J Occup Health 2013; 55: 276–283

Journal of Occupational Health

Low Back Pain and Associated Presenteeism among Hospital Nursing Staff

Angelo d'Errico[1], Sara Viotti[2], Alberto Baratti[3], Bianca Mottura[3], Anna Pia Barocelli[4], Marina Tagna[4], Barbara Sgambelluri[3], Paolo Battaglino[3] and Daniela Converso[2]

[1]Department of Epidemiology, Local Health Unit TO3, Italy, [2]Department of Psychology, University of Turin, Italy, [3]Department of Occupational Medicine, Local Health Unit CN1, Italy and [4]Department of Occupational Medicine, Local Health Unit TO2, Italy

Abstract: Low Back Pain and Associated Presenteeism among Hospital Nursing Staff: Angelo d'Errico, *et al*. Department of Epidemiology, Local Health Unit TO3, Italy—Objectives: In spite of the high prevalence of low back pain (LBP) and presenteeism previously observed among nurses, no study has assessed the risk of presenteeism specifically due to LBP in nursing staff. Therefore, aim of the present study was to assess prevalence and risk factors of presenteeism due to LBP among hospital nursing personnel. **Methods:** 174 female nurses underwent a clinical interview and filled in a questionnaire on sociodemographics, LBP symptoms and associated sickness absence, mental symptoms, burnout and on exposure to workplace organizational, psychosocial and ergonomic factors; 111 subjects affected by LBP were included in the analysis. The effect of sociodemographic and workplace characteristics on presenteeism was examined through multivariate Poisson robust regression models. **Results:** Prevalence of presenteeism due to LBP was 58%, with wide differences between registered nurses and nursing aides (p=0.001). Only a few workplace factors were significantly associated with presenteeism, including frequent stooping, which decreased the risk of presenteeism, and good working climate and procedural justice, which increased it. **Conclusions:** Presenteeism due to LBP was very high among registered nurses and was influenced only by workplace, but not by sociodemographic characteristics. Presenteeism due to LBP among registered nurses should be closely monitored, and effort should be made to reduce it to prevent future work disability associated with LBP.
(J Occup Health 2013; 55: 276–283)

Received Nov 13, 2012; Accepted May 13, 2013
Published online in J-STAGE Jun 24, 2013
Correspondence to: Angelo d'Errico, Local Health Unit ASL TO3-Piedmont Region, Department of Epidemiology, Via Sabaudia 164, Grugliasco (TO), 10095 Italy
(e-mail: angelo.derrico@epi.piemonte.it)

Key words: Epidemiology, Ergonomics, Low back pain, Nurses, Presenteeism, Psychosocial

Sickness presenteeism is a concept used "to designate the phenomenon of people, despite complaints and ill health that should prompt rest and absence from work, still turning up at their jobs"[1]. The phenomenon appears common, according to Aronsson & Gustafsson (2005), who reported that, in a representative sample of the Swedish population, 53% of the workers went to work despite illness on more than one occasion during the previous year[2].

The importance of presenteeism relies primarily on the associated reduced productivity at work, whose costs have been estimated to exceed those attributable to both medical expenses and sickness absence[3]. Furthermore, the results of a few longitudinal studies suggest that presenteeism may increase the risk of developing health disorders[4, 5].

Many studies have highlighted that the work context influences the level of presenteeism. In particular, exposure to several psychosocial factors at work has been reported to increase the level of presenteeism, including low control over work tasks[2], conflicting demands, time pressure and workload[2, 6], as has exposure to favorable workplace characteristics, such as job satisfaction[7], cooperation with colleagues and group cohesiveness[8]. Work-family conflicts and family-work conflicts have instead received little attention with respect to presenteeism, although these dimensions might also affect attendance dynamics[9].

Several chronic health conditions have been reported to increase the risk of presenteeism, including migraine, allergies, irritable bowel syndrome, gastroesophageal reflux disease, mental health problems and musculoskeletal pain[10, 11]. Of particular concern is presenteeism among subjects affected by musculosk-

eletal disorders who are employed in jobs with high physical workload, because their affected body structures, such as muscles, tendons and ligaments, may be more susceptible to the effects of physical strain, therefore increasing symptoms persistence or reducing the probability of recovering from these disorders.

