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Occupational and Environmental Risk Factors for Development of Low Back Pain in Hospital Nursing Personnel

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1. Introduction

Nursing was in the past identified as an occupation whose practitioners were at risk of developing low back pain (LBP) (Engkvist et al., 1998; Hoogendoorn et al., 1999; Goldman et al., 2000). Providing nursing care is related to frequent flexion and extension of the body, including manual lifting (Cromie et al., 2000; Elford et al., 2000; Hui et al., 2001; Daynard et al., 2001). Activities connected to lifting and transferring patients represent major physical demands for nursing personnel, which in many cases result in injuries (Marras et al., 1999; Retsas & Pinikahaba, 2000). Some European countries calculate costs related to LBP treatment at around 1% of yearly gross domestic product (van Tulder et al., 1995; Hansson & Hansson, 2005). Among the musculoskeletal disorders, LBP represents the most frequent incident and the most expensive treatment (Balantič & Zupan, 2003, Whiting & Zernicke, 2008). In a German research the cost for a single episode of LBP was estimated to amount approximately to EUR 1300 in medical costs and loss of production (Wenig et al., 2009). The literature estimates that among adults in the general population, 70-85% are believed to experience at least one episode of low back pain at some time during their lifetime (Andersson, 1999; Croft et al., 1999).

The problem of LBP in nursing has been thoroughly researched and the main risks are known, and measures have been suggested for its prevention. Success was in most cases reported as adhering to a 'zero lift policy' by using assistive devices (Zhuang et al., 1999, 2000; Nelson et al., 2003a; Collins et al., 2004; Menzel et al., 2004, Nelson et al., 2006). However, the problem of awkward body postures remains, as it is difficult to avoid these altogether (Smedley et al., 1995; Elford et al., 2000). Biomechanical research revealed the human effort in manual lifting, change of patient position in bed, patient transfer from bed to wheelchair or stretcher, patient transfer from wheelchair to toilet and vice versa as major risks for developing LBP (Owen & Garg, 1989; Owen et al., 2002). Therefore it seems reasonable that nursing personnel should remain in good physical condition, not being overweight, with a supple and firm body. Although body mass index (BMI) was not clearly

associated with LBP in the past, research has since shown that low BMI may also represent a risk (Lagerstrom et al., 1995; Kerr et al., 2001; Smedley et al., 2003). Older research also examined smoking and alcohol consumption and concluded that this might represent some risk (Frymoyer et al., 1980; Kelsey et al., 1984; Bigos et al., 1986; Heliovaara et al., 1987). Following literature reviews by Ferguson and Marras (1997) and Rubin (2007), these authors summarised the risk factors for developing LBP in advanced age as being female, having a lower economic standard, lower education, smoking, frail health, physical work, repeated tasks, awkward body postures, lower job satisfaction, depression, spinal structure and visible spinal anomalies.

The international literature suggested four major solutions to prevent LBP in nursing personnel. While the 'zero lift policy' is the most promising among the four strategies, unfortunately it is also the most expensive, because technical equipment needs to be purchased (Nelson et al., 2006). Technical equipment in nursing care provision is only useful if the amount of needed force to handle the equipment does not exceed the forces that are developed by manual handling and lifting (Santaguida et al., 2005). The other three solutions introduced were manual lifting techniques (Larese & Fiorito, 1994; Daltroy, 1997; Lagerstrom & Hagberg, 1997; Hye-Knudsen et al. 2004; Karahan & Bayraktar, 2004), forming nursing personnel or special workforces into so called 'lift teams' (Charney, 1997) and introducing regular prevention exercising (Linton & van Tulder, 2001; Rainville et al., 2004; Burton et al., 2005; Byrne et al., 2006).

Several studies that researched improvements in LBP development by applying manual lifting techniques showed no positive long-term effects (Larese & Fiorito, 1994; Daltroy, 1997; Lagerstrom & Hagberg, 1997; Nelson et al., 2003b). Many older Asiatic traditional motion techniques are currently revived, introducing new manual lifting techniques to best overcome physical burden. Marras et al. (1999) concluded that the essential problem in using manual lifting techniques is the human factor, where stressful working conditions and unexpected situations may eventually lead to failures. From a financial aspect manual, lifting techniques are most popular as a prevention strategy because they cost least.

