scholey, 1983).

The observational studies were split between 33 cross-sectional surveys and 26 longitudinal studies. Of the cross-sectional surveys, 15 relied exclusively on a questionnaire to elicit information, 9 relied exclusively on personal contact between a member of the research team and the population being surveyed, and 9 surveys used both means for obtaining information. Of the longitudinal studies, 23 were retrospective analyses of injury data, and three were prospective studies.

Workers Studied

The epidemiologic studies were classified according to the occupation of the subjects studied and the industry of their employer. Laboratory studies were classified according to the health care occupations and industries for which the results were intended to apply.

Many of the cross-sectional surveys focused on nurses. For the taxonomy the occupational category nurses includes Registered Nurses, Licensed Practical Nurses, Licensed Vocational Nurses, and similar professional personnel in countries that use different occupational titles. The majority of these were restricted to nurses working in hospitals (Arad & Ryan, 1986; Baty et al. 1985; Bell, 1979; Cassou & Gueguen, 1985; Cust et al. 1972; Cust, 1976; Harber et al. 1985; Harber, Billet, et al. 1987; Harber, Shimozaki, et al. 1987; Kaur & Pedersen, 1986; Mandel & Lohman, 1987; Owen & Damron, 1984; Prezant et al. 1987; Skovron, Mulvihill, et al. 1987; Stubbs et al. 1981 and 1986; Takala & Kukkonen, 1987; Uhl et al. 1987; and Wachs & Parker, 1987). A few other cross-sectional surveys included nurses irrespective of their work

setting (Magora & Taustein, 1969; Raistrick, 1981; Stubbs, Buckle, Hudson & Rivers, 1983; Videman et al. 1984; and Vojtecky et al. 1987).

The retrospective injury data analyses have emphasized comparisons between occupational groups including the nursing personnel groups as well as other occupational groups. Some studies have included multiple occupational categories and multiple employer categories (Biering-Sørensen, 1985; Jensen, 1985, 1986a, 1986b, 1987; and Klein et al. 1984). Several retrospective studies have compared multiple occupational categories within one or more general hospitals (Ferguson, 1970; Greenwood, 1986; Hefferin & Hill, 1976; Hubley-Kozey et al. 1985; Liskin, 1984; Owen, 1987; Pines et al. 1985; and Stobbe et al. 1988). A few retrospective studies were limited to geriatric hospitals or geriatric wards of a general hospital (Baty et al. 1985; Imbeau & Lortie, 1984; Lortie, 1985a, 1985b, 1987a, 1987b; and Scholey, 1983).

The three prospective studies included nurses and nursing aides working in hospitals (Heap, 1987; Skovron, Nordin, Sterling, & Mulvihill, 1987; and Venning, Walter, & Stitt, 1987).

The occupational classification of workers included in the studies may also be summarized. Nurses were included in 51 studies, nursing assistants/aides in 54, student nurses in 21, and other occupational groups in 19 studies.

No studies of back injury problems among home care nursing workers have been found. Nursing personnel employed in this industry have been included in some of the retrospective analyses of injury data, but the only study that reported back injury data for home nursing was Biering-Sørensen (1985).

Measurement Methods

Methods of measurement were classified into two broad groupings, one for measuring exposure, the other for measuring the effect of that exposure on the health of the study population. Measures that did not fit within this scheme were noted in a category called "other."

Attempts to measure overall on-the-job exposure to physical and/or biomechanical stressors have been creative, with each investigation utilizing its own unique method. Altogether there were 37 studies in which the investigators attempted to characterize the exposure of nursing personnel. Of these, 18 relied on the workers to estimate their personal exposure, 19 studies included direct observation of the nursing personnel performing the work. One study relied on supervisory nurses to estimate patient-lifting frequency of the nursing personnel supervised (Stobbe et al. 1988). Three studies included the measurement of intra-abdominal pressure as an index of stressfulness of manual load handling and/or posture (Baty et al. 1985; Scholey, 1983; Stubbs, Buckle, Hudson & Rivers, 1983).

A few studies assessed discrete patient-handling tasks using quantitative measures. One study used the Borg Rating of Perceived Exertion scale (Dehlin & Jaderberg, 1982). Two studies measured forces at the feet of the nurse using a force platform (Dehlin & Linberg, 1975) or instrumented shoes (Kilbom et al. 1985). Two studies applied a static biomechanical model (Dehlin & Jaderberg, 1982; and Kahlil et al., 1987). Two studies used a dynamic biomechanical model (Gagnon, Chehade, Kemp, & Lortie, 1987; and Gagnon & Lortie, 1987). Three studies applied the criteria in the NIOSH Work Practices Guide for Manual Lifting (Poll, 1987; Torma-Krajewski, 1987a, 1987b).

The measurement methods for assessing the health condition of workers' backs (prevalence or incidence rate) have been based primarily on either responses to questionnaires or employer records of injuries and workers' compensation claims. There were 48 studies that used some measure of health. Of these, 21 were based solely on responses by the workers, and 22 used existing records exclusively. Five investigations used both sources of information about back pain/injury (Heap, 1987; Liskin, 1984; Skovron, Nordin, et al. 1987; Venning, 1987; and Venning, Walter & Stitt, 1987).

Findings about Risk Factors

Findings about factors that may affect risk have been classified as either personal factors or job factors. The most studied personal factors have been age and gender. There were 24 studies that reported some sort of findings about age and back pain/injury. There were 20 reports that included gender. Anthropometric factors, reported in 12 articles, included height, weight, obesity, and leg length discrepancy. There were nine studies that included information about whether members of the study population had experienced back problems prior to the time period investigated. Psychosocial factors were included in four studies. The specific studies may be identified from the grid.

Exercise and smoking are two interesting factors that are not shown on the grid. There were five studies that asked nursing personnel about their off-the-job exercise (Cassou & Gueguen, 1985; Harber, Billet, et al. 1987; Mandel & Lohman, 1987; Owen & Damron, 1984; and Videman et al. 1984). Smoking was included in the studies by Arad and Ryan (1986) and Owen and Damron (1984).

The job factor included in the most studies was patient handling. There were 48 studies that reported some results about patient handling, patient lifting, or patient transfers. Other activities performed by nursing personnel were included in 10 studies. The postures assumed by nursing personnel were included in five studies. Length of employment in nursing was included in eight studies.

Programs for Reducing Risk

Approaches for reducing risk have been mentioned by many authors, but studied by few. The approach most studied has been training. For this classification, training was defined as teaching nursing personnel about body mechanics and/or about specific patient-handling techniques that may involve less stress than other techniques. There were 16 articles that described attempts of one kind or another to assess the possible effects of training nursing personnel to safely handle patients. (Alavosius & Sulzer-Azarnoff, 1986; Dehlin, et al. 1981; Dehlin et al. 1978; Dehlin et al. 1976; Heap, 1987; Klein, 1987; Liskin, 1984; McKechnie, 1985; Raistrick, 1981; St-Vincent et al. 1987; Scholey, 1983; Stubbs et al. 1981; Stubbs, Buckle, Hudson & Rivers, 1983; Takala & Kukkonen, 1987; Troup & Rauhala, 1987; and Wood, 1987).

There were few studies concerned with devices for handling patients. Ceiling mounted hoists were studied by Kilbom, Ljungberg and Hagg (1985). The use of a belt to help raise a patient from a chair was studied by Gagnon, Sicard and Sirois (1986). Bell (1984) reported results of a series of investigations concerning the use of patient hoists in Great Britain. In Finland, Takala and Kukkonen (1987) investigated the use of portable patient

hoists. They found that hoists were rarely used on poorly organized wards, but regularly used on a ward that had a well-organized on-the-job training program.

Patient-handling techniques have been studied by several authors (Dehlin et al. 1976; Gagnon et al. 1986; Gagnon et al. 1987; Poll, 1987; St-Vincent et al. 1987; and Stubbs, Buckle, Hudson & Rivers, 1983). In addition, Takala and Kukkonen (1987) looked at different postures used by nurses when using patient hoists. Klein (1987) explicitly described alternative procedures for certain patient transfers and investigated whether nurses would use the preferred methods after a training program when performing these transfers on the wards.

The design of health care facilities to accomodate patient movement has considerable potential. Several authors commented on space limitations around patient beds and in bathrooms, as well as other architectural features (Ferguson, 1979; Khalil, et al. 1987; Torma-Krajewski, 1987a, 1987b; and Owen, 1987). Only one study was found that actually compared wards with a modern design feature, ceiling mounted patient hoists, to wards without the feature (Takala & Kukkonen, 1987).

The possible benefits of physical fitness programs were studied in two Swedish studies (Dehlin et al. 1978, 1981). Some other authors recommended that hospitals should support physical fitness programs for personnel most at risk of back injury (Khalil et al. 1987; McKechnie, 1985; and Torma-Krajewski, 1987a, 1987b). The study by Mandel and Lohman (1987) found that among the nurses in one Minnesota hospital, those who participated in aerobics classes three or more times per week were more likely to have back pain than other

nurses at the hospital. Results of studies, however, do not provide a clear message about the possible effectiveness of employer sponsored physical fitness programs in terms of reducing risk of back injuries among nursing personnel.

RECOMMENDATIONS

From the review of studies on nursing and back injury, several areas of research appear to have been given too little attention. The following five areas are recommended for increased emphasis in the future.

1. The types of studies have over-emphasized cross-sectional surveys and retrospective analyses of injury data. The greatest need for future studies is for prospective studies.
2. There also appears to be a need for more emphasis on home nursing and nursing homes, and less need for additional cross-sectional studies of nurses working in general hospitals.
3. The methods for measuring exposure to physical/biomechanical stressors on the job need to be improved. Specific studies on measurement methodologies would be very useful to both researchers and occupational health and safety professionals in the healthcare industry.
4. The factors included in risk factor studies have not provided enough evidence about job factors that might increase or decrease risk of a back injury; therefore, more studies of job factors are recommended.
5. Finally, laboratory studies of patient handling should not just look at manual techniques, the use of patient-handling devices also needs to be investigated.

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Exposure to back stressors																				
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 TROUP, RAUHALA 1987
 UHL, et al. 1987
 VENNING 1987
 VENNING, WALTER, STITT 1987
 VIDEMAN, et al. 1984
 VOJTECKY, et al. 1987
 WACHS, PARKER 1987
 WOOD 1987

TYPE OF INVESTIGATION		SKOVBRON, MULVIHILL, et al. 1987	SKOVBRON, NORDIN, et al. 1987	STOBBER, et al. 1988	STUBBS, ... RIVERS 1983	STUBBS, et al. 1984	STUBBS, ... WORTHINGHAM 1983	STUBBS, et al. 1981	TAKALA, KUKKONEN 1987	TORMA-KRAJEWSKI 1987a	TORMA-KRAJEWSKI 1987b	TROUP, RAUHALA 1987	UHL, et al. 1987	VENNING 1987	VENNING, WALTER, STITT 1987	VIDEMAN, et al. 1984	VOJTECKY, et al. 1987	WACHS, PARKER 1987	WOOD 1987
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ABSTRACTS OF RESEARCH ARTICLES

Alavosius, MP; Sulzer-Azaroff, B

An On-the-job Method to Evaluate Patient Lifting Technique

Publication: Applied Ergonomics 16(4):307-311 (1985)

This study describes an on-the-job method of systematically evaluating the safety with which nurses, aides and attendants lift and transfer physically handicapped patients. Task analyses of one-person stand-pivot transfers and one-person total-lift transfers were conducted, the results of which were incorporated into checklists or data collection forms, to be used by trained observers to measure the safety of such transfers in health care settings. Using the checklist, the observers judged each task component as performed safely, performed unsafely or not applicable. A videotape of samples of these transfer techniques was also prepared and used to train observers to record observations of caregivers' performances.

Observers then visited caregivers in their work sites twice a week, to observe and score the safety of their transfers. During the course of the study, 250 client transfers were assessed using the checklists.

The authors discuss the reliability, cost effectiveness, and practical application of this observational system as a tool for training employees and measuring post-training compliance with procedures taught in the training program.

Alavosius, MP; Sulzer-Azaroff, B

The Effects of Performance Feedback on the Safety of Client Lifting and Transfer

Publication: Journal of Applied Behavior Analysis 19:261-267 (1986)

The study reported in this article was a prospective intervention experiment. It was conducted at a state residential school for the mentally retarded. The subjects were six direct care staff members; five of the original six subjects remained in the study throughout the entire 140-week period.

The study consisted of a pre-feedback phase, a feedback phase, and a post-feedback phase. At the beginning of the pre-feedback phase each subject was given a written description of the "correct" technique for performing each patient handling task. At the end of the pre-feedback phase the feedback intervention was started. The intervention consisted of personalized feedback about the technique for handling patients used by the subject.

To measure the effects of the program, the investigators used data obtained by direct observation of subjects performing patient handling as part of their regular job. Additional information about the methodology for obtaining the observational data was provided by the authors in another article, "An on-the-job method to evaluate patient lifting technique" published in *Applied Ergonomics*, 16:307-311, 1985. Basically, each type of patient transfer was characterized as a series of components. The correct procedure for performing each component was specified by the investigators. During all three phases observers recorded whether each component of a patient transfer was performed correctly or incorrectly. The percentage of components performed correctly was used as the measure for assessing the effect of the intervention.

Comparing the performance scores of the pre-feedback to the feedback phases the authors concluded that the personalized feedback was successful in getting the subjects to perform most of the components of the patient transfers in a manner consistent with that defined as the correct procedure.

After the feedback program was terminated, some follow-up observations were made to see if the improved behaviors for patient handling continued without the feedback. The observations during this post-feedback phase showed that the subjects continued to perform about the same percentage of patient transfers components correctly as they did during the feedback phase of the study.

Arad, D; Ryan, MD

**The Incidence and Prevalence in Nurses of Low Back Pain: A Definitive Survey
Exposes the Hazards**

Publication: The Australian Nurses Journal 16(1):44-48 (1986)

This study examined the incidence and prevalence of low-back pain in nurses. A questionnaire about personal details, social situation, family circumstances, work conditions, and the prevalence and incidence of low-back pain was distributed to 1,033 female nurses and students at the Royal North Shore Hospital in Australia in November, 1984.

Data were collected concerning each respondent's age; weight; height; education; occupational status; years of experience; marital status; consumption of alcohol, cigarettes, and other medications; amount of exercise; and working conditions, including the average number and weight of lifts per shift. In addition, subjective assessments were made of home life, family income, and work life.

Of the 831 nurses who responded to the questionnaire, 87% (720) had experienced at least one episode of low-back pain in their lifetime (incidence) while 42% had had low-back pain within the previous month or at the time of the survey. Of the 720 who had experienced low-back pain, 65% could recall an event that precipitated their first attack of low-back pain, 53% reported that this event occurred during nursing, but only 5.8% had received financial compensation because of low-back injury.

Results indicate that:

- * The highest 1-month prevalence rates occurred in the youngest nurses.
- * The incidence of low-back pain rose with increasing height and weight.
- * The highest incidence and 1-month prevalence rates were found in student nurses.
- * One-month prevalence rates rose with increasing number of lifts per shift, up to 20 lifts.
- * Those who described their life as 'unsatisfactory' or 'lonely' had markedly lower incidence and 1-month prevalence rates.
- * The lowest 1-month prevalence rates were recorded for those who did not smoke or take regular medications.

The authors suggest that the most effective solution is to increase the number of nursing staff in high-dependency wards and to assign staff carefully, according to each ward's needs.

Baty, D; Stubbs, DA; Buckle, PW; Hudson, MP; Rivers, PM

Working Postures and Associated Stress in a Nursing Population

Publication: Ergonomics International 85, (I.D. Brown, R. Goldsmith, K. Coombes, M.A. Sinclair, editors). Taylor & Francis, Philadelphia, 463-465 (1985)

This study assessed the magnitudes and frequencies of static and dynamic forces and postures involved in nursing work. Using a standard coding sheet, time-sampled postural observations were made of 64 nurses (27 trained, 28 auxiliaries and 9 learners) working in geriatric hospitals in England during a full working shift. In addition to direct observations, back stress was indirectly monitored by measuring intra-abdominal pressure through the use of radio pills. Fourteen subjects were continuously monitored for a full shift using a modified version of the E5 ambulatory receiver and aerial and the Oxford Medilog tape recorder.

Results revealed that with respect to overall levels of postural activity, 98% of the time of an average shift is spent either standing (53.7%), walking (19.4%), or sitting down (25%); stooping occurs concurrently, mainly when standing, for 22% of the shift. The mean number of peaks of intra-abdominal pressure above 4.1 kPa (30 mmHg) was 60; the mean number above 5.4 kPa (40 mmHg) was 15.

The mean number of hours that subjects spent in stooped postures per day was 1.6, with a peak loading on early shifts. This was higher than that found in other studies. However, the intra-abdominal pressure peaks suggest that nurses are at moderate risk for back pain from the dynamic postural stresses of the job. The authors conclude that problems arise for nurses from a combination of high static and moderate postural stress, along with a forced-pace element at certain times during the working day. Greater emphasis should therefore be placed on ergonomic 'good principles' to reduce the postural stress encountered by nurses during the working day.

Bell, F; Dalgity, ME; Fennell, MJ; Aitken RCB

Hospital Ward Patient-Lifting Tasks

Publication: Ergonomics 22(11):1257-1273 (1979)

This study was based on a questionnaire survey of the nursing staff in charge of 362 wards in Scotland and 363 wards in England in 85 hospitals with a total of 18,000 beds, covering every specialty. Of the total population of 725 wards surveyed, 688 returns were obtained, giving an overall response rate of 96%.

Information was collected on five major tasks involving lifting patients in and out of chairs, beds, baths, on and off toilets, and repositioning patients within chairs or beds. The reliability of the following six parameters was then measured for each task: the method used for lifting patients, the number of patients requiring lifting, the number of staff required per patient per lift, the importance of the task, the frequency of the task, and the physical effort involved. These parameters were then used to rank the five tasks within and between wards.

Results indicate that manual lifting is most often used; each task is considered equally important to patient care; two members of the staff are generally required per patient per lift; and the physical effort involved is rated to be high. Both the number of patients requiring lifting and the frequency of each task did not vary considerably. The authors conclude that patient-lifting tasks as currently practiced are unsatisfactory, and causing back injuries to nursing staff.