Low back pain (LBP) is the most common musculoskeletal disorder in the health care workforce, with high prevalences observed especially among nursing staff[12–14]. Nursing personnel have also been found to be at high risk of presenteeism[1, 15], together with other categories of workers employed in service work involving provision of care or help to others[1], and LBP has been reported among the most frequent causes of presenteeism by two studies on nurses[16, 17]. However, these studies only assessed the overall prevalence of presenteeism and the risk of presenteeism associated with LBP, whereas no studies, to our knowledge, have evaluated the frequency and risk factors of presenteeism specifically attributable to LBP in nursing personnel.

Within the occupational health surveillance program of four small-size hospitals in Piedmont, a questionnaire survey on exposure to psychosocial and ergonomic factors in the workplace was conducted, in which information on sickness absence in the previous 12 months because of LBP was also collected.

The aim of this study was to assess prevalence of presenteeism due to low back pain among nursing personnel affected by LBP in the previous year, as well to identify sociodemographic and workplace characteristics associated with it.

Materials and Methods

Data collection

1) Participants and LBP assessment

The study was conducted on 174 female nursing staff employed in one of four small-size hospitals located in the Piedmont region, who during 2007–2009 underwent, within the Occupational Health Surveillance Program, a clinical interview and, in case of back symptoms, a physical examination by an occupational physician. These workers also filled in a self-administered questionnaire on sociodemographics, sickness absence due to LBP, mental symptoms, burnout and on exposure to psychosocial and ergonomic factors (response rate: 91%). Male nurses were excluded because of their small number (n=21).

The definition of LBP included chronic LBP (CLBP), as well as acute episodes of LBP, regular use of drugs for LBP or health care consultation because of low back problems in the previous year. The presence of CLBP was ascertained using as a criterion self-reported continuous or sub-continuous (more than half of the time) discomfort or pain in the lumbar region during the last 12 months, or pain in episodes according to the following scheme: one episode lasting at least 90 days, two episodes lasting 30 days, three episodes lasting 10 days, four episodes lasting three days, six episodes lasting two days or 10 episodes lasting one day[18]. Based on this definition, 39.7% of the nurses were found to be affected by chronic LBP (CLBP). Furthermore, 4.0% reported acute LBP episodes during the previous year, 4.6% reported regular use of drugs for LBP and 15.5% reported consultation with a physician, a physical therapist or another specialist because of low back problems. Therefore, the total number of LBP cases in the sample, based on all the above criteria, was of 111 subjects, giving an overall prevalence of LBP during the previous 12 months of 64%. Severity of LBP was assessed through a question inquiring about the level of interference of LBP with daily activities in the previous six months, with answers collected using a ten-points Borg scale.

2) Presenteeism due to LBP

Information on sickness absence was collected by means of the following question: "How long have you been absent from work because of your low back problems in the last 12 months?". This question was derived from the Italian version of the Nordic Musculoskeletal Questionnaire[19] and included five possible answers (0, 1–7, 8–30, >30 days, every day). Sickness presenteeism was considered to be present among subjects with LBP in the previous 12 months and reporting no days of absence for LBP in the same period.

3) Ergonomic factors

Information on exposure to ergonomic factors was collected using a modified version of the Dutch Musculoskeletal Questionnaire[27], consisting of 23 yes/no items asking subjects whether their job often implied heavy lifting, pushing, pulling or carrying heavy loads, bending or twisting the trunk, sitting, standing, walking or keeping uncomfortable postures for an extended time. The ergonomic items were grouped into three domains, namely, uncomfortable postures, trunk activity level and manual handling of loads: the number of positive answers to each question was summed up across each domain to construct the three corresponding scales. Cronbach's alphas of the three scales indicated good internal consistency for manual handling of loads, moderate internal consistency for uncomfortable postures and poor internal consistency for trunk activity level (Table 1).

4) Psychosocial factors

Regarding psychosocial factors, information on the following dimensions was collected, through a five-points Likert scale (from "strongly agree" to "strongly disagree"): procedural justice[20], supervisor support[21],

Table 1. Number of items and internal consistency of the scales for psychosocial and ergonomic factors at work, burnout and mental health

Domain	Scale	No. items	Cronbach's alpha
Psychosocial factors	Work-family conflicts	5	0.86
Psychosocial factors	Family-work conflicts	5	0.77
Psychosocial factors	Supervisor support	5	0.89
Psychosocial factors	Climate in the working group	7	0.88
Psychosocial factors	Quality of working process	7	0.77
Psychosocial factors	Procedural justice	6	0.70
Ergonomic factors	Manual handling of loads	9	0.86
Ergonomic factors	Uncomfortable postures	6	0.72
Ergonomic factors	Trunk activity level	5	0.64
Burnout (MBI)	Emotional exhaustion	9	0.91
Burnout (MBI)	Depersonalization	5	0.71
Burnout (MBI)	Personal accomplishment	8	0.74
Mental health	Mental symptoms	4	0.82

MBI: Maslach Burnout Inventory.

climate in the working group and quality of working process[22], work-family conflicts and family-work conflicts[23] (Table 1).