Heavy lifting became a legislative issue in the 1970s and 1980s to prevent occupational activities that might harm workers' health. In the USA the National Institute on Safety and Health recommended the maximum spinal compression force should be 3400N for heavy manual lifting or manual transfer (NIOSH, 1981, 1994). Zhuang et al. (1999) showed that in performing manual patient transfer, specifically turning a patient in bed and lifting the patient to a sitting position in bed on average exceeds this recommended limit. This was especially evident in care activities of overweight patients. Additional research on different manual lifting techniques in team work in patients weighing more than 75kg resulted in spinal compression forces over the recommended threshold of 3400N (Winkelmoen et al., 1994). Nursing personnel are by their occupational duties regularly exposed to burdens that exceed these limits.

The International Labour Organisation (ILO) issued two conventions that are more closely connected to nursing care provision, (1) (Maximum Weight Convention) and (2) C155 (Occupational Safety and Health Convention). The Maximum Weight Convention was adopted on 28 June 1967 and states that no worker shall be required or permitted to engage in the manual transport of a load which, by reason of its weight, is likely to jeopardise the

worker's health or safety. In addition, the employer shall take appropriate steps to ensure that any worker assigned to manual transport of loads other than light loads receives, prior to such assignments, adequate training or instruction in working techniques, with a view to safeguarding health and preventing accidents. The Occupational Safety and Health Convention, adopted 22 June 1981, aims to prevent accidents and injury to health arising out of, linked with or occurring in the course of work, by minimising, so far as is reasonably practicable, the causes of hazards inherent in the working environment (European Agency for Safety and Health at Work, 2008).

The European community mandates certain directives in connection with occupational safety, with each member country having the right to implement the directives according to their own means. Member countries can adopt more intense regulations within individual directives, although this is seldom the case due to economic interests to remain competitiveness with Eastern countries. In general, adopted directives are not intended for certain economic branches and are also not directly connected to musculoskeletal disorders; they give general guidelines to improve occupational health and. Council directive 89/391/EEC obligates employers to introduce measures to encourage improvements in the health and safety of workers at work, whereas information, dialogue and balanced participation on health and safety at work must be developed between employers and workers (Council Directive 89/391/EEC, 1989).

Council directive 90/269/EEC was adopted on 29 May 1990 and supplements the general council directive about measures for occupational health and safety (89/391/EEC) on the minimum health and safety requirements for the manual handling of loads where there is a risk, particularly of back injury, to workers. The general provision states that the employer shall take appropriate organizational measures, or shall use the appropriate means, in particular mechanical equipment, in order to avoid the need for the manual handling of loads by workers. In addition, wherever the need for manual handling of loads by workers cannot be avoided, the employer shall organize workstations in such a way as to make such handling as safe and healthy as possible. Assessment must be made, in advance if possible, of the health and safety conditions of the type of work involved, and in particular examinations of the characteristics of loads. Employers must ensure that workers and/or their representatives receive general indications and, where possible, precise information on the weight of a load, and the centre of gravity of the heaviest side when a package is eccentrically loaded. Employers must ensure that in addition workers receive proper training and information on how to handle loads correctly and the risks they might be open to, particularly if these tasks are not performed correctly (Council directive 90/269/EEC, 1990).

Several studies have indicated that LBP may contribute to nursing personnel turnover. For example, Owen (2000) found that 20% of nursing personnel had changed jobs at least once due to LBP problems. In a survey conducted with over 43,000 members of nursing personnel in five countries, 17% to 39% reported that they planned to leave their job in the next year due to the physical and psychological demands of the profession (Aiken et al., 2001). These findings are especially alarming given the current shortage of nursing personnel and the increasing need for nursing care projected over the next decades (Massey et al., 2009; DiMattio et al., 2010).