Bell, F.

Patient-lifting Devices in Hospitals

Publisher: Croom Helm, London (1984)

This book describes several studies concerning patient hoists. There were five surveys concerning the needs for hoists, the availability of hoists in hospitals, maintenance needs and practices, and problems. Also described were evaluations of several hoists and a training program on the use of hoists. A historical review of patient-handling devices, as well as numerous suggestions for hospitals and hoist manufacturers are also included. The historical review indicated that major developments in aids for moving patients occurred during the 1950s. During the next decade there were several developments in variable height beds. During the 1970's several developments were made for bathing patients.

Surveys. The five surveys consisted of 1) a questionnaire to senior nursing staff in hospitals in two districts of the British National Health Service, 2) interviews with ward staff in 34 hospitals, 3) an inspection of hoists and maintenance records at 13 hospitals, 4) a questionnaire survey of eight hospitals, and 5) a questionnaire survey of physiotherapy and occupational therapy departments at the hospitals included in the first survey. Results from the first survey were reported in 1979 in the journal Ergonomics (see abstract preceding page). Another brief article reporting on the use of patient hoists in hospitals, but not included among these abstracts, has been published in the International Journal of Rehabilitation Research 2(2):312-313 (1979).

Results of the surveys indicated that 28% of all patients required some kind of lifting. Half of these were in geriatric wards, and one-fourth were in medical, surgical, or orthopaedic wards. Some patients in physiotherapy and occupational therapy also required lifting. Of the five patient-lifting tasks studied, those that imposed the greatest weekly load on nursing staff were lifting patients in and out of chairs, and repositioning patients either within chairs or within their bed. Next were toileting patients and lifting patients in and out of bed. Least stressful was bathing patients.

The ratio of staff to patients tended to be lowest where the number of patients requiring lifting was greatest. Also, proportionally more patient hoists were available on wards with the greatest patient-lifting needs, i.e., geriatric wards. On 75% of the geriatric wards at least one hoist was provided.

Hoists were not used very often. The studies suggested the following possible reasons for low usage rate. Nursing staff were found to have had little training in the use of hoists. There were no guidelines to help decide for which patients the use of a hoist would be appropriate. Manuevering hoists was difficult or impossible in some areas due to the limited space available through doors, around toilets, between adjacent beds, and under some beds and baths. Additionally, many nurses felt that certain types of slings put the patient in an embarrassing position.

Trials. Several commercially available patient hoists were evaluated. Both strengths and weaknesses of each piece of equipment are reported. In addition, the effect of a training program on the use of hoists was assessed using two groups of nursing students. It was concluded that a 2-hour training program on the use of hoists resulted in less time to complete a bed to wheelchair transfer and better attitudes toward the use of hoists. The trained group also appeared to have committed fewer errors.

Biering-Sørensen, F

Risk of Back Trouble in Individual Occupations in Denmark

Publication: Ergonomics 28(1):51-60 (1985)

A retrospective analysis of occupational injury records in Denmark was conducted, using injury records from reported injuries, which may be very underreported. Case records are in a coded format. The years 1979-81 were included, with 3-year-total figures used as the basis for primary tabulation.

Results are presented in tables according to coded categories. One table, which shows the "type of work" for cases coded to indicate that the injury resulted from a worker overstraining his or her back, shows that of the ten types of work with the highest number of accidents, hospital work ranked first with 33.2% of the cases, home nursing ranked third with 8.5%, and patient treatment ranked eighth with 3.4% of the cases. Other tables compare industries in terms of rates for back-related disability and percentages of cases that were permanently disabling. Additional data on prevalence of low-back trouble in various occupational groups (from earlier work by the author) are also summarized in a table.

Cassou, B; Gueguen, S

Prvalence et Facteurs de Risque de la Lombalgie: Une Enquête Epidmiologique et Rtropective Parmi le Personnel d'un Hôpital Parisien

[Prevalence and Risk Factors of Lumbalgia: A Retrospective Epidemiological Survey Among the Staff of a Hospital in Paris]

Publication: Archives des Maladies Professionnelles de Medicine du Travail et de Securite Sociale (Paris) 46(1):23-29 (1985)

A survey of personnel in a hospital in Paris, France is reported. The job categories included in the survey were nursing personnel, administrative staff, general blue collar workers, laboratory technicians, and physicians.

The purposes of the survey were to determine the 1-year prevalence of low-back pain, the pain intensity and consequences, and to determine if certain factors had an effect on risk of low-back pain. The questionnaire was mailed to 2,555 employees. There were 684 responses, for a response rate of 27%. Due to this low response rate the authors did little with respect to the risk-factor analysis, simply reporting the relative risk values for age, gender, job category, obesity, participation in sports, and seniority.

Much of the analysis focused on estimating the prevalence and incidence of low-back problems and indications of pain intensity such as back pain requiring medical treatment, work absence, of lifestyle limitation. Due to the low response rate of the main survey, the investigators conducted a survey of 135 non-respondents. The authors found that a history of low-back pain was more common in the respondent group than in the non-respondent group. The reason was that many of the non-respondents did not return the questionnaire because they had no history of back problems and felt that their responses would not be of interest to the investigators. After correcting for the non-respondents, the authors estimated that 32% of the surveyed population had experienced low-back problems during the past year. Another interesting finding was that the physicians reported experiencing as many episodes of low-back pain as the nurses, but the physicians with back pain did not have to stop work as often as nurses with back pain. Thus, in this sample, occupation did not affect frequency of back pain episodes but it did affect the consequence of back pain.

Cedercreutz, G; Videman, T; Tola, S; Asp, S

Individual Risk Factors of the Back Among Applicants to a Nursing School

Publication: Ergonomics 30(2):269-272 (1987)

This study investigated the health of the back, the work experience, and the physical activities of 370 applicants to a nursing school in Helsinki, Finland. By means of a questionnaire and a clinical examination, the study aimed to determine the prevalence of low-back pain among nursing students and to determine whether any differences due to back health could be found between those applicants accepted by the nursing school and those who were rejected.

Results revealed that 31% of the accepted applicants and 42% of the rejected applicants had sometimes experienced low-back pain. Correspondingly, 3% and 11%, respectively, had suffered from acute low-back pain. Back injuries were reported by 6% in both groups. Eighty-one percent of all the applicants did some type of physical exercise at least 2 to 3 hours per week; 61% of the accepted applicants and 67% of those rejected did regular exercises for the back.

Applicants accepted by the school were healthier than those rejected, judging by questionnaire responses. The clinical back examination, however, could not determine any clear difference between accepted and rejected applicants. The authors feel, therefore, that the ordinary entrance test was able to eliminate applicants with back symptoms from the applicant pool, and that the usefulness of a clinical back examination in connection with the selection of nursing students is questionable..

Cust, G; Pearson, JDG; Mair, A

The Prevalence of Low Back Pain in Nurses

Publication: International Nursing Review 19(2):169-179 (1972)

A questionnaire survey was conducted of all nurses working in the several hospitals in Dundee, Scotland, and school teachers in the Dundee schools. Response rates were 57% (911/1,599) of nurses, and 65.1% (949/1,458) of teachers. The respondents consisted of 874 female and 37 male nurses, and 703 female and 246 male teachers. The nurse group included those with the job titles trained nurse, student nurse, pupil nurse, and nursing auxiliary.

Respondents were asked if they had experienced one or more attacks of low-back pain (LBP) in their life. They were also asked if they had experienced one or more attacks of LBP due to their work. The measure of extent of the LBP problem was lifetime prevalence, which was reported for occupational attacks, nonoccupational attacks, and all attacks of LBP. The investigators also obtained some data to compare nonrespondents with respondents.

Lifetime prevalence rates were compared by age, gender, job title or grade of the nurses, ward or medical department where currently working, and occupation (nurses versus teachers for each gender). Also examined were years in nursing, ward or medical department when first attack of LBP was experienced, diagnosis of LBP, and events that precipitated onset of LBP. Among nurses, the most commonly reported precipitating events were patient-lifting (46%) and general duties that may include patient-handling (18%).

The comparison of teachers with nurses produced equivocal conclusions. Lifetime prevalence of LBP due to occupation is summarized below.

<u>Gender</u>	<u>Prevalence Percentage</u>	
	<u>Nurses</u>	<u>Teachers</u>
Female	19.9%	12.8%
Male	32.4%	12.2%
Combined	20.4%	12.6%

[NOTE: The combined results for men and women shown above were not reported by the authors; the abstractor combined these data and performed the significance test.]

The authors comment that the small number of men in the study population was probably the reason why the difference in prevalence rates for male nurses versus male teachers was not statistically significant.

Cust, G

Low Back Pain in Nurses

Publication: Queen's Nursing Journal 15(1):6-8 (1976)

This study compares the prevalence of low-back pain in nurses with the prevalence of low-back pain in school teachers. The nurse population consisted of all trained nurses, student and pupil nurses, and nursing auxiliaries working in the Dundee General Hospital; the teaching population included infant, primary, and secondary school teachers in the city of Dundee, Great Britain.

Each nurse and teacher was asked to fill in a questionnaire concerning his or her present occupation, past career, personal data, leisure activities, attacks of low-back pain, history of injuries, sickness absence, and, for females, gynecological and obstetric history. The response rate was 65.1% for the teachers (949 out of 1,458) and 56.8% for nurses (911 out of 1,599).

Results indicate that a history of low-back pain was found in 34.6% of the female nurses compared with 30.0% of the female teachers, and in 45.9% of the male nurses compared with 38.6% of the male teachers. Because of the small number of male nurses, however, they were eliminated from further analyses.

While there was little difference between nurses and teachers in overall prevalence of low-back pain, low-back pain reached a peak in the 31-35 age group for nurses and then fell slightly with a higher prevalence of occupational low-back pain. The incidence of low-back pain for teachers, however, increased steadily from age 21 to 65 and was generally nonoccupational in nature.

First-time low-back pain rates were significantly different in different specialities; the largest number of nurses experienced their first attack of occupational low-back pain in geriatrics.

An annual incidence of low-back pain by years in nursing was calculated. The highest annual incidence rate of all low-back pain was for nursing auxiliaries in their first year of service; the rate peaked at ages 21-25 and again at ages 46-80. Trained nurses had their highest annual incidence rates between their first and fourth years of service; their rates were highest in the 21-25 age group. Trained nurses had a significantly higher prevalence of occupational low-back injuries than student nurses and nursing auxiliaries. The annual incidence rate for teachers, however, was steady at about 1% per annum for the first 24 years of service and gradually increased with age, peaking in the 50-60 age group.

Dehlin, O; Berg, S

Back Symptoms and Psychological Perception of Work: A Study Among Nursing Aides in a Geriatric Hospital

Publication: Scandinavian Journal of Rehabilitation Medicine 9:61-65 (1977)

This study investigated the relationship between the psychological perception of work and the incidence of back symptoms in nursing aides. The subjects, 233 nursing aides in a geriatric hospital in Sweden, were interviewed about back symptoms and then asked to complete a questionnaire concerning their psychological perception of their work.

The answers to the questionnaire were factor-analyzed; this produced seven scales and one variable of overall job satisfaction, which were then tested against the presence/absence of back symptoms.

Results indicated no difference for the presence/absence of cervical spine symptoms and the seven scales. Nursing aides with thoracic spine symptoms reported a lower overall job satisfaction, more negative relations with supervisors and workmates, and greater perceived strain as compared with nursing aides without such symptoms.

Nursing aides with lumbar or sacral spine symptoms reported more negative relations with supervisors and workmates, a greater perceived demand for physical and psychic strength, and lower overall job satisfaction as compared with nursing aides without low-back symptoms. Nursing aides currently experiencing low-back symptoms reported lower overall job satisfaction than those not experiencing low-back symptoms at the time of the study.

Nursing aides who developed low-back symptoms after starting to work in nursing, when compared with those who had developed low-back symptoms prior to their nursing work, reported more negative relations with supervisors and workmates, a greater perceived demand for physical and psychic strength, and lower overall job satisfaction. Similarly, those who specifically considered their low-back symptoms to be due to their work reported more negative relations with supervisors and workmates, a greater perceived demand for physical and psychic strength, and a greater perceived need for information.

Nursing aides who developed low-back symptoms in connection with menstruation (menstrual pain) reported greater perceived demand for physical and psychic strength, greater perceived strain, and lower overall job satisfaction compared with those without menstrual pain.

No difference, however, was found between different durations of low-back symptoms and the seven scales. In addition, no relationship was found between back symptoms and the scales measuring satisfaction with the work itself, perceived need for education, and adjustment to geriatric work.

The psychological perception of work, therefore, was found to be only partly related to the presence/absence of back symptoms.

Dehlin, O; Berg, S; Andersson, GBJ; Grimby, G

Effect of Physical Training and Ergonomic Counselling on the Psychological Perception of Work and on the Subjective Assessment of Low Back Insufficiency

Publication: Scandinavian Journal of Rehabilitation Medicine 13:1-9 (1981)

This study investigated the effect of physical training and ergonomic counselling on the psychological perception of work and the frequency and severity of low-back symptoms of female nursing aides working in a geriatric hospital in Sweden.

All the participating nursing aides (N = 45) had low-back insufficiency symptoms and were divided into three groups. Group I (the training group) was given conditioning exercises twice a week for 8 weeks. Group II (the ergonomics group) was given ergonomic counselling during the same period. Group III served as the control group.

The nursing aides' psychological perception of work and subjective assessment of low-back symptoms were measured before and after the study using specially designed questionnaires. In addition, physical working capacity, was measured on a mechanically braked bicycle ergometer before and after the study.

At the end of the study, the nursing aides' psychological perception of their work had improved in two of seven variables for the training group as compared with the control group, while the ergonomics group did not show any change. There was no statistically significant difference between the three groups with respect to the intensity or frequency of low-back symptoms, consumption of analgesics, influence on working capacity or influence of work on back symptoms.

The present study has given no evidence that general physical training or ergonomic instruction has a marked influence on psychological perception of work or subjective assessment of low-back symptoms in nursing aides with low-back insufficiency.

Dehlin, O; Berg, S; Hedenrud, B; Andersson, G; Grimby, G

Muscle Training, Psychological Perception of Work and Low-Back Symptoms in Nursing Aides

Publication: Scandinavian Journal of Rehabilitation Medicine 10:201-209 (1978)

The effect of trunk and quadriceps muscle exercises on the psychological perception of work and on the subjective assessment of low-back symptoms was studied in nursing aides at a geriatric hospital in Sweden.

Subjects were divided into four groups, three with low-back symptoms (groups I, II, and III) and one without (group IV). Group I (N = 13) participated in a muscle training program, group II (N = 14) was given a series of informal lectures, group III (N = 14) served as a control group for subjects with low-back symptoms, and group IV (N = 20) was given no training or lectures, and served as the healthy subject control group.

The muscle strength of each group, the subjects' psychological perception of work, and the subjective assessment of low-back symptoms were determined before and after the three-month study period. Muscle strength increased significantly in the training group (group I) compared with the lecture group (group II), but less significantly when compared with the control group (group III). Compared with the nursing aides without low-back symptoms (group IV), nursing aides with low-back symptoms had similar trunk strength but significantly lower quadriceps muscle strength.

The psychological perception of work was determined by means of a questionnaire. Subjects in the training group (group I) showed significant positive changes on three of the seven scales for psychological perception of work as compared with those in the group given lectures (group II) and the control group (group III). These scales measured perceived strain, adjustment to geriatric work, and the perceived need for physical and psychic strength. The subjective assessment of low-back symptoms, however, was only influenced as regards the duration of symptoms, which became shorter in the training group as compared with the lecture group. The effect of training on the psychological perception of work seemed to be independent of an increase in muscle strength.

Dehlin, O; Hedenrud, B; Horal, J

Back Symptoms in Nursing Aides in a Geriatric Hospital: An Interview Study with Special Reference to the Incidence of Low-Back Symptoms

Publication: Scandinavian Journal of Rehabilitation Medicine 8:47-53 (1976)

This study attempted to determine the incidence of back symptoms, particularly in the lumbar region, in a population of nursing aides. Data were obtained by interviews with 267 nursing aides working in a geriatric hospital in Sweden.

Results revealed an overall prevalence of cervical spine symptoms in 22.8% of the subjects, thoracic spine symptoms of 19.9%, and low-back symptoms of 46.8%. Low-back insufficiency was present in 40% of the subjects, lumbago in 18.4%, and sciatica in 7.6%. Low-back symptoms were present at the time of the investigation in 18% of the nursing aides; insufficiency was the dominant symptom.

Of the 126 nursing aides who had had low-back symptoms, 34.1% had low-back symptoms before starting work as a nursing aide, while 65.9% developed their symptoms after starting work as a nursing aide (80% of these considered their symptoms to be due to their work). The two groups did not differ significantly compared with each other or with the group without low-back symptoms as regards height, weight, age, or length of employment.

Nursing aides with low-back symptoms had a higher incidence of cervical and thoracic spine symptoms as compared with the non-low-back symptom group. In addition, they considered their work to be more stressful to the spine than did those without back symptoms.

All nursing aides had received instructions on lifting techniques, which were repeated every third month. Those nurses who had experienced low-back symptoms, however, used the same lifting techniques as did those without low-back symptoms. Results indicate that lifting instructions given had no effect on the occurrence of low-back symptoms.

Dehlin, O; Jaderberg, E

Perceived Exertion During Patient Lifts

Publication: Scandinavian Journal of Rehabilitation Medicine 14:11-20 (1982)

This study attempted to find a method for assessing perceived exertion during various types of patient lifts by objectively rating a number of variables and relating them to the subjective strain on the subjects during the lifts. Two experiments were performed.

STUDY 1.

In a series of model experiments, 50 nursing aides and junior nurses at a geriatric hospital in Sweden were required to lift different loads in different postures and rate the perceived exertion (RPI) for each combination using the Borg scale.

For the model experiments, a strong correlation was found between increased RPI and a poor working posture and heavy load, respectively.

STUDY 2.

