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Occupational back pain of nurses: Special problems and prevention

P. Harber, E. Billet, S. Shimozaki and M. Vojtecky

Occupational Medicine Branch, Department of Medicine; Nursing Service, UCLA Medical Center; School of Public Health; and University of California Southern Occupational Health Center. University of California, Los Angeles, USA

An observational study was performed to assess the nature and relative frequency of special circumstances of nursing which might contribute to occupational back pain and of preventive methods unique to nursing practice. The activities of 63 nurses were observed and coded in a behavioural scoring system. The group included registered nurses, licensed vocational nurses, aides and orderlies, and they worked in several different nursing units including intensive care units, medical/surgical units, post-anesthesia room and delivery room. Physical obstruction to easy contact with patients and fragile, extended attachments to patients were the most frequently observed problems. Mechanical assist devices, although available, were rarely employed. Assistance by a second staff member was the most commonly used preventive method. Such information is valuable for worker training programme design, job design and guiding priorities for future research.

Keywords: Back pain, patient handling, occupational disorders

Introduction

Members of the nursing profession are subject to many potential occupational risks, including chemical exposure, occupational stress, and musculoskeletal stress (Patterson *et al,* 1985). Indeed, while occupational low back pain has been recognised by members of the nursing profession as 'part of the job' for many years, occupational health and ergonomics specialists have only recently focused upon these problems. Nursing is practised in many settings, quite frequently in hospitals. Even within any one hospital, there are different job requirements in different units.

While approaches used for general manual materials handling may be applicable to nursing, there are many unique aspects of nursing practice. Possible preventive interventions must not interfere with patient care activities. Nursing has unique problems and unique preventive actions, some of which are discussed in textbooks of nursing (Potter and Porry, 1985). There has been much emphasis upon patient transfers (Harber *et al,* 1987; Buckle, 1987) but less investigation of those aspects of patient care which indirectly affect these transfers. The current study was performed to estimate the relative importance of these special problems of nursing and nursing-specific preventive actions. While previous work has emphasised questionnaires and laboratory simulation (Cust *et al,* 1972; Harber *et al,* 1985; Dehlin and Berg, 1977; Stubbs *et al,* 1983; Owen and Damron, 1984; Dehlin and Jaderberg, 1982), this study is based upon direct observation of nursing staff members at work in a large acute care hospital.

Methods

As part of an effort to develop strategies for the prevention of occupational back pain in nurses, an observational study was performed in a large, multi-specialty acute care hospital which included approximately 600 patient beds. The observational plan was developed by the investigative team in co-operation with the nursing administration. Areas of the hospital were chosen for inclusion in order to provide examples of the diverse types of nursing practice. Participating units included:

1. Medical/respiratory intensive care unit
2. Surgical nursing unit – nights and weekends
3. Surgical nursing unit – days
4. Post-anaesthesia (recovery room)
5. Orthopaedics – nights and weekends
6. Orthopaedics – days
7. Delivery room
8. Licensed vocational nurses
9. Aides / orderlies

A total of 63 subjects participated. Fifty were women; all of the aides/orderlies were men.

All actions except for purely clerical related duties were coded and recorded. The actions were characterised as non-isometric (involving motion) or isometric (in which the staff member maintained an anti-gravity static posture with the

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back at least 20 degrees from the vertical for at least 30 s in the course of direct patient contact activity). The starting and stopping location of the patient or object was described.

Circumstances surrounding the action were also coded. For example, standing on a slippery surface, using unstable footing such as an unstable foot stool, or having a patient who actively fought to interfere with the transfer, were coded. The presence of attachments to the patient was also recorded; as operationally defined, such attachments included extensions from the patients which would significantly complicate patient transfer because of location and/or instability. (Endotracheal tubes or urethral catheters connected to external reservoir systems are examples of such attachments. An intravenous catheter connected via a large tubing to a bottle or pump would be included as an attachment, but an intravenous catheter which did not extend beyond the patient would not be considered an attachment.) The observers had little difficulty separating attachments from non-attachments. Obstruction was coded if the nursing staff member was unable to stand in the optimal position for effecting an action due to furniture or other obstructing equipment. For example, in some units, space constraints required that the mechanical ventilator equipment be placed directly to the side of the patient's bed or that furniture be kept close to the patient's bed, preventing the nurse from getting close to the location. Obstruction due to the design of the primary piece of equipment (e g, bed) *per se* was not, however, encoded as obstruction. Special preventive actions were also detected and recorded. These are also shown in Table 3.