To contribute to the above knowledge, the aim of this research was to examine to which extent the occupational and environmental risk factors influence the development of LBP in hospital nursing personnel. According to literature review our research included some occupational risk factors and also some personal characteristics about life style, which were designated as environmental risk factors. Among the risk factors included were also some that were expected to act as prevention for developing LBP. Potential risk or prevention factors were included in a multivariate statistical analysis to conduct factors that best predict development of LBP. In the discussion and conclusion sections we introduce some ideas, suggestions and considerations how our results could be implicated in clinical practice. We also provide some suggestions for future research.

To search in the international literature for similar research strategies as we had applied, we conducted a very general search of electronic databases about LBP and nursing personnel or occupation, followed by a subsequent review of abstracts to find more specific literature. The search in the electronic databases Medline, CINAHL and ScienceDirect resulted in 144 non-overlapping hits. Search terms 'nursing' and 'low back pain' were used by selecting the period from 1990 to 2010. The inclusion criteria for the literature search were for terms to be found in the title, abstract or keywords. The larger group of hits was related to LBP occupational risks and four articles only included recreation or exercise as potential LBP prevention. Occupational and environmental components of nursing personnel have rarely been analysed at the same time, and Feng et al. (2007) was identified as the only contribution where recreation was considered in the statistical analysis in conjunction with other LBP risks. The literature search was extended beyond 2007 (till end of 2010), where our research design was initial made and also the data gathering concluded, in order to find any up to date scientific advances.

2. Methods

As a research method a non-experimental approach with a cross-sectional survey and statistical analysis was used.

2.1 Instrument

A structured questionnaire about LBP included basic demographic and anthropometric characteristics: age, gender, body height and body weight. The second part of the instrument included occupational risk factors: duration of employment in years, duration of employment in the current position in years, frequent manual weight lifting above 10 kg, manual patient transfer and material handling, patient transfer and material handling with assistive devices, availability of height adjustable beds in nursing care provision, treatment of patients in the highest patient classification system category, and hours of daily work at the computer. The third part included physical activities and habits (environmental risk factors): regular exercises to prevent LBP, recreation and sports in youth, recreation and sports at present, and hours of watching television. The question representing the depended variable was how many episodes of LBP respondents experienced during their working career. A list of all measured characteristics is included in table 1. Duration of employment, work at the computer and watching TV were split into two groups by median value. BMI was calculated as quotient of body weight in kilograms and square of body height in metres. Overweight was marked as $BMI \geq 25 \text{ kg/m}^2$ (WHO, 2006).

The structured questionnaire was developed according to literature review about occupational risks connected to development of LBP in nursing personnel, for example, as manual patient transfer, frequent lifting and nursing care provision without the use of assistive devices (Ando et al., 2000; Fairbank & Pynsent, 2000; Davidson & Keating, 2002; Trinkoff et al., 2003; Bot et al., 2004). Included were personal characteristics that were considered to have positive or negative effects on LBP, such as being female, physical condition, BMI, preventive exercising, watching TV (Lahad et al., 1994; Ferguson & Marras, 1997; Maher et al., 1999; Trinkoff et al., 2003; Rainville et al., 2004; Burton et al., 2005; Shehab & Al-Jarallah 2005; Rubin, 2007).

2.2 Sample

The sample consisted of nursing personnel from the University Clinical Center Maribor, the second largest Hospital in Slovenia, with 2800 employees and 1500 members of nursing personnel among them. Hospital nursing personnel in Slovenia involves nursing assistants and registered nurses. Nine hundred questionnaires were distributed among the nursing personnel in 2007, 663 (73.7%) were returned and 581 (64.6%) were considered for analysis. Eighty-two (12.4%) returned questionnaires were excluded due to missing data. Data were collected by convenience sampling. The sample size was selected according to stratification of 40 hospital departments. The strategy in general was to survey 30-40% of nursing personnel from each hospital department to achieve better reliability of results. Gender distribution was 489 (84.2%) women and 92 (15.8%) men, mean age was 37.5 ± 8.9 of years. Frequent LBP was reported in 458 (78.8%) of cases.

