Arch Public Health
2002, 60, 115-123

The effectiveness of teaching appropriate lifting and transfer techniques to nursing students: results after two years of follow-up

by

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Abstract

Objective: *To evaluate the effect of teaching lifting and transfer techniques to nursing students, a controlled intervention study was set up in a nursing school in Leuven (Belgium). Results after two years of follow-up are presented.*

Methods and study population: *Control (n = 124) and intervention group (n = 100) consisted of first year nursing students enrolled at the start of their training. Both groups only differed by the year of starting the studies: the intervention group started after a lapse of one year (in 1993 versus in 1992). Outcome and exposure variables were measured through a self-administered questionnaire. Spells of back pain were retrospectively inquired for after one and after two years of follow-up. The intervention consisted in offering a regular training in lifting and transfer techniques. Incidence risks were calculated. Lost to follow-up was 66% in the intervention and 53% in the control group.*

Results and discussion: *After two years the incidence risk of one or more episodes of back pain was 78.0% in the intervention and 83.7% in*

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the control group (not significant; p > 0.05). The incidence risk of one or more episodes of sick leave due to low back pain was 2.0% in the intervention and 7.3% in the control group (Fisher exact p = 0.070) and the mean number of days of sick leave were 8 per 100 students in the intervention versus 64 in the control group (Mann Whitney U-test; p = 0.068). The same analyses among the subgroup of students without complaints at the start of the study yielded comparable results. Although the power of the study was too small, this could mean that not the incidence as such, but rather the severity of back pain and the risk of sick leave could be lowered through the intervention among nursing students.

Keywords

Intervention study, low back pain, lifting techniques, nursing students.

Objectives

Back complaints have been frequently studied in the last decades (1). As known from multiple investigations, the nursing profession shows a high prevalence of back complaints (2-4). Further, this problem already exists among trainee nurses (5-6). Considering the enormous human and economic costs of the problem, effective interventions to prevent these complaints are much wanted (7-8).

In order to evaluate the effectiveness of a scholarly training program in using appropriate lifting and transfer techniques, a controlled intervention study was set up in a large nursing school in Leuven (Belgium). The results after two years of follow-up will be discussed.

Methods and population

The effectiveness study was fit into a framework of three consecutive prevalence surveys: At the start of each school year 1992 to 1994, a survey was carried out among all students. Two groups of first year students were followed-up. Control (n = 124) and intervention group (n = 100) consisted of first year nursing students (mean age: 18.9 years) who were enrolled at

the very start of their training. Both groups only differed by the year of starting the studies: the intervention group started in 1993 whereas the control group started in 1992. The intervention comprised a regular training in lifting and transfer techniques (9) to the trainees during their first year. This training consisted of 0.5 day of theoretical introduction and 1 day of exercises during the practicals. Before 1993, such training was not part of the regular program.

At the start-up of the practical program of teaching appropriate lifting and transfer techniques to nursing students, various candidate training programs had been investigated and compared of which the most important were: the Veldman method (The Netherlands), the Dotte method (France) and the Durewall method (Sweden).

Among a limited number of nurses, each of the techniques has been tested. Only those techniques of which the nurses noted the applicability have been retained. These techniques have then been refined in collaboration with experts in ergonomics.

Apart from manual techniques, nurses were also trained in using different technical aids. These aids had been tested in advance as well to check their practical usefulness.

Outcome and exposure variables were measured through a self-administered questionnaire, comparable to the standardized Nordic questionnaires on musculoskeletal symptoms (10) and the same definitions of low back pain were used. Spells of back pain and sick leave due to back pain were retrospectively (12 months) inquired for after one and after two years of follow-up. Incidence risks were calculated in both groups.

The high percentage of "lost to follow up" (see table 1) in both groups is partly due to vocational reasons (students changing educational choice)

TABLE 1
Overview of the sample sizes of the study populations

Year of survey	Number of first year students	FOLLOW-UP Number after		%
		1 year	2 years	Lost
1992 Control	261	167	124	53
1993 Intervention	291	150	100	66

and partly to the lack of a unique identification number. Therefore, linkage had to be done using the information on birth date and body height (questionnaires were completed anonymously). Variables such as sex, mean age etc. have been compared at baseline between both groups (see table 2). Apart from body weight, differences were not statistically significant. Since weight is sometimes perceived as a risk factor for low back pain, this could have had a possible effect on the outcome parameters.