The behavioural observation system was pilot tested prior to institution. The observers received formal instruction and practice in the technique. Then, a single supervisor observed and coded a series of actual nursing action at the same time as did the coders; training of the coders was repeated as necessary to achieve consistency. All the observations were completed within a short time period (approximately six weeks) to avoid any temporal shifts in coding behaviour or work behaviours during the course of the study.

Data were acquired and transferred to an IBM XT microcomputer by keypunching or by use of a digitising tablet (Hewlett Packard 7211, Corvallis, Oregon). For purposes of this study, data on all lifts were combined into a single file. Analysis was performed using BMDP programs (Dixon, 1983) for univariate and multi-way tables (P1D, P2D, P4F).

Results

A total of 3131 individual actions were observed. Some 23% involved direct patient contact, and 17·0% were classified as isometric by the operational definition.

Special problems associated with nursing practice are shown in Tables 1 and 2 and Fig. 1. Attachments were the most common problem requiring attention, being present in 30% of all actions. As shown in Fig. 1, attachments were most common in the intensive care units. Obstruction to transfer or to isometric action performance was also quite common, occurring in 15% of all instances. However, there was less inter-unit variability in this. Unstable footing was uncommon, occurring in 0·7% overall. Fighting uncooperative patients were observed in only 15 instances out of the 3120 observed actions, suggesting that for this worker population this is a relatively rare problem. Slippery surfaces, anticipated to be a frequent risk *a priori*, were actually extremely rare.

Table 2 examines these problems by purpose of the action. As may be expected, attachments were a particularly

Table 1: Special nursing problems by unit

	Overall	ICU	Surg (N/W)	Surg (Day)	PAR
Attachments	7·2 ± 10·1	15·7 ± 17·9	4·2 ± 7·3	6·8 ± 7·3	9·0 ± 9·5
Obstruction	9·7 ± 14·8	12·1 ± 8·8	4·4 ± 3·0	7·4 ± 11·0	4·4 ± 3·3
Fighting patient	0·2 ± 1·0	0·7 ± 1·9	0·9 ± 2·3	0·0 ± 0·0	0·3 ± 0·5
Unstable footing	1·0 ± 2·9	0·4 ± 0·8	0·0 ± 0·0	0·0 ± 0·0	0·3 ± 0·8
Slippery surface	0·0 ± 0·2	0·0 ± 0·0	0·0 ± 0·0	0·0 ± 0·0	0·0 ± 0·0
Clinitron bed	2·6 ± 9·4	16·2 ± 24·7	0·1 ± 0·4	2·8 ± 4·9	0·0 ± 0·0
Incubator	0·0 ± 0·0	0·0 ± 0·0	0·0 ± 0·0	0·0 ± 0·0	0·0 ± 0·0
	Ortho (N/W)	**Ortho (Day)**	**Delivery room**	**LVN**	**Aides**
Attachments	2·8 ± 2·7	7·2 ± 7·1	6·9 ± 16·2	4·5 ± 7·5	7·4 ± 4·8
Obstruction	8·0 ± 13·4	11·8 ± 13·6	4·4 ± 8·0	19·8 ± 30·0	12·3 ± 14·5
Fighting patient	0·0 ± 0·0	0·0 ± 0·0	0·0 ± 0·0	0·0 ± 0·0	0·0 ± 0·0
Unstable footing	0·2 ± 0·4	0·2 ± 0·4	2·2 ± 3·7	2·3 ± 6·5	1·1 ± 1·6
Slippery surface	0·0 ± 0·0	0·0 ± 0·0	0·3 ± 0·5	0·0 ± 0·0	0·0 ± 0·0
Clinitron bed	0·5 ± 1·2	0·5 ± 1·2	0·0 ± 0·0	0·8 ± 2·5	0·1 ± 0·4
Incubator	0·0 ± 0·0	0·0 ± 0·0	0·0 ± 0·0	0·0 ± 0·0	0·0 ± 0·0