The procedural justice scale used was an adaptation of the corresponding subscale of the organizational justice dimension elaborated by Moorman[20]. It consisted of six items aimed at measuring presence and fairness of procedures concerning professional growth and resources allocation (e.g., "In my organization, standards that guide professional growth are clear").

The supervisor support scale was adapted from the scale developed by McAllister[21] and was composed of six items focusing on the quality of the relationship between workers and supervisors and the perception of the workers regarding the support provided by supervisors in their work (e.g., "the relationships with my supervisor are satisfactory").

Working group climate and quality of work processes were assessed through two scales created by Francis and Young[22]. The first one consists of seven items that assess quality of relationship in the working group (e.g., "Relationships with colleagues are satisfactory"). The second one evaluates several aspects of working processes, such as competence of the group members, goals achievement and quality and timeliness of the services provided (e.g., "We do not often reach objectives on time and with the quality expected").

Conflicts between work and family domains were examined using the instrument developed by Netemeyer, Boles and McMurrian[23], which includes the two subscales of work-family conflict (WFC; e.g., "The demands of my work interfere with my home and family life") and family-work conflict (FWC; e.g., "The demands of my family or spouse/partner interfere with work-related activities"). WFC measures the degree to which participation in the family role is made more difficult by virtue of participation in the work role, whereas FWC measures the degree to which the participation in family role interferes with participation in the work role.

All scales of psychosocial factors displayed acceptable internal consistency, with Cronbach's alphas above 0.70 (Table 1).

5) Mental symptoms and burnout

The presence of mental symptoms was assessed by means of a 4-items scale proposed by Avallone & Paplomatas[24], which takes in consideration feelings or symptoms of depression, anxiety, insomnia and loss of concentration.

Burnout was ascertained through the Maslach Burnout Inventory (MBI), translated into Italian and adapted by Sirigatti & Stefanile[25], composed of 22 items divided into three subscales: emotional exhaustion (9 items), depersonalization (5 items) and personal accomplishment (8 items)[26].

For both dimensions, items were responses to statements on a six-point Likert scale (from "never" to "every day"). Both the mental health scale and the three MBI subscales demonstrated moderate to good internal consistency (Table 1).

Scores in each scale of psychosocial factors, burnout and mental health were summed across items in each scale.

6) Sociodemographic and work-related characteristics

Information on several sociodemographic (age, gender, marital status) and work-related characteristics (hospital, type of contract, work schedule, job title, department, job and department seniority) was collected through the self-administered questionnaire.

Data analysis

In a univariate analysis, differences in the prevalence of presenteeism by categorical sociodemographic and work-related characteristics (marital status, tenure employment, hospital, type of department (medicine/surgery), job title, part-time or full-time work) were tested for statistical significance by means of the Fisher's exact test, whereas differences in presenteeism by continuous variables (age, job and department seniority, procedural justice, supervisor support, climate in the working group, quality of working process, work-family and family-work conflicts, mental health, emotional exhaustion, depersonalization, personal accomplishment, scales of ergonomic exposures) were tested through the Mann-Whitney statistics for unmatched samples.

Associations between presenteeism and independent variables were also assessed using Poisson multivariable regression models with the Huber-White sandwich estimator of variance, which has been demonstrated to be an appropriate method alternative to logistic regression when examining frequent outcomes[28]. Model building was performed according to the method proposed by Hosmer and Lemeshow[29], in which only variables associated with presenteeism at $p<0.25$ in the univariate analysis were explored as risk factors of presenteeism in the multivariable model; a stepwise forward procedure was employed, in which variables were added in rank order of their significance in the univariate analysis, selecting in the final regression model those with $p<0.05$. In multivariate analysis, the association between ergonomic exposures and presenteeism was examined using the scores of the three ergonomic scales (manual handling of loads, activities and postures), but also evaluating the effect of each single item, if belonging to a scale associated with $p<0.25$ at univariate analysis.