In the second series of experiments, six common types of patient lifts were studied on the hospital's wards. The following variables were objectively rated for each lift: posture, acceleration, the patient's weight, time needed for the lift, patient cooperation, the load, the moment about the fulcrum and the possibilities of getting a good hold. The subjects were asked to rate the different lifting tasks on the RPI (Borg) scale. The variables were then analyzed by multiple regression in relation to RPI.

In the practical study, strong correlations were found between different variables and RPI, with some variation between the different types of patient lifts. In the multiple regression analysis, working posture, acceleration, and patient's weight were found to be the three most important variables for five of the six different patient lifts. The only exception was the lift turning the patient over in bed, where only acceleration showed a statistically significant correlation to perceived exertion.

The authors conclude that by choosing the most characteristic variables for each patient lift, this method for assessing perceived exertion during various types of patient lifts can be utilized to study changes when the external conditions during the lift are changed.

Dehlin, O; Linberg, B

Lifting Burden for a Nursing Aide During Patient Care in a Geriatric Ward

Publication: Scandinavian Journal of Rehabilitation Medicine 7:65-72 (1975)

The lifting burden of a nursing aide who worked on a hospital ward for geriatric care in Sweden was studied with respect to three types of lifting operations. The operations were: sliding a patient up in the bed towards the pillow, transferring a patient from the bed to the chair, and transferring a patient from the chair to the bed.

The operations were studied in a room that was prepared especially for the study. Sixteen patients were brought into the room one at a time. The nursing aide performed each patient move; some were performed with the help of a second nursing aide. During a lift, the nursing aide stood on a force plate which continuously registered the horizontal and vertical forces of the lift on a Mingograf. Photographs were taken several times during each lift with marks plotted on the Mingograf recording each time a photo was taken.

Results indicate that the lifting burden of a nursing aide can be great. The weights lifted often equalled or exceeded the recommended permissible maximum loads (Asmussen, Poulsen & Rasmussen formulae, 1965) for single and repeated lifts. The duration of the lifts studied was short and most lifting operations were performed in 1-5 seconds. In addition, the lifts were often performed under unfavorable conditions, seldom approaching an ideal lifting technique.

Ferguson, D

Strain Injuries in Hospital Employees

Publication: The Medical Journal of Australia 1:376-379 (1970)

The injury registers of three Repatriation General Hospitals in Australia were analyzed in order to determine the size and nature of the problem of strain injuries of hospital staff associated with manual handling. The distribution of strain injuries was examined over a 2-year period from July 1, 1965, to June 30, 1967, with respect to loss of employee work time, work position, site and type of accident, agent of injury, and part of body injured.

Among 4,189 hospital employees, 570 strain injuries were reported. Of the injured employees, 62% reported no time lost, 25% lost from 1 to 7 days, and 13% lost more than 1 week. Approximately half of all strain injuries involved lifting, while a quarter involved falls on the same level. Over half of the injuries (54%) affected the trunk; the back was the individual body part most often injured (41%). In more than half of the strain injuries affecting members of the nursing staff, the type of accident was lifting, the agent was the patient, and the part injured was the trunk.

The study suggests that a uniform, computerized system for collecting data would facilitate the study and management of strain injuries in hospital staff. Other suggestions for preventing injury are using suitable beds, patient hoists and transfer devices; fostering self-help techniques for patients; obtaining assistance when needed; offering training in safe handling techniques; and analyzing and redesigning jobs, tasks, equipment, and the layout of workspace and buildings to eliminate or lessen the need for manual handling.

Gagnon, M; Chehade, A; Kemp, F; Lortie, M

Lumbo-sacral Loads and Selected Muscle Activity While Turning Patients in Bed

Publication: Ergonomics 30(7):1013-1032 (1987b)

The purpose of this laboratory study was to compare different techniques for turning patients in bed in terms of stress on the nursing aides who frequently perform this task in geriatric hospitals and nursing homes. Seven techniques were specified by the experimentors and an eighth condition involved the subject selecting her own technique. Fifteen experienced nursing aides were the subjects. Measurements in the laboratory included films, three force platforms, and EMG records. Values obtained from the films and force platforms were used for biomechanical modelling.

Eight techniques were compared, seven used a quilt, one was manual. The criterion variables the authors mention as being most important were: duration of task, maximum shear force at L5/S1, maximum compressive force at L5/S1, tension in the erector muscles, and tension in the deltoid muscles.

The experiment was designed to allow contrasts between pairs of techniques that were identical except for one aspect of the technique. Based on these paired contrasts, conclusions were reached about the following: direction of motion more vertical or more horizontal; speed of execution faster or slower; knees being supported or not supported by the side of the bed; legs being symmetric or one leg forward with the other leg behind; and bed height being in a higher or lower position. The authors state "of all the experimental factors examined, height of bed was the most important ..." The higher bed position had a smaller value of maximal muscle moment and maximal compression at L5/S1. This reduced stress on the lower back was apparently achieved by bearing more of the load with the arms and shoulders.

For the eight techniques the average compressive loads on the lower back ranged from 2,479N to 3,526N. These levels are considerably lower than found when nursing aides move a patient from a wheelchair onto a bed (see Gagnon et al. 1986). These results suggest that during an average turning of a patient in bed the compressive stresses in the lower back are not too stressful (according to criteria used by NIOSH), but there is a large variability such that occasionally turning a patient in bed can be quite stressful. It is important to note, however, that turning patients is a task identified in many back injury compensation claims, while lifting from a chair is infrequently identified as the task being performed when injured.

The authors conclude with the recommendation that for turning a patient in bed a nursing aide should begin by raising the bed and then pulling the patient toward the near side of the bed using more vertical forces than horizontal forces, and using a rapid motion throughout the movement. This technique minimizes back stress, but has the disadvantage of putting more stress on the shoulders compared to other techniques.

Gagnon, M; Lortie, M

A Biomechanical Approach to Low-Back Problems in Nursing Aides

Publication: Trends in Ergonomics/Human Factors IV, (S.S. Asfour, editor), North-Holland Publishing, Amsterdam, 795-802 (1987a)

This paper is a synthesis of observations based on three independent laboratory studies examining several tasks undertaken by nursing aides during patient-handling. The three biomechanical studies examined: 1) during patient-lifting (a 70-kg manikin) tasks, 2) performance of nursing aides during pulling/turning tasks, and 3) the effect of the sliding surface or type of bed sheet on patient-handling (manikin) tasks. The third study included untrained students to assess the effects of practice.

Quasi-static and dynamic biomechanical analyses were performed on each of the three experimental conditions. Research dependent variables included spinal loading (integration of compression as a function of time), electromyography of selected muscles, and work-energy parameters.

Results of the studies revealed the following:

- Patients should not be lifted from a chair with a method using a belt.
- Pulling/turning a patient in bed with a padded quilt should be performed with a vertical pull, with the bed in a high position, and rapidly if reduction of spinal loading is desired. But this technique places more stress on the shoulders than other techniques.
- The types of sliding surfaces or types of bed sheets do not significantly influence the execution parameters in pulling/turning a patient.
- Practice of pulling/turning is associated with a reduction (45%) of spinal loads and a reduction (30%) of work. These reductions are attributed to modification of body movements during patient-handling task practice. In particular, the weight transfer principle was used less as the subjects gained more experience with the technique.

Gagnon, M; Sicard, C; Sirois, JP

Evaluation of Forces on the Lumbo-Sacral Joint and Assessment of Work and Energy Transfers in Nursing Aides Lifting Patients.

Publication: Ergonomics 29(3):407-421 (1986)

The purpose of this laboratory study was to estimate the forces at L5/S1 and to assess mechanical work and energy transfers in a task consisting of raising a patient (a 72.6-kg manikin) from a chair using three different methods: (1) with the hands (2) with the forearms behind the patient's back at shoulder level, and (3) with a belt held at waist level. This task is frequently performed by nursing aides and orderlies in geriatric hospitals, and the experiment was designed to simulate such work; although subjects in the experiment were six male physical education students.

Spinal forces were estimated from a static and planar mathematical model used in conjunction with cinematography techniques, a force platform, and electromyography (EMG) recordings. External forces and the internal forces (compression and shear at L5/S1) were determined from free-body diagrams and static equations. The model was analyzed for its sensitivity in estimating patterns of EMG forces, intra-discal and musculoligamentous forces, intra-abdominal pressure and inertial forces.

The model was found to discriminate between the relative demands imposed on the spine by the different lifting methods, but the absolute values of the forces remain uncertain because of the uncertainty residing in many of the model's assumptions. The method requiring a belt to lift the patient was found to be considerably more strenuous for the spine and also to require a larger amount of work; it should, therefore, not be recommended as a procedure for raising a patient from a chair to a standing position.

Greenwood, JG

Back Injuries Can be Reduced with Worker Training, Reinforcement

Publication: Occupational Health and Safety 55(5):26-29 (1986)

This was a descriptive retrospective study of back-injury reports. Data came from four hospitals in West Virginia. It included 359 time-lost injuries among 4,000 hospital employees including food service workers, housekeeping staff, registered nurses, licensed practical nurses, and technicians. The reported analyses looked only at back-injury cases without considering denominator data.

The distribution of back-injury cases found in the hospital records indicated several patterns. Lifting accounted for 51% of the reported back injuries. Sprains and strains accounted for 85% of the cases. Forty percent of the back-injury cases were experienced by nursing aides and assistants. In one-third of the cases, the injured employee had been employed less than one year. There was a direct correlation between injury frequency and working on the latter one-third of the shift. Nearly 40% of the injuries resulted in a week or less of lost time.

A more complete report of these data, entitled "Back Injuries in In-patient Health Care Facilities: A Preliminary Inquiry", is available from the author at the following address: West Virginia Workers' Compensation Fund, 601 Morris Street, Charleston, WV 25302. It includes information about the diagnosis of back cases for seven occupational groups. For these occupational groups combined, the reported diagnostic categories were strain/sprain (85%), herniated disc (3%), compression fracture (1%), and other/undiagnosed (11%). This more complete report also shows the annual incidence rate of back-injury claims for the following occupational groups: RNs, LPNs, nursing aides, dietetics, housekeeping staff, and technicians.

Harber, P; Billet, E; Gutowski, M; SooHoo, K; Lew, M; Roman, A

Occupational Low-Back Pain in Hospital Nurses

Publication: Journal of Occupational Medicine 27(7):518-524 (1985)

This study was conducted to determine the incidence and prevalence of occupational low-back pain among the nursing staff of a large urban general hospital. All full-time employees who were nurses or unit service coordinators (USCs) were eligible for participation. USCs who conduct clerical activities on the nursing units, were included to determine if the reported back pain frequency was specific for nurses. A questionnaire was developed to elicit information concerning personal descriptors, nursing employment history, the incidence and prevalence of occupational low-back pain, job description and personal preventive activities. Questions focused on back pain for two recall periods, one of 2-weeks and one of 6-months.

The respondent population consisted of 550 nurses and 37 USCs. Nearly all (97%) of the nurses and 80% of the USCs were female. Overall, 52% of the nurses reported that they had developed back pain due to work during the previous 6 months, while only 20% of the USCs reported such pain. Similarly, 37% of the nurses reported back pain due to work during a 2-week period, compared with 16% of the USCs. During the 2-week period, 20% of the nurses had taken medicine for back pain, and 15% had to stop their work at least once during the period due to the severity of back discomfort.

When responses were analyzed to determine if there were reported differences in back pain according to division, results revealed no differences due to nursing division assignment but a significant association with specific tasks.

Harber, P; Billet, E; Lew, M; Horan, M

Importance of Non-patient Transfer Activities in Nursing-Related Back Pain: I. Questionnaire Survey

Publication: Journal of Occupational Medicine 29(12):967-970 (1987)

This paper is based on data from a questionnaire survey. The survey was described more completely in another article by Harber et al. (1985) - see abstract preceding page. This re-analysis of the data was undertaken to clarify the extent to which risk of back pain among nurses is affected by tasks other than patient handling.

Two outcome variables were created by using factor analysis techniques. One was called the "pain factor". It was determined by adding weighted values of responses to six questions about experiences with pain and use of pain medication. The second outcome variable was called the "impact factor". It was determined as a sum of weighted values of responses to four questions about missing work or changing plans because of pain. Individual scores on each factor were determined, and the 25% of the nurses with the largest scores were assigned the value one in the statistical analyses, while the other 75% were given a zero value.

These two dichotomous outcome variables were examined with several candidate predictor variables that reflect activities at work as well as some personal variables. The discriminant analysis indicated that most of the personal variables were not helpful in determining which nurses belonged to which category of the outcome variables; specifically the variables age, height, ratio of weight to height squared, frequency of personal exercise, and length of workshift. These variables were, therefore, not used in the next analysis.

The next analysis was a logistic multivariate regression that attempted to explain the values of the two dichotomous outcome variables, pain factor and impact factor, as a function of selected factors. In one application of the multivariate logistic analysis, a set of personal predictor variables were analyzed. Two significant personal variables were headache and previous back injury. In a second application of the logistic analysis, a set of work factors were analyzed. A variable that was significant for predicting both the pain factor category and the impact factor category was a variable the authors called "carry/push". This variable was computed as the sum of weighted values of responses to questions about frequency of carrying weights and pushing objects onto elevators. A second work factor that was also significant was quantified as a variable the authors called "patient care". It was the weighted sum of responses to questions about frequency of lifting patients or helping patients move. Two factors were found not to be significant, one having to do with moving furniture, equipment, and beds, the other having to do with the percentage of time spent standing, walking, or bending.

The authors conclude that carrying and pushing activities appear to be more important contributors to back pain among nurses than previously recognized.

Harber, P; Shimozaki, S; Gardner, G; Billet, E; Vojtecky, M; Kanim, L

**Importance of Non-patient Transfer Activities in Nursing-Related Back Pain:
II. Observational Study and Implications**

Publication: Journal of Occupational Medicine 29(12):971-974 (1987)

This was a cross-sectional study to describe the physical activities of nursing personnel in participating units of a large metropolitan hospital. Observations of work were made of registered nurses, licensed practical nurses, and other occupational categories including attendants and orderlies.

Observations were obtained by having one trained observer follow one member of the nursing staff during regular work. Sixty-three work shifts were observed. Most of the shifts were 12 hours. The observers recorded actions of the nurse being observed, including static activities involving patient care. Clerical activities were not included in the observational data.

Results were presented in two tables. One table shows average frequency (per shift and per hour) of actions that were dynamic and actions that were static. It also shows frequency of actions which the nurse performed in an essentially static body posture near the patient's bed. The frequencies are listed separately for patient contact activities and for non-patient contact activities. The second table shows the body positions involved when the nurse performed static actions.

The authors note that due to the lack of injury data, they cannot determine which tasks may involve more or less risk of back injury. However, the authors suggest that these data indicate that tasks other than patient transfers should be considered as topics for future research.

Heap, DC

Low Back Injuries in Nursing Staff

Publication: Journal of the Society of Occupational Medicine 37:66-70 (1987)

This report describes a 5-year prospective surveillance program concerning back injuries sustained by nursing staff as a direct result of a patient handling incident. The study population consisted of 3778 nursing staff employed in the Bath Health District of Great Britain. All were employed by the British National Health Service. Included were 22 small neighborhood hospitals, two specialized hospitals, a long-term psychiatric care hospital, and a large general hospital.

The surveillance program collected data on cases that met the following criteria: "Subjects admitted to the survey were restricted to members of the nursing staff of all grades who had been absent from work for 3 or more days due to an injury to the lower part of the back which could be directly attributable to a patient handling incident. A patient handling incident was defined as one in which a patient was lifted, carried or supported as part of a normal nursing procedure".

The number of nurses with back injuries showed a gradual declining tendency throughout the five year period. The numbers were 43, 37, 33, 39, and 29 in the years 1981 to 1985 respectively. For these cases the average number of days off did not improve over the five year period, the averages being 52, 49, 56, 43, and 87 for the years 1981 to 1985 respectively. The authors attribute the long time off values to the sick pay arrangement of the National Health Service.

The injury rates for the different grades of nursing showed that fully trained staff nurses had the lowest rate. The nurses in training had the second lowest rate. Nursing auxiliaries had the largest back injury rate.

Age was not a significant factor. Also reported in the results was a statement about the nurse's height to weight ratio: "There was no evidence to suggest that the height/weight ratio of the injured nurse bore any relation to cause although it was not possible to compare the injured nurse with the nurse population as a whole".

The author discussed the probable reasons for the decline in the number of nurses who sustained back injuries. There were three changes that took place during the early part of the study. First, seminars were presented to managers to make them aware of the problem. Second, training of the nursing personnel was improved both in focus and frequency. This included retraining the entire nursing staff in the use of the shoulder lift and the use of kinetic principles. Third, preemployment health screening was introduced. The authors described the screening program as one of not accepting "nurses with a previous history of a significant back incident for employment in a heavy lifting role. Such nurses are only accepted for employment in light or non-lifting posts such as the outpatients and the children's ward".

Hefferin, EA; Hill, BJ

Analyzing Nursing's Work-Related Injuries

Publication: American Journal of Nursing 76:924-927 (1976)

This study analyzes nursing's work-related injuries in a Veterans Administration Hospital in Los Angeles, California from August 1, 1972, through July 31, 1973. Documents studied included the employee's written description of the injury event, the supervisor's investigative report, and the physician's report of emergency treatment.

Results indicated that of the 267 injuries reported, registered nurses incurred 44.9%, licensed vocational nurses 16.5%, and nursing assistants 38.6%. These proportions are representative of the relative distribution of these types of personnel in the total nursing population. Males incurred 13.8% of the injuries; which approximated the relative proportion of males in the nursing population. The highest age-specific frequency rates of injuries occurred in the 26-30 age group, with only slightly lower rates in the 36-40 age group. The next highest injury rate was in the 31-35 age group. Lifting, pushing, and pulling accounted for 43% of the injuries. During the survey year, 22.6% of the injured personnel experienced more than one injury, accounting for almost 39% of the reported injuries.

Back and leg injuries accounted for 86% of all lost time due to injury and about 90% of all lost workday costs. The authors suggest that many of the work-related injuries could have been prevented. A safety and fire protection subcommittee was therefore established, a representative was sent to hospital safety meetings, and orientation classes were provided on body mechanics and safety procedures.