Outcome parameters were the incidence risk of one or more episodes of low back pain (LBP) and of sick leave due to LBP.

Statistical testing was performed using chi-squared or Fisher exact test when the numbers were too small. Non-parametric Mann Whitney u-test was used for sick leave because the distribution was not normal.

TABLE 2
Comparison of control and intervention group at baseline

Variable	Intervention (n = 100)	Control (n = 124)
Mean age (years)	18.7	19.0
% Females	95	94
% Performing physical exercises	44	56
Body weight (kg)	58.0	60.2 *
LBP (%)		
Year prevalence	59	56
Point prevalence	10	12
Sick leave prevalence (last year)	1.0	1.6

* Statistically significant; t-test; $p < 0.05$. Other characteristics: no significant differences.

Results

Outcome parameters between intervention and control group have been compared among all students and among the subgroup of students with no history of LBP at the start of the study (tables 3 and 4). After one year, the incidence risk of one or more episodes of back pain among all students was 67.0% in the intervention and 73.4% in the control group (chi squared test not significant; $p > 0.05$). After two years, this incidence risk was respectively 78.0% and 83.7% (chi-squared test: not significant; $p > 0.05$). The incidence risk of one or more episodes of sick leave was 1.0% in the intervention and 4.0% in the control group (Fisher exact test; $p > 0.05$) after one year, and 2.0% versus 7.3% after two years (Fisher exact

test; p = 0.070). The mean number of days of sick leave after two years were 8 per 100 students in the intervention versus 64 in the control group (Mann Whitney U test; p = 0.068).

The analyses performed on a subgroup of students who had no complaints at the start of the study, yielded comparable results, although most of the incidence figures were lower. However, the number of observations for this subanalysis was very limited, in particular when sick leave was considered. Thus these results are not presented in Table 4.

TABLE 3
Outcome variables in the intervention and control groups

		Intervention group	Control group
All Students:		(n = 100)	(n = 124)
Spells of LBP			
Incidence risk	after 1 year (%)	67.0	73.4
	after 2 years (%)	78.0	83.7
Sick leave due to LBP			
Incidence risk	after 1 year (%)	1.0	4.0
	after 2 years (%)	2.0	7.3
Students with no history of LBP:		(n = 36)	(n = 49)
Spells of LBP			
Incidence risk	after 1 year (%)	44.4	51.0
	after 2 years (%)	61.1	65.3
Sick leave due to LBP			
Incidence risk	after 1 year (%)	2.8	4.1
	after 2 years (%)	2.8	4.1

Differences not statistically significant: chi-squared test or Fisher exact test: p > 0.05.

TABLE 4
Days of sick leave due to LBP in the intervention and control groups

		Intervention group	Control group
All Students:		(n = 100)	(n = 124)
N of absentees	after 1 year	1	5
	after 2 years	2	9
Total number	after 1 year	3	36
	after 2 years	8	79
Mean number	after 1 year	3.0	7.2
	after 2 years	4.0	8.8
Number/100 students	after 1 year	3.0	29.0
	after 2 years	8.0	64.0

Differences not statistically significant: Mann Whitney U-test: p > 0.05.

Discussion

In this study, we found no statistical proof of an effect. The risk ratio (control/intervention) for spells of back pain after 1 year was only 1.10 and after two years 1.07 which is not statistically significant. The risk ratio of sick leave due to LBP however was 4.00 after one year and 3.65 after two years, which is borderline significant. The ratio of number of days of sick leave per 100 students per year was 9.67 after one year and 8.00 after two years.

Although none of these results are statistically significant, they are suggestive for a larger effect upon the severity of LBP than upon the incidence but this has to be confirmed by other studies. Moreover, absenteism is influenced by many factors other than severity of pain.