The sample size was determined by exemplars from international cross-sectional survey studies, which tend to gather a sample of approximately 500 participants. These sample sizes generally suffice for the needs of the statistical analysis and also give better representation of the researched population. For the statistical relevance, according to alpha level (p-value) of 0.05, the number of predictors (degrees of freedom) of 15 and the anticipated medium effect (f^2) size of 0.15, in order to achieve desired statistical power level of 0.8, a sample size of $n=139$ would be needed (Polit, 1996).

2.3 Statistical analysis

Sample data was presented by frequency and percentage for categorical variables or by mean value and standard deviation for numerical variables. Median values were calculated to split numerical variables into two groups. Univariate and multivariate statistics for LBP risk was calculated by binary logistic regression. The chi-square (χ^2), odds ratio (OR), 95% confidence interval (95%CI) and P-value were calculated. Multivariate binary logistic regression was calculated without a method to omit insignificant variables. Statistical analysis was performed with SPSS 15.0 software (SPSS Inc., Chicago, IL). P-value < 0.05 was marked as statistically significant.

2.4 Ethical considerations

Approval for the study was obtained locally from the Nursing Care Office of the University Clinical Center Maribor. The research participants were informed about the nature of the study and what participation would entail for them, by receiving a printed information

sheet (Puotiniemi & Kyngäs, 2004). Participants were also asked to contact head nurses of the hospital departments for further questions. Participation in the research was voluntary and anonymous. By applying the stratification by hospital departments, anonymity was to some extent compromised or contracted, nevertheless it was still not possible to recognise the individual participants. Items in the questionnaire were very general; they did not include private items, provoke feelings or address intimate relationship. Items that may potentially harm participants or the University Clinical Center Maribor were also not included in the questionnaire.

3. Results

Fifteen variables in the form of risk factors were included in the analysis (Table 1).

Risk factor	LBP (in %)		χ^2	OR	95%CI	<i>P-value</i>
	rare (n=123)	frequent (n=458)				
Age ≥ 40 y	26.0	53.9	28.4	3.3	2.1-5.2	<0.001
Female gender	75.6	86.5	8.3	2.1	1.3-3.4	0.004
Duration of employment ≥ 20 y	26.8	54.6	28.1	3.3	2.1-5.1	<0.001
Duration of employment in current position ≥ 15 y	32.5	51.7	14.0	2.2	1.5-3.4	0.001
Frequent manual lifting >10kg	43.1	63.5	16.3	2.3	1.5-3.4	<0.001
Manual patient transfer and material handling	10.6	16.2	2.3	1.6	0.8-3.1	0.126
Patient transfer and material handling with assistive devices	15.4	6.6	9.4	0.4	0.2-0.7	0.002
Height adjustable beds in nursing care provision	28.5	21.8	2.4	0.7	0.5-1.1	0.124
Treatment of patients in the highest patient classification system category	4.1	11.8	5.8	3.2	1.2-8.1	0.016
Work with the computer ≥ 2 h per day	40.7	24.7	12.0	0.5	0.3-0.7	0.001
Regular exercises to prevent LBP	27.6	52.0	21.9	2.8	1.8-4.4	<0.001
Recreation and sports in youth	60.2	44.3	9.6	0.5	0.4-0.8	0.002
Recreation and sports at present	37.4	20.3	15.1	0.4	0.3-0.7	<0.001
Watching TV ≥ 2 h per day	52.8	51.7	<0.1	1.0	0.6-1.4	0.829
BMI ≥ 25	25.2	39.3	8.2	1.9	1.2-3.0	0.004

Table 1. Univariate analysis of risk factors for development of LBP

The results of univariate statistics show that three risk factors were not significantly connected to development of LBP. These were manual patient transfer and material

handling, height adjustable beds in nursing care provision and watching TV ≥ 2 h per day. LBP incidents were marked as rare if respondents reported none, one or two incidents while employed as nursing personnel (n=123 or 21.2%).

Results of the follow-up multivariate analysis are presented in Table 2. Three risk factors were calculated as independent predictors for development of LBP. Other significant risk factors on the univariate level failed to achieve statistical significance. The prediction quality of the calculated regression model also resulted in statistical significance ($\chi^2 = 99.577$, $df=15$, $p < 0.001$). The regression model explained 24.5% of the original variance.