Hoover, SA

Job-Related Back Injuries in a Hospital

Publication: American Journal of Nursing 73:2078-2079 (1973)

This article examines the number and cost of job-related lifting injuries at the Wilmington Medical Center in Delaware and proposes a program to reduce their number.

During 1970, the Medical Center's approximately 3,500 employees incurred 623 job-related injuries, 85 of which were job-related lifting injuries to the back. Forty-three percent of the employees were in the nursing service; they accounted for 67% of the lifting injuries, followed by housekeeping with 13%.

The number of work days lost because of back injuries represented about 40% of the time lost from all injuries for an estimated dollar loss of nearly \$5,000 in salaries for disabled employees. Lifting injuries were shown to be the most expensive injuries.

In an effort to reduce the number of job-related lifting injuries, and the resulting financial loss, the physical therapy department instituted an educational program for nursing personnel, including registered nurses, practical nurses, and nurse assistants, to teach good back posture and proper techniques in lifting and transferring patients. (The outcome of this educational program is not discussed in this article.)

Hubley-Kozey, CL; Westers, BM; Stanis, WD; Wall, JC

An Investigation into the Incidence of Low Back Pain in Hospital Workers

Publication: The Nova Scotia Medical Bulletin 64(1):8-10 (1985)

The purpose of this retrospective study of accident report forms filed in the occupational health department of a large general hospital in Canada was to quantify the incidence of low-back disorders among hospital workers and to describe some factors associated with their occurrence.

Data covering a 2-year period were analyzed. Information about each case included the following twelve variables:

- | | |
|--------------------------|----------------------------------|
| 1. Age | 7. Type of shift (8 or 12 hours) |
| 2. Sex | 8. Shift time |
| 3. Location of work | 9. Day of shift cycle |
| 4. Specific nursing ward | 10. Work time lost |
| 5. Accident activity | 11. Previous disability |
| 6. Time of day | 12. Permanent disability |

During the study period there were 171 back injuries, representing 10% of the total number of injuries reported; 64 (38%) of these injuries resulted in time lost from work. The age range of employees reporting low-back pain was between 17 and 59 years with a mean age of 28.9 years. Fifty percent of the back injuries were sustained by persons less than 25 years of age, which suggests that the employee's level of experience may be worth further study. The predominant results show that females (79%) with no previous back injury (78%) were injured performing lifting tasks (68%) between 7:00 A.M. and 3:00 P.M. Nursing personnel incurred 102 (60%) of the low-back injuries, and a majority (70%) of these injuries occurred on the nursing wards. The percentage of low-back injuries reported for nurses was 18% compared with 6% for all other hospital employees. In addition, it was estimated that \$128,444 was paid to employees for work lost due to low-back injuries during the period studied.

Imbeau, D; Lortie, M

Analysis of Occupational Injuries Among Patient Care and Non-Patient Care Personnel in a Long-term Care Hospital

Publication: Proceedings of the 1984 International Conference on Occupational Ergonomics, Canada, 521-525 (1984)

The authors analyzed work injuries of 700 patient care and non-patient care personnel in a 500 bed long-term care hospital. Patient care personnel included orderlies, nurses aides, and nurses while non-patient care personnel included cooks, housekeepers, maintenance, laundry and administrative personnel. Incident reports for 852 work injuries that occurred between 1965 and 1983 were analyzed after retrieval from the Commission for Occupational Health and Safety. Data extracted from the injury reports included: action, operation being carried out, objects involved, and area injured. Some of the most notable findings are listed below.

- * Injuries among patient care workers were predominantly musculoskeletal while those of non-patient care workers were other injuries.
- * The most frequent action causing musculoskeletal injuries among males was lifting; females, moving in place.
- * Males sustained more injuries to the back while lifting a patient to bed while females sustained more injuries to the upper extremities while turning a patient in bed.
- * The bed was involved three times more often than any other object.
- * The patient was involved in 90% of all incidents involving musculoskeletal injuries.
- * Back injuries occurred in 62% of all musculoskeletal injuries, most frequently to the lumbar region (twice as often as to the cervical or dorsal region).
- * For the nursing personnel, sex was more determinant in the circumstances and type of injury than employment status.

Jensen, RC

Events That Trigger Disabling Back Pain Among Nurses

Publication: Proceedings of the Human Factors Society 29th Annual Meeting,
Human Factors Society, Santa Monica, California, 799-801 (1985)

This article collates prior literature and presents retrospective epidemiologic data. The epidemiologic data concerned nursing personnel in four US states with the following occupational classifications: (1) registered nurses; (2) licensed practical nurses; (3) nursing aides, orderlies, and attendants; and (4) health aides.

The retrospective data were obtained from workers' compensation records in Idaho, New York, North Carolina, and Wisconsin. These records were found in the Supplementary Data System (SDS), a record system maintained by the US Bureau of Labor Statistics with the cooperation of about 30 states. The cases examined were those with the following characteristics, according to the coded records: (1) injury occurred during 1980, (2) case closed by state compensation agency in 1980 or 1981, (3) part of body injured was the person's back, and (4) nature of injury was a sprain or strain. Workers' compensation is only available in these states if the injury arose as a result of employment; thus, the data apply mainly to work-related injuries.

The cases were examined to determine the proportion due to patient handling, as indicated by the "source" of injury being coded as a patient. The following percentages of back sprain/strain cases were reportedly triggered by patient-handling: nursing aides, orderlies, and attendants, 80.3%; licensed practical nurses, 77.7%; registered nurses, 73.6%; and health aides, 42.4%. These percentages were larger than corresponding findings from questionnaire surveys reported in the literature which indicate that approximately 38%-46% of back-pain episodes of nursing personnel are triggered by a patient-handling incident.

Jensen, RC

Work-related Back Injuries Among Nursing Personnel in New York

Publication: Proceedings of the Human Factors Society 30th Annual Meeting,
Human Factors Society, Santa Monica, California, 244-248 (1986a)

The results of a retrospective analysis of workers' compensation data are reported. The data were coded by the WC agency in New York state; the coded case records are part of the Supplementary Data System, a multi-state WC record system maintained by the US Bureau of Labor Statistics.

Cases examined were those with the following characteristics, according to the coded records: (1) injury occurred during 1980, (2) case closed by WC agency in 1980 or 1981, (3) part of body injured was the person's back, (4) nature of injury was a sprain or strain, and (5) occupation was one of 24 selected, including registered nurses; licensed practical nurses; and nursing aides, orderlies, and attendants. Comparisons were based on incidence ratio (IR) expressed as total back sprain or strain cases in a year per 1,000 employed persons in a group.

Results showed significant differences in IR for occupations. Of the 24 occupations studied, the seven with the largest IR values in rank order were (1) nursing aides, orderlies, and attendants; (2) construction laborers; (3) garbage collectors; (4) licensed practical nurses; (5) truck drivers; (6) registered nurses; and (7) health aides. The IR values of men and women were compared using occupation as a blocking variable; no significant difference was found.

Jensen, RC

Disabling Back Pain Among Nursing Personnel in North Carolina

Publication: Living with Change and Choice in Health (proceedings of a national research conference). Publisher: Sigma Theta Tau, Alpha Rho Chapter, School of Nursing, West Virginia University, Morgantown, West Virginia, 337-340 (1986b)

The results of a retrospective analysis of workers' compensation (WC) data are reported. The data were coded by the state WC agency in North Carolina. The coded case records are part of the Supplementary Data System, a multi-state WC record system maintained by the US Bureau of Labor Statistics.

Cases examined were those with the following characteristics, according to the coded records: (1) injury occurred during 1980, (2) case closed by WC agency in 1980 or 1981, (3) part of body injured was coded as the person's back, (4) nature of injury was a sprain or strain, and (5) occupation was one of 25 selected, including registered nurses; licensed practical nurses; and nursing aides, orderlies, and attendants. Comparisons were based on incidence ratio (IR) expressed as total back sprain or strain cases in a year per 1,000 employed persons in a group.

The 25 occupations are listed in order of their IR. Of the 25 occupations studied, the nine with the largest IR values in rank order were (1) garbage collectors; (2) construction laborers; (3) nursing aides, orderlies, and attendants; (4) truck drivers; (5) licensed practical nurses; (6) health aides, (7) radiologic technicians; (8) machinists; and (9) registered nurses. The IR values of those occupational groups consisting of over 80% women were also rank-ordered; the results suggest that gender does not explain the large IR values of the nursing personnel occupations, because even when only women are studied, the nursing occupation had comparatively large IR's than other occupations. Occupations employed primarily in the health care industries were also compared; results suggest that the large IR values of nursing personnel are not due to their employment in the health care industries.

Jensen, RC

Disabling Back Injuries Among Nursing Personnel: Research Needs and Justification

Publication: Research in Nursing and Health 10:29-38 (1987a)

The purpose of this article was to encourage nurses with research skills to conduct more studies concerned with back injuries among nursing personnel. Literature is cited to document the fact that back injuries are a major category of occupational injuries and illnesses, and nursing personnel tend to have larger prevalence rates of back pain and larger incidence rates of back injuries than most occupational groups in the health care industry, as well as in all industries. Workers' compensation data are presented to further document the extent of the back-injury problem among nursing personnel compared with other occupations.

The two main technical contributions of this article are the comparison of back-injury rates of nursing occupations to several other familiar occupational groups and comparisons of nursing personnel within health care industries. Workers' compensation data from four U.S. states were searched to determine the frequency of claims coded as sprains or strains of the back. Data on number of employed persons in each occupation and state were obtained from the 1980 census of the U.S. population. Comparisons of groups of workers were based on the ratio of number of back sprain/strain claims to the number of employed persons in the group, the resulting value being called an incidence ratio (IR). Multi-state analyses were based on within-state ranks according to IR.

The occupational comparisons revealed that nursing aides and garbage collectors ranked first or second in each state, i.e. these two groups had the largest IR values. The occupation-by-industry group looked only at nursing personnel in four major categories of the healthcare industry, hospitals, nursing and personal care facilities, offices of physicians, and other specialty healthcare providers. Results indicated that the highest ranking group (according to IR) was nursing aides and orderlies working in the industry category of nursing and personal care facilities. The author concludes that future research should place greater emphasis on this group and less emphasis on registered nurses working in university teaching hospitals.

Kaur, B; Pedersen, H

Mind Your Backs!

Publication: Nursing Times 82(16):45-47 (1986)

This study attempted to determine which factors may predispose an individual to low-back pain. One hundred female nurses, in various grades of nursing, from a hospital in Denmark were interviewed and examined. A specially designed posturometer was constructed to assess posture. Incorporated into the posturometer were a height-measuring device and a magnified goniometer to measure the range of motion of the lumbar spine. The nurses also completed a questionnaire.

Sixty-four of the 100 nurses examined gave a history of low-back pain; these formed the experimental group. The 36 nurses with no history of pain formed the control group. There were no significant differences between the experimental and control groups with respect to age or number of years in nursing. The prevalence of low-back pain increased with age, except for a peak in the under-20 age group.

No significant differences were found with regard to height, history of trauma, leg-length discrepancy, number of childbirths, or bilateral weight distribution. The mean weight of nurses with low-back pain, however, was significantly greater than that of the control group.

Results show a significantly greater number of postural deviations in the experimental group compared with the control group. There was a significant reduction in the range of motion of the thoracolumbar spine, and a significantly greater number of fixations and areas of tenderness in the lumbar spine and the sacroiliac joints in those nurses with low-back pain compared to those with no pain. The mean range of motion of extension and flexion of the lumbar spine was reduced to 62% and 85% respectively in the experimental group, compared with the control group.

While it is not possible to conclude from this study whether such factors as a restricted range of motion of the thoracolumbar spine, the presence of joint dysfunction and various postural deviations are responsible for predisposing nurses to low-back problems, the authors propose that early detection and possible correction of these factors could benefit the sufferers.

Khalil, T; Asfour, S; Marchette, B; Omachonu, V

Lower Back Injuries in Nursing: A Biomechanical Analysis and Intervention Strategy

Publication: Trends in Ergonomics/Human Factors IV, (S.S. Asfour, editor), North-Holland Publishing, Amsterdam, 811-821 (1987)

The investigators in this study performed static biomechanical analysis of work postures and low-back stresses induced upon nursing personnel during patient-handling tasks. Three postures were analyzed: lifting a patient from the supine position, lifting a seated patient from the edge of the bed, and lifting a seated patient from a chair. Reactive forces on the L5/S1 lumbar spinal joint were calculated for each posture.

Results of the study are presented in tables and figures. No comparison between study results and action limits or maximum permissible limits was made. The study results show that nurses are exposed to high levels of stresses while performing lifting tasks which are an integral part of their daily job routine.

Factors affecting the high incidence of back injuries in nursing were listed as follows: (1) lifting loads that exceed the recommended maximum safe-weight for a given nurse; (2) failure to utilize mechanical lifting devices; (3) lifting loads that do not exceed recommended maximum safe-weight but are lifted using improper lifting techniques; (4) lack of communication with the assisting co-worker concerning the lifting techniques, timing and logistics; and (5) lack of communication with the patient being lifted.

The following intervention strategies were suggested to alleviate back injuries in nursing: (1) the use of mechanical lifting equipment; (2) allocation of adequate work space so that nursing personnel may use proper body mechanics during lifting tasks; (3) additional staffing to meet patient-handling demands; (4) the matching of lifting capabilities of staff to patient-handling tasks by screening staff strength capabilities; and (5) ongoing inservice education that includes classroom and clinical demonstration and practice of sound biomechanical practices for patient-handling tasks.

Kilbom, A; Ljungberg, AS; Hagg, G

Lifting and Carrying in Geriatric Care. A Comparison Between Differences in Workspace Layout, Work Organisation and Use of Modern Equipment

Publication: Ergonomics International 85, (I.D. Brown, R. Goldsmith, K. Coombes, M.A. Sinclair, editors), Taylor & Francis, Philadelphia, 550-552 (1985)

This study assessed the lifting and carrying work of nursing aides and evaluated the effect of modern equipment, improved workspace design, and work organization in a geriatric hospital in Sweden. Twelve nursing aides (3 males and 9 females) in each of two geriatric wards were studied during their morning duties. One ward was traditional with cramped workspaces and only a few seldom-used, outdated hoists. The second ward was modern with team-care routines, spacious rooms, and patient hoists mounted in the ceiling for 50% of the patients. Lifting and carrying was measured by the use of wooden shoes with strain gauge bridges built into the toe and heel. Pressure signals were stored on a Medilog tape recorder.

Results revealed that the total lifting and carrying work performed by nursing aides was reduced in the modern ward. The total weight, the number of lifts per hour, the total duration of lifting and carrying work, and the number of lifts performed with asymmetrical load were all lower in the modern ward than in the traditional ward.

While the total lifting and carrying work in geriatric care was not found to be excessive, the duration of each lift and the large proportion of asymmetrical lifting in awkward positions made the work very strenuous and were judged to be likely causes of frequent low-back injuries. The authors conclude that the use of modern hoists along with well-designed and spacious wards can reduce the strain due to lifting and carrying in geriatric care.

Klein, BP

**The Effects of Training in Safe Manual Handling on the Patient Lifting
Techniques of Nursing Personnel**

Publication: Dissertation, Old Dominion University; University Microfilms
International, document no. 8617861, Ann Arbor, Michigan (1987)

This dissertation reports on an intervention study conducted in a university teaching hospital. Subjects were registered nurses, licensed practical nurses, and nurses' aides. The intervention was a training program on methods for performing patient-handling tasks. The four patient-handling tasks were moving patients between (1) bed and stretcher, (2) bed and wheel chair via parallel transfer, (3) bed and wheelchair via perpendicular transfer, and (4) bed and standing with a walker.

The training consisted of four parts: (1) presentation and demonstration of correct and incorrect techniques, (2) practice by trainees, (3) observation of other trainees and critique of their patient-handling techniques, and (4) feedback from the instructor to each trainee about his or her techniques. The evaluation criterion was proportion of on-the-job patient transfers that were performed correctly according to an observer. The training program was administered to the 12 nursing staff in the neurosurgery ward. Not receiving training was a control group of 28 nursing staff in the orthopedics ward.

Results indicated that the criterion variable (proportion of transfers performed correctly) was improved by the training. The test subjects had an average pre-training performance of 47%, and a post-training score of 74%. By comparison, the control group's scores for the comparable time periods were 43% and 33%.

Six weeks after the training, additional observations were made. The trained group's score dropped from the post-training score of 74% to a 6-week post-training score of 61%. This was still better than the pre-training score of 47%. The control group's performance showed virtually no change from the post-training session to the 6-week post-training session.

Several other factors were examined to determine why some patient transfers were performed correctly and others were not. None of these other factors was significant. Thus, the results indicate that the training program caused the trainees to change their on-the-job patient-handling techniques to conform, more often than not, with the techniques taught in the training program.

Klein, BP; Jensen, RC; Sanderson, LM

Assessment of Workers' Compensation Claims for Back Strains/Sprains

Publication: Journal of Occupational Medicine 26(6):443-448 (1984)

This article describes a retrospective assessment of workers' compensation records. The 1979 workers' compensation claim data from the Bureau of Labor Statistics' Supplementary Data System (SDS) were utilized to examine the demographic and occupational incidence of back strains/sprains among American industrial employees covered by state compensation systems. Employment data from the Bureau of the Census were used for exposure data. Combining the SDS data with the employment figures provided incidence ratios which allowed approximations of industry- and occupation-specific risk.

The search of SDS data found that 285,468 compensation claims for back strains/sprains were filed in 1979 in the 26 states included in the system. Results of the industry comparison indicated that construction (1.6 claims/100 workers) and mining (1.5 claims/100 workers) had the largest incidence ratios. Results of the occupational comparison indicated that miscellaneous laborers (12.3 claims/100 workers) and garbage collectors (11.1 claims/100 workers) had the largest occupational incidence ratios. The occupational category "nursing aides, orderlies, and assistants" ranked fifth with an annual incidence ratio of 3.6 claims/100 workers. The occupational category "practical nurse" (i.e., licensed practical nurses and licensed vocational nurses) ranked ninth with an annual incidence ratio of 3.3 claims/100 employees. Across all industries and occupations, 4.5% of the claims for back sprains/strains were attributed to lifting a person (such as a patient). Incidence ratios of males and females in different age categories were also compared.