Although very difficult to compare, ergonomic intervention trials studying nursing personnel often report conflicting results. In a review article, Westgaard (1) made a division into several types of intervention. In the "health education" group (back school and neck school), Donchin et al. (11) reported no effect of the training on the incidence of LBP and Feldstein et al. (3) found no effect on the pain score. In trials were the intervention consisted of performing exercises, however, more positive results could be noted. All (11-14) except Kukkonen et al. (15), reported less sick leave, reduced prevalence post-intervention and reduced pain symptoms. Kukkonen et al. reported an effect immediately after intervention, but this was not maintained after follow-up.

Enhanced training in patient handling techniques did not result in a reduction in back pain (16). A study using biofeedback techniques (15) reported reduced prevalence of shoulder and neck complaints in a relatively small group (n = 15) but the effect was seen in both, the intervention and the control group. The multiple modifier interventions consist of studies of managed health care and/or exercise programs. Effects in terms of improved musculoskeletal health were noted (17-19).

Several sources of error and bias could impair the validity of our findings. Because of the small numbers, we cannot be sure that differences in results have not arisen by chance. Due to the design of the study, we had no idea of the number and the duration of the spells of LBP. Therefore, the incidence risk had to be used as the outcome parameter whereas an incidence rate would have been preferable because it is more precise. Observation bias could be introduced because of the self-reporting of outcome variables. However, this bias is assumed to be non-differential.

Another possible source of bias is the exposure misclassification. Exchanges between intervention and control groups could have taken place of which we have no assessment (e.g. students of the control group also performing lifting techniques). Furthermore, an important percentage was lost to follow-up (up to 66%) of which the main reasons were a change in educational choice and no or wrong age data for linkage. Therefore there is no reason to suppose that those cases are anyhow selected, and it is assumed that lost to follow-up has happened at random. Further, qualification of the instructors in the intervention group as well as the intensity of the instruction and the effective use of the acquired techniques in the intervention group may have introduced a compliance bias. Each individual bias mentioned above can have led to a dilution of an eventual effect.

Conclusion

The results are an illustration of the practical problems one encounters when fitting an intervention study into a prevalence design. However, we can conclude that there could be an effect of introducing a training program on appropriate lifting and transfer techniques for nursing students. Maybe not the incidence of low back pain as such, but rather the severity of back pain and risks of sick leave could be reduced. At any rate, this should be confirmed by other studies.

Samenvatting

Doelstellingen: Om de effectiviteit van het aanleren van hef- en tiltechnieken bij leerling-verpleegkundigen na te gaan, werd in een school voor verpleegkunde te Leuven een gecontroleerde interventiestudie opgezet. De resultaten na twee jaar follow-up worden hierna voorgesteld.

Methoden en onderzoekspopulatie: Zowel de controlegroep (n = 124) als de interventiegroep (n = 100) werden samengesteld uit eerstejaars studenten verpleegkunde. Deze werden in de studie opgenomen bij aanvang van hun opleiding. Beide groepen verschilden enkel in het jaar van aanvang van de studies: de interventiegroep startte in 1993, de controlegroep in 1992. Effect- en blootstellingsvariabelen werden gemeten met een vragenlijst, die door de studenten zelf werd ingevuld.

Periodes van rugpijn werden retrospectief bevraagd na 1 en 2 jaar follow-up. De interventie bestond uit het aanbod van een welbepaalde opleiding in hef- en tiltechnieken. Incidentierisico's werden berekend. De uitval („lost to follow up") bedroeg 66% in de interventie- en 53% in de controlegroep.

Resultaten: Na twee jaar bedroeg het incidentierisico voor één of meerdere episodes van rugpijn 78,0% in de interventiegroep en 83,7% in de controlegroep (niet significant; $p > 0,05$). Het incidentierisico van één of meerdere episodes van ziekteverzuim omwille van lage rugpijn was 2,0% in de interventiegroep en 7,3% in de controlegroep (Fisher exact; $p = 0,070$) en het gemiddeld aantal dagen ziekteverzuim was 8 per 100 studenten in de interventie- tegenover 64 in de controlegroep (Mann Whitney U-test; $p = 0,068$). Dezelfde analyse bij een subgroep van studenten zonder klachten bij aanvang van de studie leverde gelijkaardige resultaten. Hoewel de power van de studie te klein was, zou dit kunnen betekenen dat niet zozeer de incidentie maar wel de ernst van de rugpijn en het risico op verzuim door de interventie verlaagd kunnen worden bij studenten verpleegkunde.