Risk factor	LBP (in %)		χ^2	OR	95%CI	P-value
	rare (n=123)	frequent (n=458)				
Age ≥ 40 y	26.0	53.9	2.0	2.3	0.7-7.2	0.152
Female gender	75.6	86.5	3.0	1.7	0.9-3.0	0.084
Duration of employment ≥ 20 y	26.8	54.6	0.0	1.1	0.4-3.6	0.847
Duration of employment in current position ≥ 15 y	32.5	51.7	0.6	0.8	0.4-1.4	0.453
Frequent manual lifting >10 kg	43.1	63.5	14.4	2.4	1.5-3.9	<0.001
Manual patient transfer and material handling	10.6	16.2	1.9	1.6	0.8-3.3	0.166
Patient transfer and material handling with assistive devices	15.4	6.6	1.5	0.6	0.3-1.3	0.219
Height adjustable beds in nursing care provision	28.5	21.8	0.2	0.9	0.5-1.5	0.638
Treatment of patients in the highest patient classification system category	4.1	11.8	1.9	2.0	0.8-5.5	0.164
Work with the computer ≥ 2 h per day	40.7	24.7	3.3	0.6	0.4-1.0	0.071
Regular exercises to prevent LBP	27.6	52.0	16.8	2.8	1.7-4.6	<0.001
Recreation and sports in youth	60.2	44.3	0.4	0.9	0.5-1.4	0.539
Recreation and sports at present	37.4	20.3	7.1	0.5	0.3-0.8	0.008
Watching TV ≥ 2 h per day	52.8	51.7	0.6	0.8	0.5-1.3	0.447
BMI ≥ 25	25.2	39.3	2.9	1.6	0.9-2.6	0.091

Nagelkerke $R^2=0.245$

Table 2. Multivariate analysis of risk factors for development of LBP (model $\chi^2 = 99.577$, $df=15$, $p < 0.001$)

According to χ^2 values in Table 2, regular exercises to prevent LBP represented the highest risk for development of LBP (OR 2.8, 95%CI 1.7-4.6). This result shows that nursing personnel started with preventive exercises when it was too late and LBP was already developed. In case of rare LBP problems, 72.4% of nursing personnel without frequent LBP

problems were not performing any preventive exercises. The second ranked risk factor was frequent manual lifting >10 kg (OR 2.4, 95%CI 1.5-3.9). Of the nursing personnel who developed LBP on a frequent basis, 63.5% reported that their care activities are connected to frequent manual lifting of considerable weight. The third ranked risk factor was conducted in better physical condition by regular recreation and sports, which reduced the risk for frequent development of LBP (OR 0.5, 95%CI 0.3-0.8). Only 20.3% of the nursing personnel who reported frequent LBP were regularly engaged in recreation and sports; this percentage was considerably lower compared to nursing personnel without recreational and sporting interests.

4. Discussion

Frequent LBP was reported in 78.8% of cases, which was similar to results in previous studies (Karahan & Bayraktar, 2004). The strongest risk factor for development of LBP was found in the absence of preventive exercises to strengthen back muscles. Nursing personnel may not be aware of LBP risks and start with preventive exercises when it is already too late and LBP episodes become frequent. Exercises to prevent LBP are considered useful although there is little scholarly agreement on the kind of preventive exercising that should be undertaken or which intensity leads to best possible results (Burton et al., 2005; Byrne et al., 2006). In addition, our results indicate that recreation and sports may reduce risk of developing LBP, although the odds ratio was not as evident. Similar results were obtained by Linton and van Tulder (2001) and Burton et al. (2005).