Frequency per shift of each problem is shown (mean ± standard deviation)

N/W = Nights and weekends; Surg = Surgical unit; PAR = Post-anaesthesia room; Ortho = Orthopaedics unit; LVN = Licensed vocational nurses

Table 2: Special nursing problems by nature of action

	Unclassed	To/from bed	In bed	Gurney	Wheelchair	Toilet/ Commode	Isometric
Attachments	3(8·8%)	9(36·0%)	293(54·6%)	70(74·4%)	0(0·0%)	3(20·0%)	285(53·5%)
Obstruction	5(14·7)	8(32·0)	145(27·0)	29(30·8)	1(10·0)	2(13·3)	127(23·8)
Fighting patient	0(0·0)	0(0·0)	13(2·4)	0(0·0)	0(0·0)	0(0·0)	2(0·4)
Unstable footing	0(0·0)	1(4·0)	7(1·3)	2(2·1)	0(0·0)	2(13·3)	9(1·7)
Slippery surface	0(0·0)	0(0·0)	1(0·19)	0(0·0)	0(0·0)	0(0·0)	0(0·0)
Clinitron bed	0(0·0)	0(0·0)	82(15·3)	2(2·1)	1(10·0)	0(0·0)	38(7·1)
Incubator	0(0·0)	0(0·0)	0(0·0)	0(0·0)	0(0·0)	0(0·0)	0(0·0)
Total N =	34	25	537	94	10	15	533

Frequency per shift of each problem is shown by purpose of action. Percentages refer to percentage of all actions of a purpose which were associated with a particular problem.

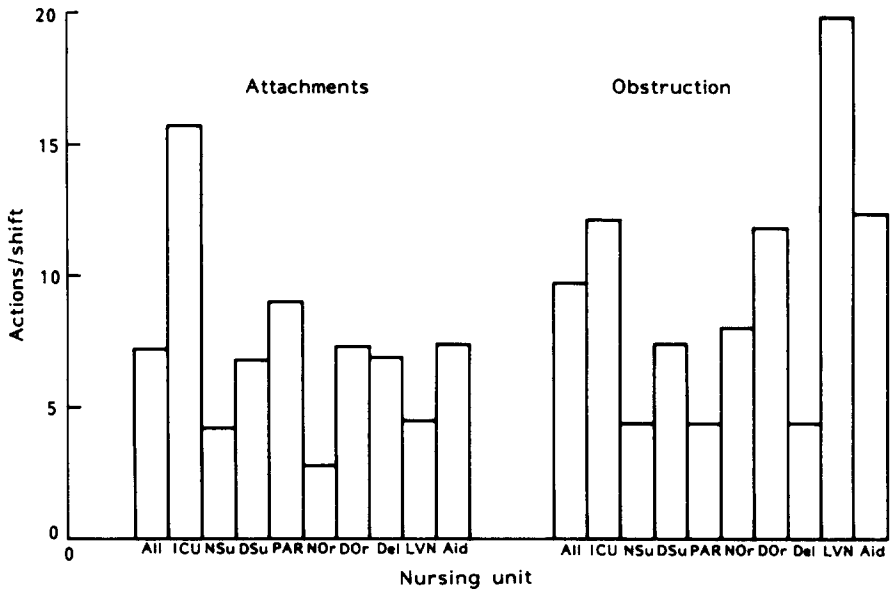

Fig. 1 Frequency of patient attachment and obstruction by nursing unit

ALL = Overall
ICU = Intensive care units
NSu = Surg (N/W)
DSu = Surg (Day)
PAR = Post Anaesthesia Room
NOr = Ortho (N/W)
DOr = Ortho (Day)
Del = Delivery room
LVN = Licensed Vocational Nurses
Aid = Aides as defined in Table 1

common problem for actions involving beds or gurneys (litters). However, attachments were not commonly problems for wheelchair transfers, suggesting that existing methods and support poles may be adequate. Table 2 and Fig. 2 demonstrate that obstruction is common in actions which are isometric. The presence of obstruction may, indeed, force a staff member to perform an action in an isometric manner.