Lewy, R

Prevention Strategies in Hospital Occupational Medicine

Publication: Journal of Occupational Medicine 23(2):109-111 (1981)

In this article the author presents the view that hospitals need to improve health services for hospital employees. Retrospective injury data from one hospital are cited in support of the need for including accident prevention into these services.

A NIOSH survey was cited that found only 8% of surveyed hospitals satisfied minimal criteria for an effective occupational health and safety program. The author indicates that occupational hazards in the hospital environment fall into four broad categories: (1) occupational injuries and accidents; (2) infection; (3) toxicological hazards; and (4) stress. Other sources were cited that indicated nurses, food service workers, and maintenance workers have the highest injury rates in hospitals.

Data from the Presbyterian Hospital in New York City indicated that nurses account for over 59% of accidents even though they represent only one-third of the hospital work force. The most common types of accidents reported were contusions and bruises (24.9%), back injuries (16.3%), lacerations (11.8%) and strains and sprains (9.6%).

Liskin, L

Lifting Injuries Among Nursing Employees

Publication: Master of Science Thesis, The Johns Hopkins University,
Baltimore, Maryland (1984)

This study was conducted among a sample of hospital nursing employees to explore the problem of injuries caused by lifting or transporting patients and to describe the factors associated with such injuries. The design was non-experimental, retrospective, and descriptive. A total of 53 cases involving nursing employees who reported injuries caused by lifting and transporting patients to the Johns Hopkins Hospital Workers' Compensation Clinic in 1979 and 1980 and 53 controls matched to cases by job classification were interviewed by telephone.

Results indicated that 66% of the injuries were nondisabling, with employees able to return to work the same day. The rest were disabling, requiring 1 to 22 days off work. Almost 75% of the cases involved back injuries.

Comparing cases and controls, injured nurses were more likely to work rotating shifts than fixed shifts, were significantly more likely to work in the specialties of medicine and surgery, and were more likely to report lifting or transporting patients 10 or more times a day.

Analysis of the sociodemographic variables indicated that injured nurses were similar to the controls with respect to age, education, total nursing experience, and training in lifting techniques. Nursing employees with disabling injuries were significantly older and had more years of nursing experience than employees suffering nondisabling injuries.

Over 90% of the cases and controls had received training in lifting techniques at some point but less than 20% had had any training or continuing education courses in the year preceding the interview. Compared to controls, injured employees were significantly more likely to consider lifting injuries an inevitable part of the job, and were less optimistic regarding the role of training in lifting techniques as an adequate preventive measure against lifting injuries.

Lortie, M

L'Identification des Activites a Risque en Milieu Hospitalier
[Identification of High-Risk Activities in a Hospital Setting]

Publication: Proceeding of the Human Factors Association of Canada, 18th Annual Meeting, Human Factors Association of Canada, Rexdale, Ontario, 119-122 (1985a)

The injury incident reports of 316 full-and part-time day-shift nursing aides and orderlies in an extended care hospital were reviewed to identify specific activities that may lead to high risk of injuries. This paper describes two parts of this research.

- 1) In the first part of the research, the reports were analyzed to determine the circumstances of the incidents of those injuries resulting from muscular effort, including the operation taking place at the moment of injury, the action causing the incident, the object-place where the incident occurred, the object-tool used, and the area injured.
- 2) In the second part, the work activities of 15 orderlies were analyzed. The frequency of performing basic tasks (e.g., transferring patient, moving patient in place) was recorded along with the posture and efforts used to perform each task.

Employment status (full-or part-time) did not have an impact on the injury profile in terms of circumstances. Although males and females performed the same type of work, they performed some activities with different frequencies and so their injury circumstances differed. Thus, turning patients is associated with an elevated number of injuries in women because of a high frequency of performing this activity not because it is a high-risk activity. The different operations performed and the material and equipment involved in the handling operations appear to present equal risk factors for females. For males, however, transferring patients, raising or lifting patients, and performing handling tasks involving the bed present greater risks than other operations.

From the work analysis, it is evident that females use patient hoists and pads/drawsheets more often than males. Males prefer to manage patients in chairs, while females prefer beds.

The author concludes that differences in muscular efforts and subsequent injuries of males and females arise from differences in the frequency of specific activities and the way they perform them rather than from differences in the structure of the basic tasks.

Lortie, M

Analysis of the Work of Nursing Aides in a Geriatric Hospital

Publication: Ergonomics International 85, (I.D. Brown, R. Goldsmith, K. Coombes, M.A. Sinclair, editors), Taylor & Francis, Philadelphia, 973-975 (1985b)

This paper presents an analysis of handling tasks carried out by male and female orderlies in a geriatric hospital in Quebec, Canada. Five male and 10 female orderlies who worked the day shift and were considered to be representative of the whole regular staff were observed. Data were recorded with a pocket computer.

Results revealed that females perform almost twice as many patient-handling activities as males, preferring beds as their place of handling. Males, on the other hand, used chairs more frequently. Females prefer to wash their patients in bed while males prefer to transfer them to a chair and wash them at the sink. Females use draw sheets twice as often as males and hoists four times more often. Females exert two-thirds of their efforts in a horizontal direction while males exert one-third. Horizontal efforts are also used by females more frequently in vertical moving especially by females who develop handling techniques which use as little direct lifting as possible. Team work is systematically planned by female, but not by male orderlies.

Lortie, M

Analyse du Travail de Manutention de Patients des Aides-soignants dans un
Hopital pour soins Prolongs
[Task Analysis of Patient Handling by Orderlies in a Geriatric Hospital]

Publication: Le Travail Humain 49(4):315-332 (1986)

This study was conducted to identify the different operations or tasks involved in the work of orderlies. Handling activities of nine female and four male full-time orderlies in a geriatric hospital were observed for a total of 15 days by two observers. The following data were recorded: the frequency of patient-handling activities performed, direction of forces applied during patient-handling activities according to type of handling task, and postures involved. An analysis grid was constructed.

Results indicate that half of all operations consist of handling patients in place. Patient-handling tasks are most frequently performed along the horizontal axis, and while both men and women perform similar tasks, they perform them in different ways. Females perform nearly twice as many different operations as males. And the women turn and raise their patients nearly three times as often as men; use a pique (waterproof linen placed under the patient) and patient hoists more often; and use the bed more often as their place of work, while males use the wheelchair more often. Females exert 2.3 times as many efforts along different axes than males, and exert a significantly greater number of different efforts or motions to execute an operation: 2 per principal operation versus 1.5 for males. Males, on the other hand, make significantly more lateral changes in posture for the operation of moving in place than females.

The author suggests that preventive strategies should emphasize more the avoidance of abrupt anterior and lateral twisting motions while exerting forces. The nature of the patient-handling tasks often prevents workers from achieving ideal postures. Workers develop certain techniques and postural strategies that are often a compromise between maintaining a stable lifting posture and providing for the safety of the patient. The author indicates that a better understanding is needed of what is a good compromise.

Lortie, M

Analyse Comparative des Accidents Déclarés par des Préposés Hommes et Femmes d'un Hôpital Gériatrique
[Comparative Analysis of Accidents Reported by Male and Female Orderlies in a Geriatric Hospital]

Publication: Journal of Occupational Accidents 9:59-81 (1987a)

This study presents a comparative analysis of occupational accidents of 316 male and female orderlies in a geriatric hospital in Quebec, Canada. Data were obtained on 662 injury incidents from the hospital internal records and from the Occupational Health and Safety Commission according to the following variables: the type of handling carried out at the time of the accident, the action causing the injury, the equipment involved (either as place of handling or as tool used to handle), the injured body area and the sex of the injured person.

Males and females perform the same job but work only with patients and co-workers of the same sex. Results revealed that females reported twice as many handling in place accidents as males, especially related to turning or moving a patient up in bed. Males reported more accidents related to transfers and raising or lifting patients. No male-female differences were found with respect to the distribution of the places of handling involved in the accident nor of the body areas injured. Handling tasks and places, however, were associated with statistically significant different patterns of injured body area; females received more back injuries while males received more injuries to the trunk. In addition, given a specific place, the reported circumstances of accidents appeared to differ significantly between males and females. For example, of the incidents that occurred near a patient's bed, the male orderlies were often performing a patient transfer, whereas the female orderlies were more likely to have been handling the patient while on the bed.

The author suggests that these results indicate that the work organization and the handling methods place a major role in subsequent work injuries. The work methods, however, are strongly related to the worker's gender.

Lortie, M

**Structural Analysis of Occupational Accidents Affecting Orderlies
in a Geriatric Hospital**

Publication: Journal of Occupational Medicine 29(5):437-444 (1987b)

This study analyzed occupational accidents of a group of orderlies employed in a geriatric hospital in Quebec, Canada on a retrospective basis. Information was obtained from formal claims for compensation by the Quebec Occupational Health and Safety Commission, the post-accident report filed at the hospital, and by group interviews.

Results revealed that 56% (N = 369) of the accidents reported were directly caused by muscular effort applied to a handling operation and were classified as type A. Forty-five percent (N = 287) were not a direct result of a handling effort and were classified as type B. Fifty-nine percent of type A and 28% of type B accidents were followed by absences from work, representing 5,075 and 1,372 absentee days, respectively. In one half of the type A accidents, the injured region was the back, accounting for 56% of the days absent. The back area was injured in only 7% of the type B injuries, accounting for 5% of the days absent.

The author describes the structural components of the accidents, including their distribution over a 10-year period; by month, season, and time of day; by shift; by full-time and part-time employment status; and by sex.

Lortie, M; Gagnon, M; St-Vincent, M

Evaluation of Accident Risks with Handling Activities: Insufficient Criteria Presently Used

Publication: Trends in Ergonomics/Human Factors IV, (S.S. Asfour, editor), North-Holland Publishing, Amsterdam, 823-829 (1987)

The object of this paper is to explain, by review of results obtained from different studies, the nature of problems met during the evaluation of accident risks associated with patient-handling tasks. Summaries of work, accident, and biomechanical analyses and of training program effectiveness are presented and briefly discussed. These studies included orderlies and students, who were evaluated while performing lifting and turning/pulling tasks on the bed with a quilt.

Results of the review showed back-injury distribution as follows: 40% lumbar, 32% cervico-dorsal, 20% dorso-lumbar, and 8% unspecified. Handling patients in bed was responsible for 42% of the reported accidents and 51% of the absentee days following an injury. Distribution of tasks performed and site of handling were noted as follows.

	Average Freq. per Day		% of the Tasks		% of the Accidents	
	F	M	F	M	F	M
<u>Task Performed</u>						
In-place handling	22.2	11.8	57%	53%	47%	21%
Transferring	5.9	4.0	15%	18%	17%	37%
Lifting	5.7	3.6	15%	16%	11%	24%
Putting in bed	1.0	0.5	3%	2%	18%	18%
Sitting	3.8	2.6	10%	12%	6%	1%
<u>Site of Handling</u>						
Bed	27.3	9.4	60%	35%	59%	52%
Chair	16.2	16.4	35%	61%	20%	17%
Other	2.3	1.1	5%	4%	21%	32%

Analysis of the information showed no strong association between the area of injury and the type of handling. Work analysis showed that 75% of recorded efforts involving the bed as a site of handling were carried out along a horizontal axis; therefore, vertical moving does not constitute the only important risk factor. Male orderlies handle patients from a chair 61% of the time, yet this was associated with only 17% of their accidents even though the compressive loading on their lower backs is large. A reduction of spinal loading for pulling/turning is obtained by performing the movement rapidly rather than slowly. Factors such as the symmetry or asymmetry of the feet, use of a support, and weight transfer, which are often emphasized in training programs, did not show an important or positive impact in the training study reviewed. Accident analysis brought out the active role played by the patient in 25% of handling accidents.

The authors state that the evaluation of compressive and shearing forces at L5/S1 lumbar spinal joint deserve attention, but are insufficient criteria for a full understanding of patient-handling tasks. The bottom line is that when working in a healthcare facility the worker still has to choose between different risks such as between minimizing biomechanical stresses on the lower back or on the shoulders, and between postural stability or most desirable back posture. They conclude that we know a lot about handling, but very little about how people handle.

McKechnie, MR

Preventing Back Injuries: An Application of the Nursing Research Process

Publication: Occupational Health Nursing 33(11):552-557 (1985)

This paper describes attempts to use the research process in assessing the problem of back injuries and in the planning, implementing and evaluating of back injury prevention programs in a Chicago hospital.

Back injuries were targeted as a special concern by the hospital's safety committee during the first year of operation of the hospital. One educational program on lifting techniques and principles of back care entitled "Back Talk" was developed and offered in 20 sessions to all hospital employees before becoming a part of the orientation program for all new employees.

In addition, the housekeeping department developed its own back injury prevention program made up of the following components: back talk class four times per year, consultation with a physical therapist, literature distribution, discussion groups, fitness testing, stress management program, safety awareness sign and posters, aggressive treatment of back injuries, Back School, psychological counseling services and a light duty pool.

Related literature was continuously reviewed and informal investigations were conducted throughout the development of the program. These included informal case studies, summaries of back injuries by cause of injury, and incidence studies of back injuries using accident reports.

In addition, a simple evaluation study of the "Back Talk" program was conducted based on evaluation forms which were completed two months after the initial series of sessions. The evaluation included a test to measure how well the attendees understood the course material two months after completing the course. Results indicated that the majority of the sample were able to meet the learning objectives of the program. Since this was the only test of knowledge administered to course attendees, it was not possible to assess the effects of the program.

The author points out the challenges to performing research studies at the worksite by describing the difficulties encountered in conducting a cost analysis study to determine how much back injuries were costing the hospital.

Magora, A; Taustein, I

An Investigation of the Problem of Sick-Leave in the Patient Suffering from Low Back Pain

Publication: Industrial Medicine 38(11):398-408 (1969)

This article reports part of the results of a cross-sectional survey of 3,316 workers in Israel. The workers were selected from eight occupational groups including nursing. Point prevalence of back pain was determined by worker interviews.

Results taken from the entire survey population indicated that point prevalence decreased with increasing age.

In a comparison of the eight occupations, the following point prevalence percentages were found.

<u>Occupation</u>	<u>Prevalence</u>
Heavy industry workers	1.6%
Nurses	16.8%
Farmers	14.5%
Light industry workers	14.1%
Bus drivers	11.9%
Post office clerks	10.1%
Bank clerks	10.1%
Policemen	6.4%

Additional frequency tables are provided showing: age versus low-back pain (LBP) group; sick leave versus occupation; sick leave versus education; sick leave versus age of first onset of LBP; sick leave versus activity that triggered onset of LBP; sick leave versus neurological signs; sick leave versus lumbar lordosis; sick leave versus spine mobility; sick leave versus time lapse between onset of LBP and medical exam; and sick leave versus type of after-work activity.

Mandel, JH; Lohman, W

Low Back Pain in Nurses: The Relative Importance of Medical History, Work Factors, Exercise, and Demographics

Publication: Research in Nursing and Health 10(3):165-170 (1987)

This study attempted to assess the magnitude of low-back pain (LBP) in a group of registered nurses working at a midwestern county hospital and to examine the relative strength of the associations of LBP with demographics, medical history, exercise, sports, and work variables. Of the nurses surveyed by multiple-choice questionnaire, 428 (65%) responded. A LBP episode was defined as LBP that lasted 48 hours or more.

Results indicated that 15% of the nurses had experienced their first LBP episode during the previous year. Age was not significantly associated with the dichotomous variable that characterized whether the nurse had a LBP episode during the study year. Of the nurses who reported having had a LBP episode during the past year, only 13% actually missed work. Episodes resulting in lost time accounted for 82 weeks of absence, or an average of 1.5 weeks for each nurse missing work.

When all 32 variables were examined by nonstratified associations, those significantly associated with LBP ($p < .1$) during the study year were (1) previous LBP, (2) discomfort in another part of the spine (neck or upper back), (3) aerobic dance exercise, (4) using drugs that alter calcium metabolism, (5) lifting over 10 patients per week, (6) working on surgical wards, (7) and length of employment. None of the demographic, medical, or leisure-time variables were statistically significant ($p > .1$).

Logistic regression revealed that having had LBP before the study year, having had pain in another part of the spine, performing aerobic dance exercise three or more times per week, and lifting more than 10 patients weekly were the best predictors of LBP during the study year; one or more of these were associated with LBP in 95% of all the cases. The authors conclude that factors unrelated to work may be more important to LBP than previously thought.

Owen, BD

The Lifting Process and Back Injury in Hospital Nursing Personnel

Publication: Western Journal of Nursing Research 7(4):445-459 (1985)

The purpose of this study was to investigate the relationship of selected aspects of the lifting process to the occurrence of back injury in hospital nursing personnel.

The sample of this laboratory experiment consisted of 64 female volunteer nursing personnel from a large midwestern hospital. The back injured (BI) group comprised 21 registered nurses and 11 nursing assistants who had filed an accident report form indicating that they had received an injury to the lumbar-sacral area while on the job and while in the act of manual handling of patients or equipment. The non-back-injured (NBI) group contained 21 registered nurses and 11 nursing assistants who had never filed an accident form due to low-back injury and who had no history of low back pain.

The BI group had a mean age of 36, had worked an average of 8 years on nursing units that required frequent lifting with 53% having two or more family members with back problems. The NBI group had a mean age of 28, had worked an average of 4.5 years on these units with only 18% having family members with back problems.

The subjects were asked to pick up a 15-pound (16x16") box without handles from the floor and place it on a table that stood at waist level 6 feet away from the box. An 8mm Bell and Howell movie camera was used for documentation of body positions. The investigator and an assistant served as raters in taking 13 measurements from the film, which was magnified and projected on to a lighted drawing surface. The film was then introduced into another film magnifier that was part of a Hewlett-Parkard computer that measured angles of body flexion.

Two-way analysis of variance was used to determine differences in the lifting process in relation to variables of back injury status and job title.

