

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

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*To determine the low back stressor exposures of hospital nursing staff members, the daily activities of 63 staff members were observed and coded. In addition to direct patient contact activities, non-patient contact activities were common. Many patient contact actions were static (isometric), requiring maintenance of an antigravity position which stresses the low back. These findings suggest the need to expand the focus of work practice training, equipment redesign, and future research activities.*

The causes of occupational back pain in nurses are poorly understood. Many believe that patient transfer actions are particularly important, and much attention has been focused on patient transfer activities. Research, nurse training, and provision of equipment to assist with patient lifting all reflect the focus upon dynamic patient transfers.

This study was performed to characterize empirically the work actually performed by nurses in order to determine those actions which are frequent and likely to contribute to back pain.

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0096-1736/87/2911-971\$02.00/0

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## Observational Study Methods

Several hospital units participated in an observational study of work performed by personnel. Table 1 summarizes the participating subgroups. Groups were based both on physical location, type of unit (critical care, medical/surgical, delivery room, etc), shift worked, and job category. Three nursing service categories were included: registered nurses, licensed vocational nurses (similar to licensed practical nurses in other parts of the country), and other (including attendants and orderlies). In this paper, the term "nurse" refers generally to all the study participants unless otherwise specified. Eighty percent of these subjects were female. Mean age was 31.2 years ( $\pm$ SD). Nurses had worked as nurses an average of 8.88 years ( $\pm$ 5.11 years SD). The average shift length was 11.05 hours ( $\pm$ 1.83 hours). Subgroup 9 ("other") was younger ( $25.6 \pm 3.50$  years).

An activity observation system was developed and pilot tested; "clerical" activities such as recording information in charts were excluded. The duration in seconds, body position (upright, semi-squat, squat), starting and stopping location (bed, chair, gurney, wheel chair, toilet/commode, other), nature of activity (push, pull, carry, "static"), and other information were recorded. Static actions were those patient contact activities in which the nurse maintained a static antigravity posture for at least 30 sec and in which there was no transfer of the patient or object. In addition, actions involving contact with objects and equipment (as opposed to patient contact) were separately recorded.

Observers were trained in the use of the coding system; reliability was ascertained by direct observation of the observers by the study coordinator (S.S.). An observer worked with only one nurse at a time. Observ-

ers were cautioned not to become actively involved in assisting with work in any way and to remain as "unobtrusive" as possible.

## Results

Sixty-three work shifts were observed. Most nursing staff members worked 12-hour shifts; the overall mean shift length was about 11 hours.

The frequency and types of observed actions are summarized in Tables 1 and 2. In Table 1, the observations over each shift are expressed as number per shift and number per hour. The latter values were determined by dividing the per-shift value by the shift length for each nurse; thus, the standard deviations do not reflect the intra-shift hour-to-hour variability.

Patient contact actions were divided into dynamic (with motion) and static. Actions involving motion were more frequent than static actions. Most patient-movement actions were performed in bed (eg, helping a patient sit up or roll to side), accounting for an average of 10.7 of the 16.5 patient transfers per shift. Helping patients in and out of bed (1.4 per shift) and lifting patients to/from a gurney (1.6 per shift) were also common activities.

Non-patient contact actions were more frequent (average = 34.4 per shift) than patient contact activities (23.7) per shift. Many of these involved lifting, pushing, or otherwise manipulating heavy objects or equipment

weighing more than 60 lb. Actions involving equipment and objects were particularly common in Group 9 (Aides-Orderlies).

Table 2 shows the static actions. By definition, all were patient-related. Most involved movement below the waist level (50.3%); only 11 involved movement above shoulder level. The nurses generally turned to face the patient directly; only 25% were performed asymmetrically. The majority of static actions were performed in a squat or semi-squat position (78%), possibly increasing low back stress.

TABLE 2  
Static Actions\*

	Number	Percentage†	Time, sec
Vertical position			
Above shoulder	11	2.1%	36.8 ± 18.2
Sagittal	6	1.1%	—
Asymmetric	5	0.9%	—
Belcw waist	268	50.3%	44.4 ± 34.3
Other	245	46.0%	55.6 ± 42.9
Plane			
Sagittal	385	72.2%	49.4 ± 39.6
Asymmetric	132	24.8%	50.2 ± 36.9
Leg position			
Upright	105	19.7%	49.7 ± 35.4
Squat/semi-squat	416	78.1%	49.5 ± 39.7

\* A total of 533 actions were observed.

† Percentages static actions. Percentages may sum to less than 100% due to missing or unclear raw data.