Manual lifting is the best known risk for development of LBP, especially if the weight is considerable, of frequent nature, or both (Marras et al., 1999; Retsas & Pinikahaba, 2000; Bongers et al., 2002). For many years now, the international literature called to implement working rules for reduction of physical stressors on the human body. The best solution to the problem may be the 'zero lift policy' by using assistive devices when providing nursing care (Collins et al., 2004; Nelson et al., 2006). When considering that the manual lifting hazard grows with advancing age and that the retirement age is increasing, reaching retirement without developing LBP may become a challenge for nursing personnel (Engkvist, 2008). Surprisingly, our results did not significantly confirm this, although odds ratio of 2.3 for higher age (≥ 40) pointed in the same direction. The financial costs of LBP treatment should not be considered only during employment, because in retirement problems usually increase and become chronic (Turk, 2005). In such cases the financial costs for health insurance may turn out to be considerable for the rest of the person's life due to the need for analgesic drugs and physiotherapy.

Improved physical conditions for nursing personnel is not something that the public directly connects with the purpose of nursing care, which is primarily to offer physical and psychosocial help and care to sick and frail people. Society connects nursing care primarily with virtues like solace, attentiveness, empathy etc., and less with physical strength. It is therefore odd to expect from nursing personnel to expose their low backs far beyond recommended thresholds when manually transferring patients. In that manner, the proposal to reduce workload by grouping nursing personnel or employing specialists as lift teams would considerably reduce exposure to low back problems (Charney, 1997), but due to lack of staff or additional staff costs it is difficult to consider either organisation or employment of such teams. Yet, Charney (1997) argued that if sick leave, subsequent insurance and

medical costs, staff turnover and other possible negative side effects of LBP development are taken into account, then this equation should turn out positive in the long run.

Regular prevention exercises to strengthen back and abdominal muscles lead to improved physical strength and relief to the musculoskeletal when lifting manually or needing to use force (Linton & van Tulder, 2001; Burton et al., 2005). Some other studies, however, only partially confirmed that such an approach prevents developing LBP (Lahad et al., 1994; Maher, 2000; Rainville et al., 2004). Nevertheless, improved physical condition is popular and represents a modern life style to reduce the daily stress. LBP prevention should be incorporated in the regular daily working schedule of nursing personnel in particular. There are several possible ways to realise this, but the most important is to gain the support of legislation and employers. In our opinion it would be best if employees could decide on their own which prevention strategy is most suitable for them, considering their abilities and expectations, and in this way employers, for example, would show their contribution with time subsidies (approximately 15-30 minutes daily). It is also very important to consider that prevention activities and especially sports activities can also lead to health contraindications (Burton et al., 2005).

Members of the nursing personnel who are not interested in recreation and sports should not be forced to improve their physical condition in such a way. Nevertheless, only a small effort is needed for significant improvement (Feng et al., 2007). It is our belief that exercises to prevent LBP should be clearly promoted. Employees in Slovenia must participate in various trainings to keep their working licence, but there is no obligation to train how to maintain vitality. The orientation should be on education about physical stressors and routines how to strengthen the musculoskeletal system to at least try to keep the lifelong resistance. Mitchell et al. (2009) suggested that lifestyle and psychological factors associated with LBP should begin to be addressed during undergraduate study.

4.1 Suggestions for future research

The results conducted in this research are much as expected, yet in some cases also surprising, especially that the frequent manual lifting >10kg was the only significant occupational risk factors for development of LBP. Our expectations were oriented towards duration of employment and age as two typical risk factors for any kind of health risk. We also expected that patient transfer and material handling with assistive devices would reduce the risk for developing LBP. At the University Clinical Center Maribor, for example, surgical departments have better technical equipment than internal medical departments. Surgical departments are housed in new buildings with wide corridors and also in patients' rooms there is more space between beds, although conditions differ according to circumstances; usually in winter time there are more injuries. The typical problem in nearly all hospital departments is lack of space around toilet bowls and bath tubs, doors are not wide enough for easy access with wheelchairs or stretchers. These architectural barriers make solutions for a 'zero lift policy' for nursing personnel a far dream. Engkvist et al. (1995) exposed some of these problems scientifically.

Further research is needed, including the risk factors involved in this research and more precise details about specific manual patient transfer or manual material handling (patient transfer to wheelchair, stretcher or bath tub, repositioning in bed, washing, toileting etc.).