Results

The nursing personnel were on average 42.2 years of age, had 15.8 years of job seniority and had 9.6 years of department seniority; 62% of nurses were married, 23% were single and 13% were separated or widowed. More than 95% of them had a permanent contract, with about three-quarters employed in medicine departments and one-quarter employed in surgery departments. Registered nurses represented 69% of the study population.

The overall prevalence of presenteeism due to LBP in the sample was 58.2%. Presenteeism was lower among workers affected by chronic LBP (55.9%), compared with those reporting acute episodes of LBP or having taken drugs or consulted a physician or therapist for LBP in the previous year (61.9%), but such a difference was not statistically significant ($p=0.56$).

In the univariate analysis (Tables 1 and 2), presenteeism was significantly higher among registered nurses, compared with nursing aides (67.5% vs. 36.4%, $p=0.003$); it was also significantly positively associated with longer department seniority ($p=0.04$) and better climate in the working group ($p=0.04$) and negatively associated with mental health symptoms ($p=0.007$) and interference of LBP with daily activities ($p=0.006$). Procedural justice and the ergonomic "uncomfortable postures" scale showed associations of borderline significance ($p=0.08$ and $p=0.09$, respectively).

In the multivariate analysis (Table 3), job title remained significantly associated with presenteeism (RR=0.42 among nursing aides vs. registered nurses, $p=0.001$), after controlling for the other significant factors, namely, climate in the working group ($p=0.04$) and procedural justice ($p=0.04$). Exposure to ergonomic factors was not associated with presenteeism when the items were aggregated in scales, whereas, examining the effect of each single factor belonging to the "uncomfortable postures" scale, a significantly decreased risk was computed for stooping often for a prolonged time (RR=0.63, $p=0.002$). The significant associations observed in the univariate analysis with department seniority, mental symptoms and interference of LBP with daily activities disappeared after adjusting for significant covariates.

Discussion

In this sample of female nursing staff, it was found that almost 60% of workers suffering from LBP went to work at least one day during the previous year, despite their low back symptoms. It is difficult to compare the observed prevalence with other reports in the literature, since in other studies, only presenteeism related to any disease was assessed, whereas the present study focused exclusively on presenteeism due to low back pain. However, taking into account such a difference, 12-month presenteeism appears more frequent in our study than in studies conducted on the general working population, where 50–70% workers reported at least one episode of presenteeism for any cause of illness in the previous year[1, 2, 5, 30, 31].

The high prevalence of presenteeism found in the present study is consistent with previous observations of a higher risk of presenteeism among health care

Table 2. Prevalence of presenteeism by categorical independent variables (n=111)

Categorical variables	No. subjects[1]	Presenteeism (%)	*p*-value (Fisher exact test)
Marital status			
Married	69	56.5	
Unmarried	25	60.0	0.96
Separated/divorced/widowed	14	57.1	
Type of contract			
Temporary	5	58.1	1.00
Permanent	105	60.0	
Work schedule			
Full-time	88	58.0	0.81
Part-time	21	61.9	
Job title			
Registered nurse	77	67.5	0.003
Nursing aide	33	36.4	
Hospital			
Savigliano	50	60.0	
Saluzzo	32	62.5	0.38
Fossano	5	80.0	
Maria Vittoria	23	43.5	
Type of department			
Medicine	81	56.8	0.67
Surgery	29	62.1	

[1]Total number of subjects does not sum up to 111 because of missing values.

workers[15, 31]. Aronsson *et al*. (2000), who compared different working populations, found that occupations in the caring, helping and primary teaching sectors were most prone to preesenteism[1]. According to the authors, the ties between workers and their care recipients may reduce the disposition to be absent from work and thereby amplify the tendency to be at work despite illness. Furthermore, Johns (2010) suggested that in these sectors work identity is strongly linked to helping the client/patient/pupil and that working with vulnerable people may be also associated with a workplace culture characterized by loyalty to and concern for clients[32].