Table 3 summarises the preventive actions used by the staff members. The most commonly used method was assistance by another person, occurring 286 times. There was some inter-unit variability in the frequency of such actions. However, it is not possible to determine if this is a consequence of different availability of help or of different requirement for assistance. Other commonly used methods included adjustment of the bed height and lowering the side rail prior to an action. It may be seen that the use of a mechanical assist device, a Hoyer lift, was extremely rare, occurring in seven out of over 3000 operations. This low rate was noted despite the availability of such devices on almost all nursing units.

Situational determinants of use of these preventive measures is discussed in Tables 4 and 5. As would be expected, drawer sheets are most commonly used in actions involving beds and litters (gurneys). Assistance by another person was common for transfers involving beds, gurneys and wheelchairs, but was rare for transfers to/from toilets or commodes. This is of note since involvement of a nurse in a transfer involving a toilet/commode generally implies that the patient requires significant assistance (i e, many patients prefer to go to the toilet without a nurse's involvement if they possibly can). The geometry of toilets also makes it difficult for patients to get on and off them themselves, and the necessity to bend over to assist such patient transfers places particular stresses upon the staff member's low back. Hence, the rarity of assistance by another person for toilet/commode transfers is a bit surprising. Table 5 demonstrates the relationship between the special problems and the preventive actions. The data suggest several conclusions. First, drawer sheets are rarely used when obstruction is present, an expected finding since the presence of obstruction would make use of a drawer sheet impossible. Assistance by another person appeared to be related to the

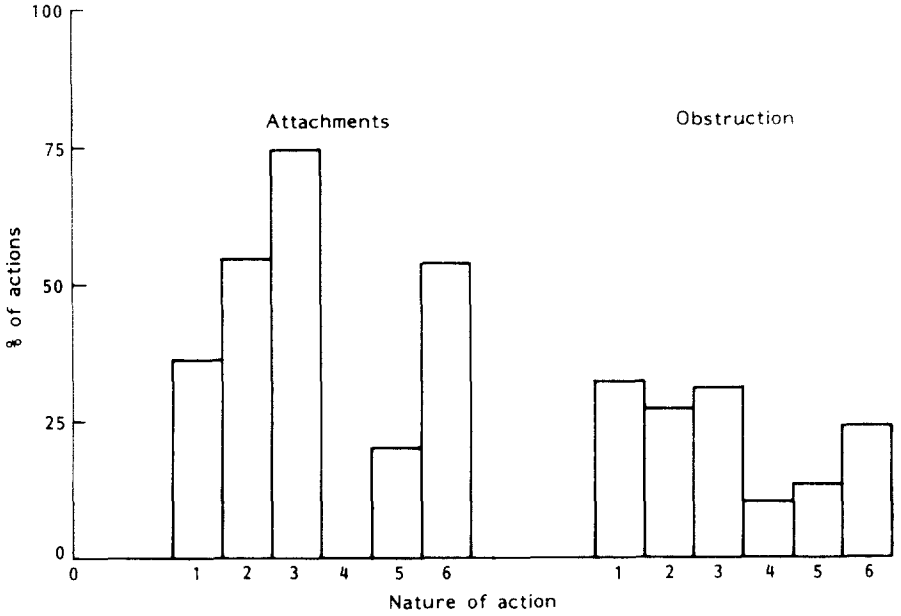

Fig. 2 Percentage of action involving patient attachments and obstruction by nature of action
1 = To/from bed,
2 = In bed
3 = Gurney
4 = Wheelchair
5 = Toilet/commode
6 = Isometric