Results indicated significant differences between the BI and NBI groups in lifting techniques in relation to the distance the feet were apart during the lift and the distance the load was away from the body at knee level. The BI group had their feet closer together for the lift and held the box further from their bodies when it was at knee level during the lift. No subjects lifted with a straight vertical back or with straight knees.

Owen, BD

Personal Characteristics Important to Back Injury

Publication: Rehabilitation Nursing 11(4):12-16 (1986)

This paper provides a synthesis of findings from an extended investigation that involved multiple studies (Owen & Damron, 1984; Owen, 1985). The purpose of these investigations was to find out if there were differences in physical, life-style, or lifting-style characteristics between back injured and non-back-injured hospital nursing personnel.

The sample consisted of 64 female volunteer nursing personnel from a large midwestern hospital. The back injured group consisted of 21 nurses and 11 nursing assistants who had filed an accident report indicating that they had injured their backs while lifting or transferring patients or equipment. The non-back injured group consisted of 21 nurses and 11 nursing assistants who had no reported history of low-back pain or low-back injury. Data were obtained using a questionnaire, personal anthropometric measurements, and observation of lifting style in an experimental setting.

Results revealed 14 statistically significant differences between back-injured nursing personnel and non-back-injured nursing personnel. In general, the back injured group was more likely to be made up of nursing personnel who:

Demographic Characteristics:

1. were older
2. worked on units that require frequent lifting of patients or equipment
3. had family members with low-back problems
4. had family members whose onset of low-back problems was early

Physical Characteristics:

5. had the least muscle flexibility
6. exhibited less proprioceptive ability (including balance)
7. had unequal leg length

Life-Style Characteristics:

8. were more vulnerable to stressor of frustration
9. were more vulnerable to stressor of overload
10. spent fewer hours per week in high-energy output exercise
11. smoked more cigarettes
12. rated their physical condition lower

Lifting Style:

13. had feet closer together during lifting
14. carried weight to be lifted further from body

When all of the factors were analyzed, the characteristics that best forecast back injury included a sense of overload, less muscle flexibility, poor proprioception, family history of low-back problems, difference in leg length, increased years of frequent lifting in nursing practice, and smoking.

Owen, BD

The Need for Application of Ergonomic Principles in Nursing

Publication: Trends in Ergonomics/Human Factors IV, (S.S. Asfour, editor), North-Holland Publishing, Amsterdam, 831-838 (1987)

Two studies were conducted to describe back problems among nurses and to elicit ideas for prevention of back problems from nursing personnel.

In Study 1 data were gathered through questionnaires sent to a sample of registered nurses. Some highlights of the survey are included in this article. A complete report on the survey entitled "The Magnitude of the Low Back Problem in Nursing", is scheduled for publication in the Western Journal of Nursing Research in 1989. The survey sample was obtained by sending questionnaires to 1,000 randomly selected nurses in Wisconsin. Over fifty percent (50.3%) were returned and included in the study.

Results indicated that 38% of the nurses stated they had experienced at least one occupational low back injury (LBI) or low back pain (LBP). Of these, 66% had occupational LBI or LBP but had never filed any accident or worker compensation claim. Those nurses with LBP reported only 16.5% of the 519 episodes they experienced. The author concludes that injury statistics underestimate the magnitude of the low back injury problem among nurses.

The author also looked at events associated with the onset of LBP. Sixty-two percent of these episodes were perceived to have been precipitated by maneuvering a patient in bed. Transferring patients accounted for 18%; stabilizing a patient, 5%; restraining a combative patient, 4%; non-patient handling tasks, 11%.

Study 2 was based on accident reports over a 2-year period from two acute care 500 bed hospitals. Of the 244 back pain reports filed by nurses, 128 (53%) cited maneuvering patients in bed as the perceived precipitating factor. Lost time was incurred by 43% (N = 104) of the nursing personnel; 51% of this lost time was due to maneuvering patients in bed.

The specific precipitating task in maneuvering patients in bed most frequently reported was lifting, pulling, sliding patients up in bed (53%), followed by turning patients (29%). The patient characteristic most frequently described in the incident was the weight of the patient. In 65% of the reports the patient handling task had been performed by one nurse rather than by two or more nurses.

Both the questionnaire used in Study 1 and the accident report forms used in Study 2 had an item requesting suggestions for preventing back injuries in the future. Nurses' suggestions from the two studies were combined for the analysis reported here. The majority (87%) stated good body mechanics during lifting and transferring of patients was the most important preventive measure.

Most suggestions centered around the abilities of the individual nurse with only 13% of the responses referring to preventive approaches other than personal behavior modification.

The author suggests that more attention be focussed on how patients are maneuvered in bed. Attention should be given to two environmental aspects (1) confined work space and (2) the design of the work surface of the nurse (primarily the patient's bed).

Owen, BD; Damron, CF

Personal Characteristics and Back Injury Among Hospital Nursing Personnel

Publication: Research in Nursing and Health 7(4):305-313 (1984)

This cross-sectional study obtained data using both a questionnaire and personal anthropometric measurements. Subjects were classified as cases or non-cases based on prior reports of back injury.

From one large midwestern university hospital, two years of injury reports were used to identify 79 nursing personnel who had reported a low-back injury. Of these, 56 were located in the area; 34 agreed to participate (60%), but two could not participate. The resulting case group was made up of 32 subjects - 21 RNs and 11 nursing assistants (NAs). The non-case group was selected from a roster of nurses who had not filed back-injury reports during the same two-year period. These were individuals employed on a set date, who worked in one of the nine hospital units where at least four low-back injuries were reported during the 2-year period. From the 124 nurses selected, 40 agreed to participate; three could not; five were excluded because they had a history of low-back pain. This left 32 subjects - 21 RNs and 11 NAs.

Mean age of cases was 36; of controls, 28. Mean years of employment on nursing units where frequent lifting was required was eight years for the case group and 4.5 years for the non-case group. The latter variable was better in the discriminant function than age.

Several variables were useful in the following discriminant function: Back injury or none = $a + b x_1 + c x_2 + \dots$. The variables that successfully discriminated were work overload, flexibility, proprioceptive ability, family history of back problems, difference in leg length, years working on nursing units where frequent lifting was required, and number of cigarettes smoked. Using these seven variables, 87% of the subjects could be correctly identified as belonging to the case or non-case group (90% of the case group and 84% of the non-case group).

Variables not included as discriminant variables were age, exercise, perception of physical condition, frustration, height, weight, abdominal muscle strength, depth of lordotic curve, nutrition, caffeine or alcohol consumption, medications, and risk-taking behavior. (Authors note that attempt to measure risk-taking behavior was not very successful.)

Pines, A; Cleghorn de Rohrmoser, DC; Pollak, E

Occupational Accidents in a Hospital Setting: An Epidemiological Analysis

Publication: Journal of Occupational Accidents 7:195-215 (1985)

This study presents the results of an analysis of data obtained from routine forms submitted for occupational injuries by workers of a large modern hospital in Israel during a three year period.

During the study period, the hospital personnel reported 792 occupational injuries, resulting in 8,926 work days lost. The annual injury incidence rate (AIIR) was 89.2 per 1,000 workers per year. The mean duration of absence from work per injury was 11.3 days and the mean number of work days lost per worker per year was 0.98 days. Of the total number of injuries, 20.9% did not result in absence from work, while 15.1% resulted in more than 20 work days lost.

Injury rates were higher in males (AIIR = 95.0) than females (AIIR = 82.6) and their injuries were more severe. Male workers younger than 25 years were the most prone to work injuries (AIIR = 395) while women older than 45 years had a higher AIIR (174) than men. The most common cause of reported injuries was falls (41.2%), followed by improper handling of objects or persons (24.2%).

Unskilled and skilled workers employed predominantly in housekeeping, maintenance, laundry and catering had a higher incidence but lower severity than physicians, nurses, technicians and clerks. The highest injury rates were observed in the group of recently (less than one year) employed workers.

Poll, KJ.

Patient Lifting: An Ergonomic Approach

Publication: Musculoskeletal Disorders at Work, (P. Buckle, editor), Taylor & Francis, Philadelphia, 247-249 (1987)

This study, conducted in Amsterdam, compares two different methods of lifting patients. Two volunteers were asked to lift a patient six times from a standard hospital bed set at its highest position (80 cm) by either:

Method 1: arms around the patient

Method 2: both arms under the back of the patient

The same lifting task was also executed on an experimental bed which could place the patient 100 cm from the floor. The subjects chose the height. Video records were made of each lift. Comparisons were based on values for Action Limit (AL) and Maximum Permissible Lift (MPL) as defined in the NIOSH "Work Practices Guide to Manual Lifting" (NIOSH, 1981).

Results indicate that the height of the bed in relation to the lifting methods influenced the AL and this MPL. The higher the position of the bed, the shorter the horizontal distances between the patient and the lifting person which is reflected in larger values of AL and MPL compared to the lower bed height. Using the standard bed, method 1 had a larger AL (24 kg) than method 2 (18 kg), thus method 1 appears safer for the subjects. Using the experimental bed, method 2 had a larger AL (31 kg) than method 1 (28 kg), thus method 2 appears safer for the subjects when using the experimental bed.

Prezant, B; Demers, P; Strand, K

Back Problems, Training Experience, and Use of Lifting Aids Among Hospital Nurses

Publication: Trends in Ergonomics/Human Factors IV, (S.S. Asfour, editor), North-Holland Publishing, Amsterdam, 839-846 (1987)

The results of a cross-sectional survey of registered nurses who worked in a large urban hospital are reported. The health status of the nurse's back was determined from multiple questions on a questionnaire. The questionnaire had two key questions about the past year: experienced back pain, and experienced back tiredness or fatigue. For responses to these two questions, the questionnaire had a grid with three rows for region of the spine (cervical, thoracic, lumbar) and three columns for frequency of pain (once per month or less, once per week, almost daily).

Results indicated that pain in the lumbar spine was most frequent; 5% reported pain in the lumbar spine on a daily basis, 14% weekly, and 34% monthly. Somewhat larger percentages were reported for the question about feelings of back tiredness and fatigue. One-fourth of the respondents felt that the symptoms interfered with their ability to perform their job. About 17% had lost between one and five workdays in the past year due to back problems.

No significant relationship was found between any of the personal descriptors, such as age, sex, or weight and height, nor between any of the work-schedule variables and the back-injury measures, lost time, or doctor visits due to back problems.

The report provides data on the perceived adequacy of prior training in the use of patient-handling devices. These results, however, appear to be applicable only to the nurses at this particular hospital. None of the training variables were able to predict any of the back-pain variables.

Raistrick, A

Nurses with Back Pain - Can the Problem be Prevented?

Publication: Nursing Times 77(20):853-856 (1981)

This study was conducted to estimate the magnitude of the problem of back pain among nursing personnel in one British health district. Questionnaires were sent to every member of staff known to be working for the district health authority (N = 2,090) and were returned by 54.8% (N = 1,146).

Results showed an incidence of back pain in nurses of 41.1%, ranging from an incidence of 24.0% in learners to 86.3% for health visitors. Of the 243 nurses with back pain, 106 (43.6%) gave lifting at work as the main cause. From this 243, 22 (9.1%) had never had any lifting/handling training.

While height and weight are considered to be factors in back pain, these were not found to be significant.

In response to these findings, a comprehensive lifting and handling training package was developed. This package includes: pre-employment screening, redesign of the working environment, health education, and lifting and handling training. While the number of back accidents due to lifting patients decreased during the first 12 months the program was in effect, the author suggests further study to evaluate its effectiveness.

St-Vincent, M; Lortie, M; Tellier, C

A New Approach for the Evaluation of Training Programs in Safe Lifting

Publication: Trends in Ergonomics/Human Factors IV, (S.S. Asfour, editor), North-Holland Publishing, Amsterdam, 847-854 (1987)

A training program in patient-handling techniques given to nursing orderlies in a geriatric hospital was assessed, by means of a field study and by comparing the methods taught with the methods actually used in the work environment.

Specific objectives were (1) to determine to what extent the methods taught are used, (2) to characterize the methods actually used, and (3) to identify and interpret major deviations.

The field study was carried out by two observers in a geriatric hospital who monitored the type of handling task and handling method used by 33 hospital orderlies. The evaluation of training procedures consisted of (1) teaching the basic principles of "straight back, bent knees" and (2) handling techniques specific to different tasks in the hospital. Multifactorial analyses techniques were used to compare techniques used with techniques taught.

Results of this study reveal that the "straight back, bent knees" lifting technique is seldom used in clinical practice. Contrary to what is taught, the back is used in the majority (90%) of the lifting cases. Depending on the back movements, two dominant patterns are observed: Type I (56%); none of the principles taught are applied; and Type II (44%); some of the principles taught are applied. Type I patterns dominate handling tasks that include a horizontal component; Type II patterns dominate handling tasks that include a vertical component.

The deviation of techniques used from techniques taught may be accounted for by the modification of taught-techniques by orderlies to attain and maintain optimal posture, stability, and favorable lever-arm during handling tasks.

Two conclusions emerge from the study: (1) the application of the handling principles taught depends on the characteristics of the tasks carried out; and (2) workers do not optimize their working technique only in relation to back posture. In certain cases, stability or handling distance seem more significant.

This study shows that the techniques taught during training do not integrate all the variables that come into play in a handling task.

The authors had an earlier paper about the planning of this study published in 1985: "Les Programmes de Formation a la Manutention dans le Secteur Hospitalier: Leur Evaluation par L'etude des Comportements de Travail", published by the Human Factors Association of Canada in the 18th Annual Meeting Proceedings.

Scholey, M

Back Stress: The Effects of Training Nurses to Lift Patients in a Clinical Situation

Publication: International Journal of Nursing Studies 20(1):1-13 (1983)

This was an intervention study performed in a hospital with several geriatric wards. Two specific wards were selected, one for men, the other for women. The nursing staff consisted of permanent qualified female staff, auxiliaries and student nurses. Patients differed in the extent to which they helped with their transfer, and the training provided to the nurses was tailored to specific tasks for those patients. Thus, it is a quasi-experiment rather than a true experiment because of lack of control of important variables.

The pre- and post-training periods lasted 3 weeks each. A radio-pill was used to measure intra-abdominal pressure, which provided the raw data to form a dependent (criterion) variable. Radio-pills are practical to use on real hospital wards, and their output can be shown to nurses to help inform them of the stressfulness of specific tasks. Radio-pill usage requires three observers: one to record the tasks; one to note any coughs; the third to note exactly what technique was used.

Observations were used to identify the most stressful manual patient-handling tasks (turning the patients at night) and those performed most frequently by two nurses together (transferring the patients between the bed and commode or chair). It was also found that tasks were not identical or repetitious, and asymmetric lifting was common.

Four nurses were trained to perform three specific patient-handling tasks. Results showed significant differences between pre-training and post-training. However, the direction of the change was inconsistent. Reduced intra-abdominal pressure was found in the cases where the patient was about the same in both observation periods. Increased pressure was found with two male patients who became less cooperative for the post-training observations.

Generally, the results appear to support the benefits of training, but the evidence is equivocal.

Skovron, ML; Mulvihill, M; Sterling, R; Nordin, M; Tougas, G; Gallagher, M; Speeling, E

Work Organization and Low Back Pain in Nursing Personnel

Publication: Ergonomics 30(2):359-366 (1987)

The purpose of this questionnaire survey was to examine the association between work organizational factors, sociodemographic factors, history of musculoskeletal problems, exposure to lifting and low back pain in the past 6 months among registered nurses and non-registered nursing personnel in two acute care urban hospitals.

Low back pain was defined as that not associated with urinary tract infections or menses and which was one of the three most troublesome musculoskeletal problems experienced in the past 6 months. Work organizational factors explored included clinical area, usual shift, type of work schedule, mode of nursing care, frequency of patient lifting and job category. Satisfaction with head nurse was measured using an adaptation of the Head Nurse Scale. Perceived autonomy was measured using the Quality of Employment instrument. Satisfaction in relationships with co-workers was assessed by means of the Work Apgar Scale.

Data were collected by means of a questionnaire. Response rate for registered nurses (RN's) was 60% and non RN's was 30%. A total of 787 completed questionnaires were returned. Forty-three percent of the respondents reported having had low back symptoms sometime in the past. Twenty-eight percent of the subjects, or two-thirds of those with a history of LBP, reported an episode of at least 3 days duration. Twenty percent of the respondents reported at least one episode within the previous 6 months and 36% of these reported its origin as work-related.

Univariate analyses revealed that neither characteristics of the work organization, relationships with head nurse, satisfaction in relationships with co-workers nor perceived autonomy of job were significantly associated with occupational injuries as the origin of recent troublesome LBP.

Multivariate analyses revealed the age of the respondent, job category and work apgar continued to be independent predictors of recent LBP. Recent LBP appeared to decline slightly with age and to increase with satisfaction with co-workers (Work Apgar). The prevalence of recent LBP was greater among registered nurses than non-registered nurses. The prevalence of LBP differed between the categories of registered nurses.

The results of this study suggest that work organizational factors; with the exception of job category, and unfavorable working relationships are not associated with LBP in the acute care setting.

Skovron, ML; Nordin, M; Sterling, RC; Mulvihill, MN

Patient Care and Low Back Injury in Nursing Personnel

Publication: Trends in Ergonomics/Human Factors IV, (S.S. Asfour, editor), North-Holland Publishing, Amsterdam, 855-862 (1987)

The purpose of this prospective study was to examine factors potentially related to risk of subsequent back injury. Nursing personnel in two acute care urban hospitals were surveyed by use of a self-administered questionnaire and were followed for an 18 month period. Patient care activities were measured based on responses to nine items in the survey questionnaire. A preliminary analysis of the relationship of age, body mass, history of low back pain, job category and the patient care factors and low back injury is reported.

A total of 787 completed questionnaires were returned. Eighty-three percent of the respondents were RN's. Respondents and non-respondents did not differ in mean age or time since hire. The incidence of reported low back injury during the follow-up period was 2.4%, which did not differ significantly from the rate among non-participants. The mean age of injured subjects (35.1 yrs, S.D. = 7.1) did not differ significantly from that of non-injured (36.2 yrs, S.D. = 9.8). Mean Quetelet's body mass index was also similar. Respondents reporting a previous history of low back pain had a higher incidence of subsequent back injury than subjects without such history. (Alpha was set at 0.10 in these preliminary analyses).