A strong difference in the risk of presenteeism was observed between nursing aides and registered nurses, among whom the risk was more than the double of that of nursing aides, and such a difference was not reduced after controlling for differences in working conditions, sociodemographic characteristics or LBP severity. It seems possible that the level of psychological identification with work and centrality of work in life is crucial to understanding the phenomenon of presenteeism. In fact, several studies highlighted the influence of some job characteristics on work attendance, such as "job satisfaction", "work involvement" and "meaning of work"[30], which may explain the difference observed between the subgroups of registered nurses and nursing aides. For example, Kalisch and colleagues found that nursing aides report lower scores than registered nurses in job satisfaction because of lower status and low level of power, influence and autonomy[33]. Rugulies *et al*., in a prospective study on the predictors of sickness absence among human service professionals in Denmark, observed that low meaning of work increased sickness absence[34]. According to Claes, more research would be necessary on the "meaning of work" construct in different occupational groups, in order to clarify its relation with presenteeism[7].

However, other features of the nursing profession may be responsible for the higher risk observed among registered nurses, such as less ease of replacement and working during nonstandard hours, which have also been reported as risk factors for presentee-

Table 3. Range and mean values of continuous independent variables by presenteeism

Continuous variables	Possible range of values	Presenteeism-No mean (sd)	Presenteeism-Yes mean (sd)	*p*-value (Wilcoxon test)
Age (years)	24–60[1]	43.30 (8.97)	41.30 (7.97)	0.17
Job seniority (years)	1–34[1]	14.38 (9.71)	16.64 (9.01)	0.18
Department seniority (years)	0.1–32[1]	8.09 (8.97)	10.33 (7.93)	0.04
Quality of working process	7–35	27.58 (4.64)	26.21 (4.63)	0.16
Supervisor support	5–25	17.51 (4.50)	18.38 (3.44)	0.52
Procedural justice	6–30	14.26 (3.99)	15.02 (3.18)	0.08
Climate in the working group	7–35	32.44 (5.84)	34.23 (4.33)	0.04
Work-family conflicts	5–25	15.66 (4.65)	14.79 (4.41)	0.28
Family-work conflicts	5–25	9.76 (3.48)	10.03 (3.04)	0.82
Burnout - Emotional exhaustion	0–54	21.73 (12.55)	20.63 (10.42)	0.78
Burnout - Depersonalization	0–30	5.86 (5.90)	4.29 (4.80)	0.24
Burnout - Personal accomplishment	0–48	34.53 (8.50)	36.93 (6.42)	0.22
Manual handling scale	0–9	5.19 (2.63)	4.66 (2.71)	0.29
Uncomfortable postures scale	0–6	2.69 (1.49)	2.16 (1.64)	0.09
Trunk activity level scale	0–5	3.57 (1.33)	3.45 (1.22)	0.60
Mental symptoms	4–24	12.58 (4.48)	10.33 (4.10)	0.007
Interference of LBP with daily activities	1–10	5.50 (2.22)	4.33 (2.09)	0.006

[1]Actual range of values. LBP: Low back pain.

Table 4. Relative risks (RR) of presenteeism (and 95% confidence intervals) by covariates associated with $p<0.05$ - fully adjusted Poisson regression model

Covariates	RR	LCL 95%	UCL 95%
Job title			
Registered nurses	1	—	—
Nursing aides	0.42	0.25	0.71
Stooping for a long time			
No	1	—	—
Yes	0.63	0.47	0.85
Climate in the working group (per 1 unit increase)	1.04	1.00	1.08
Organizational justice (per 1 unit increase)	1.05	1.00	1.11

LCL: Lower Confidence Limit. UCL: Upper Confidence Limit.

ism[35]. Furthermore, a negative attitude towards sickness absence, apparently more diffuse among white-collar workers compared to blue-collar workers[30], would also increase the risk of presenteeism and may account for the observed difference between the two job groups.

In the current study, a higher level of presenteeism was observed among workers reporting a better climate in the working group, which is in line with previous research. For example, teamwork or higher levels of cooperation with colleagues, also more common among registered nurses, have been found to increase the risk of presenteeism in several qualitative studies, apparently because of the obligation felt by team members towards the rest of the team, leading to a reluctance in taking sick leaves[8, 36]. Another explanation comes from Johns, who suggests that in the health care sector, workers are particularly dependent on coworkers activities or output. In this sense, the task interdependence might increase presenteeism through personal responsibility and responsibility towards colleagues[9]. Differences in presenteeism

between registered nurses and nursing aides were practically unchanged after adjusting for workplace climate, demonstrating that workplace climate was not a confounder of the association found between job group and presenteeism.