References

1. WESTGAARD RH, WINKEL J. Review article Ergonomic intervention research for improved musculoskeletal health: A critical review. Int J Industr Erg 1997; 20: 463-500.
2. KAPLAN RM, DEYO RA. Back pain in health care workers. In: Deyo R, editor. Back pain in workers. Occup Med: state of the art reviews; 1988; 3(1): 61-73.
3. FELDSTEIN A, VALANIS B, VOLLMER W et al. The back injury prevention project pilot study. J Occup Med 1993; 35: 114-20.
4. YASSI A, TATE R, COOPER JE et al. Early intervention for back-injured nurses at a large Canadian tertiary care hospital: an evaluation of the effectiveness and cost benefits of a two-year pilot project. Occup Med 1995; 45(4): 209-14.
5. KNIBBE H, KNIBBE N. Praktijk fysieke belasting vereist bijstelling normen. Arbeidsomstandigheden 1993; 69: 473-6.
6. MOFFETT JAK, HUGHES GI, GRIFFITHS P. A longitudinal study of low back pain in student nurses. Int J Nursing Studies 1993; 30(3): 197-212.
7. STUBBS DA, BUCKLE PW, HUDSON MP et al. Back pain in the nursing profession II the effectiveness of training. Ergonomics 1983; 26(8): 767-79.
8. HELLSING A-L, LINTON SJ, ANDERSHED B et al. Ergonomic education for nursing students. Int J Nursing Studies 1993; 30(6): 499-510.
9. DOHOGNE T, SELIS K. Rugsparende verplaatsingstechnieken in de verzorgingssector (Back saving lifting techniques in health care), IDEWE, 1994.
10. KUORINKA I, JONSSON B, KILBOM A. Standardized Nordic questionnaires for the analysis of musculosceletal symptoms. Appl Ergon 1987; 18: 223-37.
11. DONCHIN M, WOOLF O, KAPLAN L et al. Secondary prevention of low back pain-a clinical trial. Spine 1990; 15: 1317-20.
12. GUNDEWALL B, LILJEQVIST M, HANSSON T. Primary prevention of back symptoms and absence from work. Spine 1993; 18: 587-94.
13. HÄRMÄ MI, ILMARINEN J, KNAUTH P et al. Physical training intervention in female shift workers: I. The effects of intervention on fitness, fatigue, sleep, and psychosomatic symptoms. Ergonomics 1988; 31: 39-50.
14. WIGAEUS HJELM E, HAGBERG M, HELLSTRÖM S. UPP study group. Prevention of musculoskeletal disorders in nursing aides by physical training. In: Hagberg, Hofmann, Stössel, Westlander, eds. Occupational health for health care workers. Ecomed Germany 1992; 364-6.
15. KUKKONEN R, LAMMI S, ANTTI-POIKA M. Effects of dynamic muscular exercise and working habits on neck/shoulder pain among hospital workers. In: Quéinnec, Daniellou, eds. Designing for everyone: Proceedings of the 11th congress of the International Ergonomics Association, Vol. 1, Taylor and Francis, London, 1991; 135-7.

16. VIDEMAN T, RAUHALA H, ASP S et al. Patient handling skill, back injuries, and back pain. An intervention study in nursing. Spine 1989; 14: 148-56.
17. LAGERSTRÖM M, HAGBERG M, WIGAEUS HJELM E. Evaluation of a three-year intervention program among female nursing personnel. In: Proceedings of 2nd International Scientific Conference on Prevention of Work-related Musculoskeletal Disorders, IRSST, Montreal, 1995; 369-71.
18. LINTON SJ, BRADLEY LA, JENSEN I et al. the secondary prevention of low back pain: A controlled study with follow-up. Pain 1989; 36: 197-207.
19. WOOD DJ. Design and evaluation of a back injury prevention program within a geriatric hospital. Spine 1987; 12: 77-82.