A difference in risk of subsequent back injury by job category was observed with staff RNs having an incidence of 2.65%, NAs and LPNs having an incidence of 5.9%, and no injuries occurring among other job categories. This difference was not statistically significant.

Factor analysis of the nine patient care activities items yielded the following three factors which explained approximately 58% of the variance: amount of direct care, use of technical aids in lifting, and work pace. Risk of subsequent back injury was positively associated with amount of direct care among registered nurses.

The authors suggest further prospective study with larger numbers of subjects and validation of factors derived by direct observation/measurement.

Stobbe, TJ; Plummer, RW; Jensen, RC; Attfield, MD

Incidence of Low Back Injuries Among Nursing Personnel as a Function of Patient Lifting Frequency

Publication: Journal of Safety Research 19(2):21-28 (1988)

This was a longitudinal study based on records kept by a major medical center. Supervisors provided estimates of patient-lifting frequency for employees they supervise. Those who infrequently lift patients and those who frequently lift patients constituted the two groups of the study population of 415 employees. This study population included 143 LPNs, 252 nursing aides, and 20 attendants.

Hospital injury report records were used to obtain information about reported back injuries. Logistic analysis indicated that occupational category was not a significant factor in explaining which employees fit into the back injured group or the not injured group. Therefore, subsequent analyses were based on all 415 members of the study population combined.

To compare the frequent to infrequent patient lifting groups, survival analysis was used. It showed that those in the frequent patient lifting group had a significantly lower survival curve than those in the infrequent patient lifting group. For example, 600 days after becoming a member of the study cohort, those in the more frequent patient lifting group had 83% without a reported back injury, whereas those in the less frequent patient lifting group had 93% without a reported back injury.

The authors conclude that when frequent patient lifting appears to be a hazard, an appropriate approach to control the hazard would be to reduce exposure by finding different ways to move patients, such as greater usage of patient-handling devices.

Stubbs, DA; Rivers, PM; Hudson, MP; Worringham, CJ

Back Pain Research

Publication: Nursing Times 77(20):857-858 (1981)

The authors present preliminary findings of research that was carried out at the University of Surrey into patient-handling and back pain in nurses. This research involved 5,000 hospital-and community-based nurses of all grades in four health districts in Guildford, England.

Results are based on responses from a questionnaire survey with a 76% response rate (N = 3,660). Forty-three percent of the nurses had experienced back pain; 44% of these identified the incident as having occurred at work, and 84% of the incidents occurring at work were caused by patient handling. Of all the back pain episodes attributed to patient handling, 41% were related to moving a patient in bed. Significantly more back pain attributed to patient handling occurred in geriatric, general medical, orthopedic, and district nursing. Nine percent of the nurses received no training in basic lifting techniques, 57% received 6 hours or less and only 34% received more than 6 hours of instruction.

The authors feel that practicing nurses and researchers should explore safer, alternative ways for patient handling.

Stubbs, DA; Buckle, PW; Hudson, MP; Rivers, PM

Back Pain in the Nursing Profession: II. The Effectiveness of Training

Publication: Ergonomics 26(8):767-779 (1983)

This work presents the findings of two laboratory studies that looked at the role of training in techniques of patient-handling. The first part presents the findings of a laboratory study that examined four two-person techniques for moving a patient up in a hospital bed. A convenience sample of eight female student nurses between the ages of 19 and 23 was studied. The criterion measures included intra-abdominal pressure (IAP) and perceived discomfort.

The four different procedures for moving the patient in bed were found to differ in IAP: the shoulder lift (also called Australian lift) produced significantly lower IAP than the other procedures. The shoulder lift and the orthodox lift were considered more comfortable than the other two procedures.

The second part presented the findings of a laboratory study involving two nursing students, age 20, undergoing training for eight specific patient transfers. Results of the second study produced inconclusive results as measured by IAP; however, the article contains an extended summary and discussion of studies that tried to evaluate the effects of training nurses in patient-handling.

Stubbs, DA; Buckle, W; Hudson, MP; Rivers, PM; Baty, D

Backing Out: Nurse Wastage Associated with Back Pain

Publication: International Journal of Nursing Studies 23(4)325-336 (1986)

This study reports the results of a questionnaire survey of 1,008 British National Health Service nurses and nursing auxiliaries leaving their current position. Nurse leavers were defined as all community and hospital-based nurses, midwives, health visitors, nurse managers, tutors, clinical teachers, nursery nurses, learners and nursing auxiliaries and aides who left post during an eight month study period in 1983.

Results indicate that 3.5% of nurses left their position because of back pain and of those, 1.3% reported back pain as a sole cause and 2.2% left with back pain as a contributory factor. In addition, 45% of those leaving because of back pain planned to leave for good, significantly more than the rest of the respondents. Of those leaving because of back pain, those leaving for good were significantly older than those hoping to continue and were more likely to be working part-time. In addition, those leaving because of back pain were significantly older with a mean age of 41.2 years compared to a mean age of 29.4 years for all others. Nurse leavers with back pain, however, did not differ significantly from other nurse leavers with respect to sex, specialty, grade/position or history of back pain.

The authors point out that these findings have implications in relation to costs and manpower planning and emphasize the need for further education and prompt referral and treatment to prevent long-term back morbidity and wastage for all nursing personnel.

Stubbs, DA; Buckle, PW; Hudson, MP; Rivers, PM; Worringham, CJ

Back Pain in the Nursing Profession: I. Epidemiology and Pilot Methodology

Publication: Ergonomics 26(8):755-765 (1983)

This was a cross-sectional survey of a population approximately representative of the total population of nurses employed within the British National Health Care System. The report is not explicit on whether this included students of nursing and nursing aides and assistants. The authors expressed the opinion that each ward specialty and nursing status category should be studied as a separate occupation.

A questionnaire was distributed to all nurses in four health districts in Great Britain. Response rate was 76%; a total of 3,912 nurses responded. Multiple health measures were used including (1) one-year prevalence of back pain; (2) number of nurses who suffered their first-ever back pain during the past year, per 1,000 respondents; (3) one-year prevalence of back pain, the onset of which was attributed to patient-handling incidents; and (4) number of nurses who suffered their first-ever back pain, the onset of which was attributed to patient-handling incidents, per 1,000 nurses. The authors referred to measures (2) and (4) as "incidence" measures, but they are more properly called "prevalence" measures. The questionnaire had been field-tested at one hospital prior to this survey by having nurses respond and then sit for a personal interview.

Results for the four measures were (1) 43.1%, (2) 7.7%, (3) 15.9%, and (4) 2.9%. Concerning the part of back affected, results indicated that of all respondents who reported having suffered back pain, 77.9% said the pain included the low back. The percentages of respondents reporting pain, by part of body, follow.

<u>Part of Body</u>	<u>Percentage</u>
Upper back and neck only	4.4%
Mid back only	4.5%
Low back only	53.7%
Buttocks and legs only	9.9%
Multiple parts including low back	24.3%
Multiple parts excluding low back	3.3%

The number of episodes experienced by respondents during the year was reported; 43% had seven or more episodes during the year. Age was assessed using point prevalence; those with back pain had a mean age (37.3 years) significantly greater than those without back pain (35.4 years). No recommendations for hazard control were offered.

Takala, EP; Kukkonen, R

The Handling of Patients on Geriatric Wards

Publication: Applied Ergonomics 18(1):17-22 (1987)

This study investigated the differences in the use of lifting aids, the role of lifting instructions on a ward and the possible association between different lifting practices and low back pain on seven geriatric and acutely ill wards in five hospitals in Finland. Of the seven wards, three had no patient hoists, three had patient hoists and on one ward the hoist was used only by nurses for bathing patients. The lifting work of 143 nurses (134 female and 9 male) on the wards was studied by means of workplace analysis, questionnaire and video analysis of lifts.

Results indicated that mechanical hoists were regularly used only on the ward that had well organized on-the-job training. Reasons for not using hoists (lack of space or time, etc.), however, were similar for all of the wards. While lifting with hoists was slower than without aids, the total extra time needed for their use was estimated to be 3-6% of the 8-hour work shift. No statistically significant differences were found between the wards regarding nurses' back problems. When lifting aids were used there were less stooped ($p < .01$) and twisted ($p < .001$) trunk positions than without the aids. Some nurses, however, worked with bent and twisted trunk positions even when using lifting aids. It was felt that more attention should be paid to work postures during training of patient handling.

Torma-Krajewski, J

Analysis of Lifting Tasks in the Health Care Industry

Publication: Occupational Hazards to Health Care Workers, American Conference of Governmental Industrial Hygienists (publication number 0170), Cincinnati, 52-68 (1987a)

This study attempted to identify and evaluate the manual material-handling tasks performed by health care personnel in a large, metropolitan hospital in Colorado. Job analyses were conducted for the positions of paramedic, occupational therapist, physical therapist, nurse, and aide. Each job analysis was conducted in two steps. The first consisted of obtaining descriptive information; the second consisted of a biomechanical analysis of tasks requiring muscular strength. Data on hand positions, force exertions, and body postures were obtained for each task. The data were then used to identify critical lifting tasks that could pose risk for injury according to NIOSH guidelines for tasks falling below the Action Limit (AL), tasks falling above the AL but below the Maximal Permissible Limit (MPL), and tasks falling above the MPL. Forces exerted on the low back, shoulder, and arm joints were also calculated.

Results indicated that manual material-handling tasks performed by all job classification personnel consisted of lifting tasks, i.e., lifting equipment and/or patients. Many of the lifts involved transferring patients and were performed in the sagittal plane in a slow and controlled manner. In some situations, however, awkward positions and twisting motions were necessary. Many of the lifts required transferring heavy weights at large horizontal distances from the weight-bearing point of the body. Although lifts were performed by more than one person whenever possible, most of the lift tasks selected for analysis either exceeded the AL or the MPL, thus indicating at least a moderate risk for injury.

The author recommends that a program be developed and implemented to address both administrative controls and the redesign of work stations. This program would include a physical fitness program, strength testing of employees, the establishment of work practices requiring multiple-person lifts whenever possible, and the redesign of work tasks to reduce either the weight lifted or the horizontal distance of the hands from the weight lifted.

Torma-Krajewski, J

Analysis of Injury Data and Job Tasks at a Medical Center

Publication: Trends in Ergonomics/Human Factors IV, (S.S. Asfour, editor), North-Holland Publishing, Amsterdam, 863-874 (1987b)

This article reports results of two studies conducted at a government-operated research medical center. The purpose of the first study was to evaluate injury data in order to identify job tasks with a high risk of injury. The second study was a task analysis limited to the nursing department.

STUDY 1. Injury data analysis was performed for all departments of the research medical center. The center has an average of 1,404 total employees. Occupational injury and illness data for the study were obtained from accident reports; employee's notice of occupational disease; employee's notice of traumatic injury and claim for continuation of pay/compensation; and personnel and payroll records.

A total of 274 cases were analyzed using a data base-management microcomputer program. Severity and frequency rates of injuries were calculated. The nursing department contributed 38% of the lost time. Within the nursing department, 59% of the cases involved the employee's back. These findings, and others, led to the decision to undertake more specific analyses of the tasks performed by personnel in the nursing department.

STUDY 2. Lifting tasks performed by nursing personnel were identified for task analysis. Descriptive information concerning schedules, staff assignments, use of mechanical aids and assistance, and weight limits was obtained from nursing personnel. This analysis was conducted according to the NIOSH Work Practices Guide with Action Limits (AL) and Maximal Permissible Limits (MPL) calculated for each task. A survey of nursing personnel was used to determine that the maximum body weight lifted manually was 150 pounds. During multiple-person lifts, this weight was divided either equally, for symmetrical lifts, or proportionally, based upon body-segment weights, for asymmetrical lifts.

Results of task analysis reveal that nurses performed several lifting tasks, all involving patient transfers or lifts. All tasks analyzed exceeded the AL, except for turning a patient in bed. Two tasks exceeded the MPL: transferring a patient from bed to chair (two-person lift) and transferring a patient from bed to litter (three-person lift). All lifts were performed according to techniques taught during training classes. However, the stresses associated with the transfers were not reduced sufficiently to eliminate the risk of injury. Most patient transfers were executed so that both the vertical and horizontal locations of the hands forced the nurse to assume a stooped posture. A review of the specific injury situations indicated that the need to support a patient was often unexpected and the need for assistance was underestimated. Mechanical aids were generally used only for patients weighing more than 150 pounds. These mechanical aids were usually stored in areas that made their use inconvenient.

The analysis of nursing tasks revealed that lifting tasks posed a moderate to significant risk of injury to the nurses even though body mechanics, as presented in training sessions, were utilized. General administrative and engineering controls for resolving these risk factors were recommended by the author.

Troup, JDG; Rauhala, HH

Ergonomics and Training

Publication: International Journal of Nursing Studies 24(4):325-330 (1987)

A training program for nursing students on patient handling was examined. The study took place at the Helsinki Institute of Nursing in Finland. It was part of a long-term epidemiologic study, but this article only reports the results of a study conducted in a laboratory set up to simulate a patient room.

Nursing students who entered the nursing school in 1981 and 1982 were the control group; they received the traditional training in patient-handling. Nursing students who entered the program in 1983 and 1984 were the treatment group; they received a special program that emphasized ergonomics, practice, and feedback from video tape recordings. The feedback came from themselves and other nursing students. The patient-handling procedures taught in the program were based on those described in the book The Handling of Patients: A Guide for Nurse Managers by Lloyd, Osborne, Tarling, and Troup (Middlesex, England: Back Pain Association, 1981). After completing the training program, the performance of each student on a patient-handling task was rated by the course instructor, another expert, and the student. An overall performance score was used as the criterion variable to compare the control group with the treatment group.

Results indicated that the treatment group averaged higher scores than the control group. This indicates that the special training was more effective than the traditional training in teaching the skills required to perform patient-handling tasks in the manner defined as correct for purposes of the study.

The study reported in this article did not indicate whether training in patient-handling (or lack of training) has an effect on risk of back injury. However, the subjects are being followed as part of a prospective longitudinal epidemiologic study to determine if their performance scores are related to back-pain experiences during their nursing careers.

Uhl, JE; Wilkinson, WE; Wilkinson, CS

Aching Backs? A Glimpse into the Hazards of Nursing

Publication: AAOHN Journal 35(1):13-17 (1987)

The reason for undertaking this study was to obtain objective information on back injuries among nursing personnel employed at a large medical center in the Pacific Northwest in order to examine the belief that lifting patients is the main cause of back pain problems experienced by nurses.

Data consisted of personnel records and injury report forms for 659 registered nurses, licensed practical nurses and nurse aides. Of this number, 123 nursing personnel reported back injuries during the study period.

Results indicated that age, length of employment, and sex were not significantly associated with whether the employee was in the injured or non-injured group. Greater numbers of those injured worked on surgical and medical units while lesser numbers worked on psychiatry and long-term care units.

In addition, on-site observations of patient lifts were made for ten eight-hour shifts on 15 different occasions and different work sites by a nurse-research analyst. The number of patient lifts counted by the observer was then compared with self-report questionnaire responses of over 54% of the total population of nurses within the medical center system. The t-test comparing data from observed and self-reported number of patient lifts provided a significant ($t = p < .001$) difference in favor of self-report for number of lifts per eight hour shift. Nursing personnel thus perceive themselves to do much more lifting than indicated by the observer's data. It is not clear which source of data is most accurate. The authors conclude that these results point to the need to question the results of studies that relied on nursing personnel estimates of their own patient lifting frequency.

Venning, PJ

Time-off Patterns for Back Injuries in Nurses

Publication: Trends in Ergonomics/Human Factors IV, (S.S. Asfour, editor), North-Holland Publishing, Amsterdam, 875-882 (1987)

In this investigation, data sets from two geographically different nursing populations were examined to determine the influence of job-related factors on the length of time-off required for resolution of back injuries. One data set was compiled from a five-year retrospective study of all injury reports filed by employees from 1981 through 1985 at the State University of New York, University Hospital, Syracuse, New York. Data were gathered from the injury reports indicating a back injury. Factors of interest for analysis included frequency of reporting by subject, job category and service area. Time-off was recorded as the number of days of work lost. A second data set was compiled from a multi-center prospective cohort study of 5,284 Canadian nursing personnel. Nursing personnel from ten health care facilities, excluding senior administrative staff, completed a 30-item self-administered questionnaire. Survey construction and administration is described elsewhere in another article entitled "Personal and Job-related Factors as Determinants of Incidence of Back Injuries Among Nursing Personnel" Journal of Occupational Medicine (1987) - see abstract next page.

In the Syracuse study, examination of the events reported by nursing personnel found 51% required time-off. Definition by job category found LPN's, aides, attendants and orderlies were 2.2 times more likely to report long time-off injuries as compared to RN's and nursing supervisors ($p < .001$). Among nursing subsets, service area was not a significant factor but job category was highly significant ($p < .0001$).

In the Canadian study, the same pattern of time-off was seen. Over 48% of the incidents required no time off. By 15 working days post-injury approximately 80% had returned to work. Beyond 60 days the rate of return to work was almost zero. These subjects that were off work more than 60 days can be categorized as persistent and costly cases. Using both samples it was found that one of every six time-off injuries reported became a persistent and costly case. Nursing aides and orderlies were 4.4 times as likely to incur long time-off injuries as compared to RNs and supervisors. Subjects from nursing service areas where lifting occurs most were found to be at 3.5 times higher risk than those assigned to other nursing areas.

Venning, PJ; Walter, SD; Stitt, LW

Personal and Job-related Factors as Determinants of Incidence of Back Injuries Among Nursing Personnel

Publication: Journal of Occupational Medicine 28(10):820-825 (1987)

The purpose of this multicenter prospective cohort study was to assess personal and job-related factors as determinants of incidence of reported back injuries among nurses. The study population included 5,649 registered nurses and nursing aides and orderlies. Each was surveyed by questionnaire (response rate 76 %) and then observed for a 12-month study period.