We also propose that future research should include specific types of recreation and sports activities (running, cycling, fitness, hiking etc.) and types of regular exercises to prevent LBP (yoga, Pilates, aerobics, abdominal training, traditional morning exercises etc.). Non-inclusion of this data represents some justified self-criticism of our research design and criticism of other similar studies. Results about risk factors are primarily too general and seldom offer precise information which manual lifting activities should be avoided and which recreational, sporting and preventive activities should be fostered.

4.2 Study limitations

The sample in our research was gathered from a single hospital. However, our literature review showed that several international hospitals face similar problems to those in Slovenia, primarily because of inadequate staffing levels and occupational stress (time distress, physical and psychological fatigue), that consequently cause pain and injuries to nursing personnel (Hollingdale & Warin, 1997; Vasiliadou et al., 1997; Aiken et al., 2001; Smedley et al., 2003; Videman et al., 2005). We believe that the University Clinical Center Maribor represents typical European and international hospitals supplying comprehensive health care services and disease treatments. Therefore, our research sample included nursing personnel from all areas or departments that are determined by international medicine.

A concern represents a possible non-response. From 900 distributed questionnaires, 237 or 26%, remained unevaluated. There is a possibility of impact on the results because we could not include variance of nursing personnel who did not respond to the research. Nevertheless, the response rate of 74% was, according to international literature, very good (Trinkoff et al., 2003).

Given the cross-sectional study design and the collection of data by self-report, these findings must, however, be interpreted with caution, because self-report may reflect denial, deception, or difficulty in recall (Trinkoff et al., 2003).

5. Conclusion

Because of various health problems in relation to LBP, which may result in absence from work and consequently increased pressure from employers, it seems reasonable that nursing personnel pay more attention how to maintain a healthy spine. Awkward body postures and manual lifting may be difficult to avoid due to the nature of nursing. Little interest from employers to purchase assistive devices and improve working conditions means that it is important for nursing personnel to find their own suitable LBP prevention strategy. For example, preventive exercises can be more physically oriented, such as abdominal training, or be more vigorous like aerobics, yoga or Pilates. Each prevention strategy may lead to some improvement and if there is dissatisfaction it is easy to stop and to try something else.

The international literature is alarmed about the occupational tasks of nursing personnel that involve a heavy physical burden connected to manual patient and material handling. Nursing personnel are pushed into these risky tasks without much consideration about their health risks. Manual patient transfer and lifting of heavy burden is not defined as an occupational duty or task of nursing personnel. The current shortage of nursing personnel who avoid this ever more physically and psychologically stressful occupation, and the

increasing need for nursing care of a frail older population must lead to legislation, and to employers to search for solutions to improve working environment.

The LBP problem is very complex one. The battle against spine diseases should include several professions and multidirectional approaches. We see two crucial points where the most important work against LBP in nursing personnel must be executed. First the nursing schools should include the knowledge about spine problems, risk factors and prevention strategies in their educational programme. Second the employers should be aware of cost-benefit of LBP prevention and take care of optimal work organisation and ergonomics with proper technical equipment for diminution of heavy physical work of nursing personnel.

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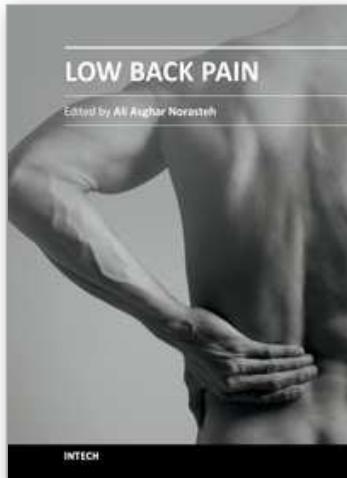
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This book includes two sections. Section one is about basic science, epidemiology, risk factors and evaluation, section two is about clinical science especially different approach in exercise therapy. I envisage that this book will provide helpful information and guidance for all those practitioners involved with managing people with back pain-physiotherapists, osteopaths, chiropractors and doctors of orthopedics, rheumatology, rehabilitation and manual medicine. Likewise for students of movement and those who are involved in re-educating movement-exercise physiologists, Pilates and yoga teachers etc.

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