Table 3: Preventive actions by unit

	All	ICU	Surg (N/W)	Surg (Day)	PAR
Hoyer lift	0·1 ± 0·4	0·6 ± 1·2	0·0 ± 0·0	0·0 ± 0·0	0·0 ± 0·0
Person	5·4 ± 5·6	8·4 ± 3·0	1·5 ± 1·4	3·0 ± 4·0	5·0 ± 5·3
Drawer sheet	1·5 ± 2·7	4·3 ± 5·7	0·6 ± 0·9	0·1 ± 0·4	1·1 ± 2·2
Bed height	3·8 ± 5·0	1·7 ± 2·2	2·1 ± 1·8	4·3 ± 3·8	1·0 ± 1·3
Back angle	2·8 ± 7·2	0·9 ± 1·5	0·9 ± 1·1	1·0 ± 1·7	2·6 ± 3·8
Side rail	5·4 ± 7·0	3·6 ± 5·8	2·2 ± 2·7	4·4 ± 4·0	4·7 ± 3·9
Other	0·4 ± 1·1	0·1 ± 0·4	0·0 ± 0·0	0·0 ± 0·0	0·0 ± 0·0

	Ortho (N/W)	Ortho (Day)	Delivery room	LVN	Aides
Hoyer lift	0·0 ± 0·0	0·0 ± 0·0	0·0 ± 0·0	0·0 ± 0·0	0·0 ± 0·0
Person	5·0 ± 4·1	10·0 ± 4·8	7·4 ± 10·6	3·2 ± 4·7	6·1 ± 4·6
Drawer sheet	1·5 ± 2·5	3·5 ± 3·0	0·8 ± 1·0	0·3 ± 1·0	2·1 ± 2·1
Bed height	4·6 ± 4·2	6·0 ± 6·5	0·2 ± 0·6	6·0 ± 7·1	8·3 ± 7·2
Back angle	0·4 ± 0·7	2·5 ± 3·4	5·6 ± 14·7	6·5 ± 12·6	3·1 ± 5·4
Side rail	6·7 ± 5·5	8·5 ± 7·0	0·3 ± 0·8	9·3 ± 13·0	8·4 ± 6·6
Other	0·8 ± 1·2	2·0 ± 2·3	0·4 ± 1·1	0·0 ± 0·0	0·7 ± 1·0

Frequency per shift of each problem is shown (mean ± standard deviation).

N/W = Nights and weekends; Surg = Surgical unit; PAR = Post-anaesthesia room; Ortho = Orthopaedics unit; LVN = Licensed vocational nurses

weight of the person moved; when the estimated weight carried or lifted was greater than 100 lb (45 kg), assistance by another person was employed 60% of the time.

Discussion

Although much is written about occupational back pain in nurses (Harris, 1977; Troup, 1977; Iveson-Iveson, 1979; MacMillan, 1979; Buckle, 1987; Dehlin *et al*, 1976), there has been a paucity of empiric data describing the specific behaviours which may contribute to or help prevent such problems. Unlike many manufacturing operations, the work of nursing is quite varied, including many separate tasks. Furthermore, much nursing practice involves human beings rather than inanimate objects, and this imposes special problems unique to nursing. For example, Pheasant (1987) showed that bed height is selected for patient comfort rather than nurse safety. Understanding these special aspects and determining their relative frequency may be quite helpful in developing effective preventive strategies.

Notably, mechanical assist equipment was very rarely used. There has been considerable emphasis in the literature and in training about the use of devices such as the Hoyer lift (a mechanical lift assistance device). Although available on

Table 4: Preventive actions by nature of action

	Unclassed	To/from bed	In bed	Gurney	Wheelchair	Toilet/ Commode	Isometric
Hoyer lift	0(0·0%)	0(0·0%)	4(0·7%)	0(0·0%)	0(0·0%)	0(0·0%)	1(0·2%)
Person	3(8·8)	9(36·0)	207(38·55)	51(54·3)	5(50·0)	2(13·3)	9(1·7)
Drawer sheet	1(2·9)	0(0·0)	67(12·5)	20(21·3)	0(0·0)	0(0·0)	0(0·0)
Bed height	2(5·9)	10(40·0)	80(14·9)	26(77·7)	0(0·0)	0(0·0)	42(7·9)
Bed angle	1(2·9)	6(24·0)	66(12·3)	20(21·3)	1(10·0)	1(6·7)	19(3·6)
Side rail	4(11·7)	16(64·0)	123(22·9)	35(37·2)	1(10·0)	1(6·7)	56(10·5)
Other	0(0·0)	2(8·0)	11(2·0)	6(6·4)	0(0·0)	2(13·3)	2(0·4)
Total N =	34	25	537	94	10	15	533