Case were identified when the employee reported a back complaint to the hospital employee health department. An annual injury rate of 4.9% was observed. The following factors were analyzed and found not to be significantly associated with whether the person reported a back injury: age, history of self-reported back injury, and history of reported back injury at work.

Four factors were found to be significant predictors of back injury. (1) "Service area" was a categorical variable that grouped the jobs by frequency of patient lifting. Nursing personnel who worked in jobs that involved the most patient lifting (chronic care, orthopedics, and mixed wards) were 4.26 times more likely to sustain a back injury than those who worked in jobs with minimal patient lifting. (2) "Type of lifter" was a categorical variable that grouped the nursing personnel into one of four groups: daily lifters, occasional lifters, light lifters, and nonlifters. According to the adjusted odds ratio, the daily lifters were 2.19 times more likely to sustain a back injury than were those in the other three categories. (3) "Job category" was found to be a significant determinant of whether a subject would experience a back injury. The adjusted odds ratio for nursing aides and orderlies compared to RNs and supervisory nursing staff was 1.77. (4) "History of previously reported back injury" was the fourth variable that affected likelihood of a subject experiencing a back injury. The adjusted odds ratio for those with a previously reported back injury compared to those with no previous report was 1.73. All four factors maintained significance when a forward stepping model of logistic regression was applied. These findings strongly suggest that the major predictors of back injury in nurses are job-related factors rather than personal characteristics.

Those that reported a back injury during the year were also asked to fill out a special injury report form. There were 199 individuals who reported a back injury during the year. Most of them (194) reported one incident, whereas five of them reported two incidents during the year. The article provides a summary of the findings about the cases. Below is a partial list of the distribution, as percentages, of cases according to coding categories.

- site of the injury: neck 16%, upper back 18%, low back 60%
- type of injury: overexertion 87%
- work variables: day shift 60%, mid-hours of shift 71%, while performing a familiar task 95%, occurred in a familiar location 95%
- patient variables: patient contact 88%, medical patients 52%, transfer activity 35%, positioning activity 23%
- days lost: zero 48%, 1-5 days 33%, over 15 days 19%

Videman, T; Nurminen, T; Tola, S; Kuorinka, I; Vanharanta, H; Troup, JDG

Low-Back Pain in Nurses and Some Loading Factors of Work

Publication: Spine 9(4):400-404 (1984)

This study investigated the prevalence of low back pain (LBP) and sciatic symptoms in nurses in relation to age, work-load, free-time activities, menstruation, pregnancies, and number of children. Questionnaires were sent to a random sample of 764 qualified female nurses (QNS) and 453 female nursing aides (NAS), selected from the registry of the National Board of Health in Finland.

Results of the study, which are based on replies from 562 QNS and 318 NAS, revealed that 79% of QNS and 85% of NAS had experienced at least one episode of LBP, increasing in prevalence with age. In NAS, the prevalence of LBP showed an early peak in the 20-24 year age group and QNS show a reduction for occasional LBP after 50 years of age.

NAS also experienced a greater prevalence of LBP leading to unfitness for daily tasks, LBP severe enough to require bed-rest, pain of sciatic distribution and previous back injury than QNS. Occupationally, NAS reported a heavier work-load with twice the amount of lifting, bending, and rotation, while QNS reported more sitting and standing at work. Heaviness of work was related to LBP in both NAS and QNS under the age of 30.

Vojtecky, MA; Harber, P; Sayre, JW; Billet, E; Shimozaki, S

The Use of Assistance While Lifting

Publication: Journal of Safety Research 18(2):49-56 (1987)

This was an observational study conducted at a large teaching hospital. The 63 nursing staff observed included 47 RNs, 9 licensed vocational nurses, and 7 orderlies. Observations of lifting events were made by a trained observer who recorded the lifting behavior of each subject. Among other things the observations included whether the lift was performed by one subject without any assistance, or with some assistance from either a co-worker or a device such as a draw sheet or hoist lift. A total of 3,127 lifts were observed (1,181 patient transfers and 1,946 object transfers).

The investigators developed a unique index for quantifying the physical stressfulness of the lifting task in relation to the lifter's capability [V4], called a lift demand index (LDI).

Of the total number of lifts, a sample was selected for further analysis by selecting those lifts that had complete information on both personal and task-related factors. The 2,221 lifts selected for this sample were analyzed with a goal of determining what factors best explain whether or not a nursing staff will seek assistance for a lift. A stepwise logistic regression procedure resulted in the following factors being associated with increased probability that assistance will be sought: (1) a patient is to be transferred rather than an object; (2) larger values of LDI, i.e., greater work stress associated with the lift; (3) more preparatory steps are required before doing the lift, (4) more years of experience of the lifter in the occupation, and (5) the particular lifter has shown a propensity for seeking assistance.

The study did not provide data about the relationship between risk of back pain and factors that might affect risk. However, the study looked at factors that affect a hazard-control procedure, i.e., seeking assistance.

Wachs, JE; Parker, JE

Registered Nurses' Lifting Behavior in the Hospital Setting

Publication: Trends in Ergonomics/Human Factors IV, (S.S. Asfour, editor),
North-Holland Publishing, Amsterdam, 883-890 (1987)

This study was undertaken to ascertain the prevalence of prescribed lifting behavior among registered nurses (RN's). A convenience sample of 178 female registered nurses from four Midwestern community hospitals served as the source of data through direct observation and a self-administered questionnaire following observation. Mean age was 34 years with an average employment as RNs of 9 years and an average of 5 years in current nursing unit.

The observation guide for recording lifting behavior was comprised of an environmental and nurse behavior portion. The environmental portion included height of the bed, position of siderails, position of the head of the bed, locks on bed wheels, and obstacles around the bed. The nurse portion focused on the movement and posture of the nurse type of shoes, stance, actual movement of her body during the lift, and position of her back, waist, hips and knees. The internal consistency of the total items and of each subscale was assessed with Kuder-Richardson 20 and revealed a coefficient of 0.33 for the total scale, 0.25 for the environmental portion and 0.63 for the nurse portion.

A total lift score was computed based on 13 unweighted behaviors that were scored as having occurred or not having occurred. Mean score was 8.3 (S.D. = 1.9). Three nurses (2%) completed all 13 behaviors as prescribed. Fourteen percent of the 178 nurses behaved correctly as to all prescribed environmental behaviors. The mean was 3 for the five items. Ten percent completed all prescribed behaviors relating to posture, stance and lifting. In looking at each of the 13 items independently, more than one-third of the beds did not have locked wheels, the position of the bed was raised in nearly 20% of the observations, and the siderail was raised in nearly 50% of the cases.

Sixty percent of the nurses did not use a rocking motion and the back, waist, hips and knees were flexed approximately 50% of the time.

The findings suggest that registered nurses do not move patients in bed as they have been taught. The authors discuss implications for research. The limitations of the study are also discussed.

Wood, DJ

Design and Evaluation of a Back Injury Prevention Program Within a Geriatric Hospital

Publication: Spine 12(2):77-82 (1987)

This report presents the findings of an evaluation of two phases of a back injury prevention program instituted by a group of four geriatric hospitals in British Columbia using 2,035 accident reports filed by permanent nursing staff members between 1979 and 1984.

Phase 1 was the Personnel Program which was designed to reduce the duration of wage-loss claims by increasing the effectiveness of the existing procedure for processing accident claims. Results indicate that the program significantly lowered the proportion of high-hour claims ($p < .05$) and significantly reversed the trend of increasing accident rates ($p < .05$).

Phase 2 was the Back Program which was designed to reduce back injuries through a feedback oriented training program instituted at one of the four hospitals. This hospital consisted of three separate units. Initially, the feedback program was implemented in two units of the hospital while a third unit served as a control. Results found no difference between the experimental and control Groups with respect to the number of wage-loss claims.

It was felt that the greater effect of the Personnel Program overshadowed and confounded the effect of the Back Program. The wage-loss claims for registered nurses and nurse-aides were therefore compared with the claims from a comparison group of hospitals. Results indicate that the combination of Personnel Program and the Back Program significantly lowered back injuries compared with a similar group of injuries that occurred at the comparison hospitals ($p < .001$).

ABSTRACTS OF STATE-OF-THE-ART REVIEW ARTICLES

Agnew, J

Back Pain in Hospital Workers

**Publication: Occupational Medicine: State of the Art Reviews 2(3):609-616
(1987)**

The author provides a summary of studies of back injuries in health care. Data limitations of these studies are outlined. The author points out that a firm diagnosis of back pain is rarely made, limiting comparability across studies. In addition, the magnitude of back pain in hospital workers is underestimated by the use of accident reports, especially where hospital workers have access to informal consultation from health care colleagues.

Studies are summarized under the headings of (1) the magnitude of the problem in hospital workers, (2) work factors, (3) individual factors, and (4) prevention and control strategies.

Bell, F

Patient Hoist Biomechanics

Publication: British Journal of Occupational Therapy 42(1):10-17 (1979)

The author details the general biomechanical principles of the hoist function, including the biomechanics of patient support and describes the types of factors to consider in selecting a lifting device for a disabled patient. The selection of a patient-lifting device can be approached at a number of levels. The overall needs of the patient and his or her attendant are considered. If the use of a hoist is indicated, then the alternative types of devices need to be considered. Selection of the appropriate lifting device may be facilitated by using the list of factors for assessment of a hoist which is included in this article as table 1.

Jensen, RC

Low Back Pain and Back Injury Among Health Care Workers

Publication: Occupational Hazards of Health Care Workers, American Conference of Governmental Industrial Hygienists (publication number 0170), Cincinnati, 41-50 (1987b)

This is a summary of prior studies concerning job factors that apparently increase the risk of nursing personnel experiencing an episode of low-back pain or sustaining a back injury. Not included in the review are personal risk factors (e.g., age, gender, prior training in patient-handling, physical fitness, prior history of back problems, inherited characteristics).

The studies differed in design, populations studied, data collection procedures, measures of back problems, measures of exposure, and definition of terms. Yet, in spite of these differences, the studies were generally consistent in finding that nursing personnel who have been exposed to a large amount of patient handling tend to experience more problems with their backs than those who do little patient handling. It was also found that when occupations were compared, the nursing aide group typically had five times more compensation claims for back sprains and strains than registered nurses, and had prevalence rates of back pain about two times that of registered nurses. Licensed practical nurses generally had injury rates and prevalence rates between the nursing aides and the registered nurses.

Jensen, RC

Epidemiologic Studies of the Back Pain Problems of Nursing Personnel - The Need for Consistency in Future Studies

Publication: Trends in Ergonomics/Human Factors IV, (S.S. Asfour, editor).
North-Holland Publishing, Amsterdam, 803-809 (1987c)

The author found that results of the various studies were difficult to compare because of inconsistencies which could be classified into three groups. First, different investigators used different definitions of the anatomical sites included in their study (e.g., low-back, entire back, spine), and some investigators imposed additional criteria for deciding whether to include or exclude certain back-pain experiences. Second, investigators used inconsistent definitions of occupations, and measured different consequences of the pain (e.g., discomfort, impairment, disability). Third, investigators were inconsistent in the measures used to quantify the extent of the back problem in the study population. Some used annual incidence rates of reported back injuries. Those who used prevalence measures defined the time frames differently (e.g., point prevalence, 1-week prevalence, 6-month prevalence, 1-year prevalence, 18-month prevalence, and lifetime prevalence). All these inconsistencies make it difficult to draw overall conclusions about the effects of suspected risk factors. The author recommends the formation of a committee of researchers to develop guidelines for future epidemiologic studies, in order to overcome some of these problems.

Kaplan, RM; Deyo, RA

Back Pain in Hospital Workers

Publication: Spine: State of the Art Reviews 2(1):61-73 (1987)

This article summarizes literature about back pain among hospital workers. The report includes five sections: (1) Epidemiology, (2) Potential explanations for back-pain risk, (3) Preventive and therapeutic interventions for hospital employees, (4) Conclusions, and a (5) Future agenda. The epidemiology section is the most extensive. In addition to summarizing epidemiologic studies in the open literature, the authors also provide some injury data from a large Veterans' Administration hospital in Seattle, Washington. The nursing service had the largest rates of back sprain and strain cases of any administrative unit at the hospital. In their summary of risk factors and preventive interventions, the authors indicate that definitive conclusions cannot be drawn from the existing published research.

Marchette, L; Marchette B

Back Injury: A Preventable Occupational Hazard

Publication: Orthopedic Nursing 4(6):25-29 (1985)

This review article briefly explains "how and why" nurses sustain patient-lifting-related back injuries. Brief, well-referenced explanations of biomechanical, anatomic, physiologic, and other contributing factors affecting the incidence and prevalence of back pain in nurses are presented. A limited number of assessment and diagnostic procedures are discussed.

Planning and implementation strategies are identified and discussed. These approaches include increased use of mechanical lifting devices, reallocation of available work space, additional staffing, pre-employment screening, and in-service education.

Lloyd, P; Osborne, C; Tarling, C; Troup, D

The Handling of Patients. A Guide for Nurse Managers

Publisher: Back Pain Association, Middlesex, England (1981)

This manual was published by the Back Pain Association and the Royal College of Nursing in Great Britain. The first chapter begins with the epidemiology of back pain in nurses; the results of six studies are reported in relation to prevalence, incidence, and lost time. The following topics complete the first chapter: causes of back pain, occupational back pain, the mechanics of the spine, basic handling rules, and preventive approaches. The second chapter focuses on the principles of handling, including preparation and techniques. Chapter 3 elaborates techniques for handling patients in a variety of circumstances and activities. The last chapter illustrates aids for lifting patients based on level of dependency. Recommendations are made in relation to nursing practice, education, employing authorities, purchasing agents, and the professional organization.

Lloyd, P; Tarling, C; Troup, JDG; Wright, B

The Handling of Patients. A Guide for Nurses 2d ed.

Publisher: Back Pain Association, Middlesex, England (1987)

The second edition of the 1981 manual by Lloyd et al. contains an additional chapter on special cautions and special patient needs, including such topics as moving patients up in bed in their own homes, special needs of the double amputee, and moving patients on water beds. The other chapters focus on principles of handling, techniques for handling patients, and aids for lifting patients. Numerous drawings illustrate specific patient-handling techniques. This publication is published in Great Britain by the Back Pain Association in conjunction with the Royal College of Nursing.

Copies are available from: Back Pain Association, 31-33 Park Road, Teddington, Middlesex TW11 0AB, England; or from the Royal College of Nursing, Henrietta Place, London.

Ergonomics Research Unit

Back Pain in Nurses - Summary and Recommendations

Publisher: University of Surrey, Guildford, Surrey, England (1986)

This publication reports the work carried out over 6 years by the Ergonomics Research Unit of the Robens Institute of Industrial and Environmental Health and Safety at the University of Surrey, Guildford, England. The report addresses the definition of back pain, the size of the problem within nursing and within comparison work groups, the amount of lost time and attrition from nursing due to back pain. The causes and factors related to back pain are discussed along with preventive approaches: training, selection, and ergonomics. An ergonomic framework for reducing postural stress is outlined which includes consideration of the equipment, tasks, environment, and personnel. The reader is referred to the references for specific details of the work.

Health Services Advisory Committee

The Lifting of Patients in the Health Services

Publisher: Her Majesty's Stationery Office, London (1984)

This is the report of a working party set up by the Health Services Advisory Committee of the National Health Service in Great Britain. The report addresses the magnitude of the problem of back pain and injuries among nursing personnel, the causes of handling incidents, and steps to reduce the problem which include (1) identifying hazards and their causes; (2) designing and maintaining a safe working environment; (3) establishing a safety policy including the need to specify safe procedures for patient lifting; (4) providing adequate staffing; (5) providing and encouraging the use of mechanical handling aids; (6) training of all patient-handling staff; and (7) establishing a monitoring system to assess whether staff utilizes safe patient-handling procedures.

Recommendations are delineated for reporting incidents, practice, policy, and organizational responsibility.

Stubbs, D; Buckle, P

The Epidemiology of Back Pain in Nurses

Publication: Nursing 32:935-938 (1984)

The authors discuss the difficulties in studying back pain within the nursing profession, including the highly variable and symptomatic nature of the disorder, the lack of understanding of the etiology of back pain, and the difficulty in making comparisons with other occupations and within the nursing profession itself. Various studies are cited to illustrate these difficulties.

The authors point out that back pain, because of its highly variable nature, cannot be reliably measured, nor can a firm diagnosis be made. Many studies use small samples and have low response rates, making estimates of the extent of the back pain syndrome difficult. Reporting systems that rely on accident forms create another bias, as illustrated by the authors' study finding (Stubbs et al. 1983) that of the nurses reporting back pain during one year, only 36% attributed the onset of pain to moving or supporting a patient, and only 20% of these could remember submitting an accident report.

While a number of studies have shown that nurses have relatively high rates of back pain in comparison with other professions, direct comparisons are difficult, since each study used a different population and a different method for assessing the effect and extent of injuries. Conflicting results have also been shown for "within-group" risk analysis due to the diverse nature of nursing specialties and nursing status.

Evidence has shown that such things as heavy physical work, lifting and forceful movements, frequent bending and twisting, static work postures, vibration, and repetitive work are associated factors of back pain in relation to the workplace. While all increase the load on the spine, an association with any single vocational factor is difficult to establish since several factors are often present at the same time in a given job. The relationship between "triggers" and cumulative events should therefore be considered.

Troup, JDG

Training in the Handling of Patients: the Demands on Education and Occupation Health for Nurses

Publication: Nurse Education Today 2:13-15 (1982)

An evaluation is presented of the booklet, The Handling of Patients: A Guide for Nurse Managers, published in 1981 by the Back Pain Association in collaboration with the Royal College of Nursing in London. This guide, which is addressed primarily to nurse managers, provides basic educational material on prevention and handling skills. It discusses four approaches to prevention: ergonomics, safety training, pre-employment screening, and treatment/rehabilitation. The emphasis of the guide is on training, but the reviewer points out that it (1) does not contain a general statement on how training should be tackled, and (2) lacks documentation of the benefits of training coming from the practical experience of active programs.

The reviewer delineates a number of general principles to be considered in setting up training programs and outlines some training programs in current use.