TABLE 1  
Characterization of Actions

	Patient Contact						Non-patient Contact			
	Total Dynamic		Static		In Bed, Static		Total		Weight >60 lb	
	Per Shift	Per Hour	Per Shift	Per Hour	Per Shift	Per Hour	Per Shift	Per Hour	Per Shift	Per Hour
All subjects (n = 63)	13.4 (14.6)*	1.2 (1.2)	10.3 (7.7)	0.9 (0.7)	—	—	34.4 (50.6)	3.6 (0.7)	17.8 (42.3)	2.2 (6.2)
Group 1 (n = 7) (Intensive care unit)	19.4 (18.4)	1.6 (1.5)	14.2 (7.3)	1.2 (0.6)	—	—	13.9 (6.0)	0.7 (0.5)	4.0 (3.8)	0.3 (0.3)
Group 2 (n = 7) (Medical/surgical, night)	6.4 (7.1)	0.5 (0.6)	11.6 (8.9)	1.0 (0.7)	—	—	22.2 (26.0)	2.2 (2.6)	2.4 (3.1)	0.2 (0.2)
Group 3 (n = 7) (Medical/surgical, day)	15.5 (11.8)	1.2 (1.0)	15.1 (7.6)	1.2 (0.6)	—	—	51.4 (35.1)	3.8 (3.5)	10.8 (12.1)	0.9 (1.0)
Group 4 (n = 7) (Recovery room)	12.5 (11.0)	1.3 (1.3)	9.6 (9.6)	1.2 (1.2)	—	—	10.7 (8.0)	1.1 (1.1)	5.6 (5.0)	0.7 (0.6)
Group 5 (n = 6) (Delivery room)	12.5 (11.0)	1.0 (0.9)	—	—	7.9 (5.6)	0.6 (0.5)	16.5 (10.1)	7.2 (0.8)	3.0 (2.4)	0.3 (0.2)
Group 6 (n = 6) (Medical/surgical, orthopedic, night)	21.8 (10.9)	1.8 (0.9)	—	—	19.2 (9.0)	1.6 (0.7)	25.5 (16.1)	2.1 (1.3)	9.5 (8.8)	0.8 (0.7)
Group 7 (n = 7) (Medical/surgical, orthopedic, day)	14.4 (18.4)	1.2 (1.5)	—	—	14.6 (18.3)	1.2 (1.5)	15.1 (9.1)	1.01 (0.8)	3.8 (4.7)	0.3 (0.4)
Group 8 (n = 9) (LVNs)	12.5 (19.6)	1.0 (1.6)	—	—	12.0 (19.7)	1.0 (1.6)	11.3 (14.0)	0.6 (0.9)	3.2 (3.6)	0.26 (0.3)
Group 9 (n = 7) (Other)	9.8 (9.9)	1.1 (0.7)	—	—	5.6 (5.4)	0.6 (0.7)	144.43 (80.1)	17.8 (14.8)	119.0 (68.3)	15.9 (12.4)

\* Values are means ± SD (in parentheses) for each nurse-shift and for each nurse-shift divided by the shift length.

## Discussion

Occupational low back pain is common in hospital nurses. Because work characterization methods or lifting limits (eg, those recommended by the National Institute for Occupational Safety and Health (NIOSH)),<sup>1,2</sup> are difficult to apply to the highly varied tasks of nurses, two other approaches were employed in these studies. Multivariate analysis of questionnaires about self-described work and back pain<sup>3</sup> and observational study of work actually performed both suggested that activities other than just patient transfer may be significant contributors to occupational back pain.

Although most previous ergonomic research has emphasized patient lifts and transfers, this observational study demonstrates that other activities must also be considered. As shown in Table 1, non-patient-related transfers were more frequent than patient contact activities. For example, nurses frequently had to move equipment, carry supplies, and rearrange furniture. This study may actually underestimate the importance of non-patient contact relative to patient contact activities because the operational definition of static actions specifically excluded non-patient contact activities and because "clerical" activities, which were exclusively non-patient-related, were also excluded. Hence, it appears quite likely that non-patient contact activities are quite common.

This study also demonstrated that static actions are common. These were defined as actions involving patient contact in which the nurse maintained an antigravity position potentially stressing the back for at least 30 sec. Table 1 shows that these static actions were nearly as common as actions involving change of position. Static actions, such as leaning over the side rail of a patient's bed to adjust flow rate through an intravenous catheter, often require prolonged maintenance of an awkward, antigravity position. Such static, isometric actions may be particularly stressful because, unlike actions involving motion, the same muscle groups are involved throughout the action. As shown in Table 2, the majority of such actions were performed in a non-upright position, potentially further increasing biomechanical stress on the low back. Also, prolonged isometric contraction will decrease the blood flow to the involved muscle.

The findings thus suggest that further attention to such static actions is warranted. Finally, appropriate staff education programs should include training on avoidance of prolonged maintenance of static isometric antigravity postures in the course of nursing work.