Frequency per shift of each problem is shown by purpose of action. Percentages refer to percentage of all actions of a purpose which were associated with a particular problem.

each floor in the hospital we studied, these were hardly used. Improved ergonomics design of this equipment might increase its utilisation. For example, the Hoyer lift requires that the patient be attached in a sling which must then be re-attached to the overhead component of the lift, a somewhat difficult process, particularly if the patient is not able to co-operate actively.

Although equipment was rarely used, assistance by another person was commonly employed. Such two person lifts have been recognised by the nursing profession and are discussed in textbooks (Potter and Porry, 1985). Factors affecting use of such assistance have been summarised by Vojtecky *et al* (1987). It is very dependent upon staffing patterns and ratios between staff and patients. Given a limited budget, nursing administrators must choose the optimal staffing patterns. (For example, in the hospital studied, almost two aides could be hired for the same salary as a single mid-salary-range registered nurse.) The pattern of shift assignments might also affect the frequency of help. Assignment of a patient to specific individual nurses has many advantages but might make assistance harder to get if nurses have exclusive responsibilities. Such organisational concerns are quite important in view of the large role of personal assistants as documented in this current study.

Physical constraints, particularly obstruction, may limit the use of preventive actions. Drawer sheets are very difficult to use if there is not a clear path to both sides of a patient's bed. Furthermore, many of the 'isometric' actions described in this study became necessary because of physical constraints. Although this study was conducted in a single facility, anecdotal knowledge suggests that physical design constraints in hospitals are frequent problems in most facilities.

Certain problems appear to occur very rarely. For example, slippery surfaces, anticipated to be a common problem, were actually very rare. This suggests that existing worker training programmes and work organisation for dealing with spills are adequate and that future attention should be focused elsewhere. Although fighting patients were uncommon in this study, they may be more frequent in general nursing practice. Our study group did not include any nurses in psychiatric units or emergency rooms.

Attachments were also common hindrances to patient transfers. These are often mechanically difficult to deal

Table 5: Preventive measure use by work situation

	Attachment	Obstruction	Fighting patient	Move > 100 lb (45 kg)
Hoyer lift	7 (0·7%)	2 (0·4%)	0 (0·0%)	0 (0·0%)
Person	214 (22·0)	88 (18·3)	0 (0·0)	45 (60·0)
Drawer sheet	54 (5·5)	11 (2·3)	0 (0·0)	16 (21·3)
Bed height	101 (10·4)	81 (16·8)	0 (0·0)	27 (36·0)
Back angle	101 (10·4)	1 (0·8)	1 (6·7)	15 (20·0)
Side rail	149 (15·3)	4 (3·1)	0 (0·0)	0 (0·0)
Other	36 (3·7)	1 (0·8)	0 (0·0)	0 (0·0)
Total N =	974	482	15	75

Association of preventive action and special problems is shown by frequency counts. Percentages of times each preventive action is used for each problem are shown.

with, moving independently of the patient, and may be quite fragile.

In summary, this direct observational study has identified and assessed the frequency of special problems associated with hospital nursing practice and particular strategies employed by individual nurses to limit back stress. Such information is necessary for worker training programme development, equipment redesign, and for guiding future research concerning prevention of this very important occupational health problem. Attention to these unique aspects of nursing practice may complement other ergonomics approaches to improving the patient-nurse-equipment interface (Pheasant, 1987) and improved ergonomically oriented nurse training about patient transfer methods (Troup, 1987; Takala and Kukkonon, 1987). Having characterised these specific problems and preventives, future studies must assess the relationship between their frequency and the likelihood of occupational back pain in specific nurses.

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