The risk of presenteeism was also found to be increased among workers reporting higher procedural justice, which is a new finding, to our knowledge. Our results appear, however, to be consistent with studies showing lower sickness absence among workers reporting higher levels of justice at work[37, 38]. It seems likely that, in workplaces where there are established and acknowledged norms and procedures to carry out tasks, people with LBP are more prone to go to work despite pain because they feel more protected from the eventuality of being exposed to excessive physical strain during the workday.

Among ergonomic exposures, stooping for a long time was associated with a decreased risk of presenteeism, indicating that workers affected by LBP may be less willing to go work if they are exposed to postures posing a strain on the back. Although no studies investigated the relationship between exposure to ergonomic factors at work and presenteeism, an increased risk of sickness absence associated to uncomfortable postures has been reported[39], which is consistent with our results. However, these authors found that sickness absence was also increased by frequent lifting, whereas in the present study no relationship was found with other ergonomic factors and in particular with lifting of heavy loads.

Presenteeism was not significantly influenced by either work to family conflict or family to work conflict, in contrast with the results of two studies reporting a significant association between work-family conflict and presenteeism[9, 40]. Further research seems to be needed to clarify this relationship.

No other sociodemographic or employment-related characteristic was associated with presenteeism, possibly because of the relatively low statistical power of the study. This appears true in particular for the level of interference of LBP with daily activities, whose association with presenteeism was statistically significant in the univariate analysis and whose significance was lost after controlling for other covariates, although it remained marginally significant.

Among other limitations of the study, the self-reported information on presenteeism may have been characterized by low accuracy, although high one-year test-retest reliability was reported by a study on nurses that used the same definition of presenteeism as employed in the present study[6].

Moreover, the cross-sectional design of the study does not permit inference that the observed associations between exposure to workplace factors and presenteeism represent causal relationships, nor can it establish their direction. In particular, it cannot be excluded that workers may improve their quality of relationships in the workplace by displaying a presenteeism behavior, whereas it does not seem plausible that presenteeism would cause an increase in procedural justice and a decrease in prolonged stooping.

Lastly, our LBP definition was essentially based on information provided by the workers and not on a clinical evaluation; this feature, in spite of our efforts to include only LBP cases characterized by more severe symptoms, may have involved a certain degree of heterogeneity in the severity of LBP cases and a consequent overestimation of presenteeism prevalence.

In conclusion, a high prevalence of presenteeism was observed in this sample of nursing staff, and the prevalence was particularly elevated among registered nurses. No sociodemographic characteristic was found to be associated with presenteeism, which was instead influenced by organizational and ergonomic factors in the workplace. Nurses should be the target of educational programs aimed at informing them about the possible health consequences of presenteeism, in order to reduce it.

Acknowledgments: This research was supported by the Grant number 2348/2007 from the Piedmont Region.

References

1) Aronsson G, Gustafsson K, Dallner M. Sick but yet at work. An empirical study of sickness presenteeism. J Epidemiol Community Health 2000; 54: 502–9.
2) Aronsson G, Gustafsson K. Sickness presenteeism: prevalence, attendance-pressure factors, and an outline of a model for research. J Occup Environ Med 2005; 47: 958–66.
3) Hemp P. Presenteeism: at work—but out of it. Harv Bus Rev 2004: 1–9.
4) Kivimäki M, Head J, Ferrie JE, et al. Working while ill as a risk factor for serious coronary events: the Whitehall II study. Am J Public Health 2005; 95: 98–102.
5) Bergström G, Bodin L, Hagberg J, Lindh T, Aronsson G, Josephson M. Does sickness presenteeism have an impact on future general health? Int Arch Occup Environ Health 2009; 82: 1179–90.
6) Demerouti E, Le Blanc PM, Bakker AB, Schaufeli WB, Hox J. Present but sick: a three-wave study on job demands, presenteeism and burnout. Career Dev Int 2009; 14: 50–68.
7) Claes R. Employee correlates of sickness presence: a study across four European countries. Work Stress 2011; 25: 224–42.
8) Grinyer A, Singleton V. Sickness absence as risk-taking behaviour: a study of organisational and cultural factors in the public sector. Health Risk Soc