Other investigators have employed other methods to characterize nursing work. Dehlin and Berg<sup>4</sup> employed interviews to assess the psychologic perception of work requirements, and in another study<sup>5</sup> employed work observation to determine which factors were statistically related to an overall estimate of exertion. Posture and heaviness of load appeared most closely related. Alavosius and Sulzer-Azaroff<sup>6</sup> used a much more detailed observational method to describe two particular

nursing activities; however, this method is based on several a priori assumptions about the "proper methods." Subjects in the study of Alavosius and Sulzer-Azaroff evaluated effort in a small number of model situations.

The subjects in this study were not selected randomly, but were purposely chosen to reflect the variety of nursing tasks. Hence, there may be some difficulty in generalizing these findings to describe all hospital nurses. However, with the exception of group 9 (aides-orderlies), the results were fairly comparable. This group had a particularly high frequency of non-patient contact actions. Although Cust et al<sup>7</sup> found higher injury rates among "trained" nurses (perhaps comparable to the RN groups), Klein et al<sup>8</sup> suggest injury rates were particularly high in aides and orderlies.

The methods employed in this study may be applicable to others. The method recommended by NIOSH for quantifying such stresses requires careful description of each motion and is easily applicable only if repetitive motions are performed.<sup>1,2</sup> The technique used herein emphasizes the purpose as well as the nature of the task performed. In this way, it may help identify those tasks which would be particularly amenable to preventive intervention.

There is a need to focus attention upon non-patient contact tasks and actions other than patient lifting for several reasons. First, this study has shown that they are common. Second, more is known about the practice of manual handling (summarized in a NIOSH Guideline<sup>1</sup>) than about scientifically validated methods for dynamic patient lifts.

Third, several studies of non-nursing populations suggest that lifting per se does not account for most back injuries. Klein et al<sup>8</sup> and Brown,<sup>9</sup> respectively, found only 48% and 49% related to lifting.

Fourth, non-nursing personnel may perform certain of these non-patient contact activities, whereas "patient lifting" generally involves direct clinical care and may require the training of a nurse and be facilitated by a trusting nurse-patient relationship. Nurses are rarely selected for physical strength, but strength might be included as a factor in preplacement evaluation for these non-patient contact tasks.<sup>10</sup> Fifth, selection of patient transfer techniques may be affected by concern about patient comfort as well as nurse protection, whereas the latter factor may predominate in equipment handling. Sixth, patients are unpredictable, occasionally suddenly changing position or even resisting movement. This unpredictability may make engineering redesign for patient transfers more difficult. Seventh, although most protective methods for patient lifting activities require "active" participation by the nurse, more "passive" methods may be available for these other tasks. Most studies have failed to demonstrate objective benefit of training programs which emphasize "proper lift" methods. For example, a US Department of Labor survey<sup>11</sup> showed that half of workers with back injuries had been trained. The study by Stubbs et al<sup>12</sup> of back pain in nurses also suggested that "traditional" training is not effective in preventing back pain in nurses. Snook

et al,<sup>13</sup> Dehlin et al,<sup>14</sup> and Brown<sup>9</sup> have also demonstrated lack of efficacy of such training.

In summary, these studies suggest that attention should be given to the broad range of physical activities performed by nurses. Similar conclusions were reached from two separate studies using very different techniques. An epidemiologic questionnaire study<sup>3</sup> and this observational study both demonstrate that patient transfers involving dynamic motion are not necessarily the prime cause of back pain in nurses. Other activities—both static patient contact and non-patient contact activities—are common and appear possibly related to adverse effects. Narrow focus on direct patient transfer activities with heavy emphasis on training in “proper lift technique” and on personal factors may divert resources from other potentially useful methods for preventing back pain.

#### Acknowledgments

This work was supported in part by the National Institute for Occupational Safety and Health, Division of Safety Research.

The authors thank the Director of the Nursing Service for her enthusiastic support, the observer/coders for careful data collection, Nancy Marshello for preparing the manuscript, Mr. Roger Jensen of NIOSH for valuable suggestions, and particularly the participating members of the nursing staff.

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#### Inadequate Information for Providers

One of the primary deficits associated with existing review programs is the lack of information supplied to hospitals and health professionals on aberrant practice patterns. This feedback becomes especially important as providers become involved in risk sharing arrangements such as withholding fee-for-service payments and establishing targeted utilization rates. Most of the existing utilization review entities provide aggregate information to insurers, third party administrators, and large employer groups, but rarely is that information available on a site or diagnosis specific basis. Typically, the format for the data presentation is on the basis of the number of hospital admissions requested vs. denied, hospital days requested vs. allowed, inpatient admissions shifted to outpatient settings, and so forth. This reporting process is of little use to providers in evaluating practice patterns within their area or for use in educating outlier physicians about cost-effective use of health services. Finally, if the decision is made to supply information to the provider community, it must be made available on a timely basis. Semi-annual or annual reporting will not provide an effective means for censuring errant providers.

—From “The Next Generation of Utilization Review”  
by Joan Trauner, in *Business and Health* 1987;4:14-16