2000; 2: 7–21.
9) Johns G. Attendance dynamics at work: the antecedents and correlates of presenteeism, absenteeism, and productivity loss. J Occup Health Psychol 2011; 16: 483–500.
10) Marlowe J. Depressions surprising toll on worker productivity. Employee Benefit J 2002; 27: 16–21.
11) Schultz AB, Edington DW. Employee health and presenteeism: a systematic review. J Occup Rehabil 2007; 17: 547–79.
12) Failde I, Gonzalez JL, Novalbos JP, Casais F, Marín J, Elorza J. Psychological and occupational predictive factors for back pain among employees of a university hospital in southern Spain. Occup Med (Lond) 2000; 50: 591–6.
13) Eriksen W. The prevalence of musculoskeletal pain in Norwegian nurses' aides. Int Arch Occup Environ Health 2003; 76: 625–30.
14) Violante FS, Fiori M, Fiorentini C, et al. Associations of psychosocial and individual factors with three different categories of back disorder among nursing staff. J Occup Health 2004; 46: 100–8.
15) Elstad JI, Vabø M. Job stress, sickness absence and sickness presenteeism in Nordic elderly care. Scand J Public Health 2008; 36: 467–74.
16) Lerner D, Rogers WH, Chang H. Scoring the Work Limitations Questionnaire (WLQ) scales and the WLQ index for estimating work productivity loss. Technical Report. Boston (MA): The Health Institute, Tufts—New England Medical Center; 2003.
17) Martinez LF, Ferreira AI. Sick at work: presenteeism among Nurses in a Portuguese Public Hospital. Stress Health 2011. (doi: 10.1002/smi.1432).
18) Ricci MG, Menoni O, Colombini D, Occhipinti E. Clinical studies in health workers employed in the manual lifting of patients: methods for the examination of spinal lesions. Med Lav 1999; 90: 173–90 (in Italian).
19) Dickinson CE, Campion K, Foster AF, Newman SJ, O'Rourke AM, Thomas PG. Questionnaire development: an examination of the Nordic musculoskeletal questionnaire. Appl Ergon 1992; 23: 197–201.
20) Moorman RH. Relationship between organizational justice and organizational citizenship behaviors: Do fairness perceptions influence employee citizenship? J Appl Psychol 1991; 76: 845–55.
21) McAllister DJ. Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations. Acad Manage J 1995; 38: 24–59.
22) Francis D, Young D. Improving Work Groups: A Practical Manual for Team Building. La Jolla (CA): University Associates; 1979. p.261.
23) Netemeyer RG, Boles JS, McMurrian R. Development and validation of work-family conflict and work-family conflict scales. J Appl Psychol 1996; 81: 400–10.
24) Avallone F, Paplomatas A. Organizational health. Psychology of well-being in work contexts. Milano: Raffaello Cortina Editore, 2005 (in Italian).
25) Sirigatti S, Stefanile C. Italian Adaptation of MBI – Maslach Burnout Inventory. Firenze (Italy): Organizzazioni Speciali; 1993 (in Italian).
26) Maslach C, Jackson SE. The measurement of experienced burnout. J Occup Behav 1981; 2: 99–113.
27) Hildebrandt VH, Bongers PM, van Dijk FJ, Kemper HC, Dul J. Dutch Musculoskeletal Questionnaire: description and basic qualities. Ergonomics 2001; 44: 1038–55.
28) Barros AJ, Hirakata VN. Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. BMC Med Res Methodol 2003; 3: 21.
29) Hosmer DW, Lemeshow S. Applied logistic regression. 2nd ed. New York: John Wiley & Sons; 2000.
30) Hansen CD, Andersen JH. Going ill to work—what personal circumstances, attitudes and work-related factors are associated with sickness presenteeism? Soc Sci Med 2008; 67: 956–64.
31) Johansson G, Lundberg I. Adjustment latitude and attendance requirements as determinants of sickness absence or attendance. Empirical tests of the illness flexibility model. Soc Sci Med 2004; 58: 1857–68.
32) Johns G. Presenteeism in the workplace: a review and research agenda. J Organiz Behav 2010; 31: 519–42.
33) Kalisch BJ, Lee H, Rochman M. Nursing staff teamwork and job satisfaction. J Nurs Manag 2010; 18: 938–47.
34) Rugulies R, Christensen KB, Borritz M, Villadsen E, Bültmann U, Kristensen TS. The contribution of the psychosocial work environment to sickness absence in human service workers: Results of a 3-year follow-up study. Work Stress 2007; 21: 293–311.
35) Virtanen M, Kivimaki M, Elovainio M, Vahtera J, Cooper C. Contingent employment, health and sickness absence. Scand J Work Environ Health 2002; 27: 365–72.
36) Dew K, Keefe V, Small K. 'Choosing' to work when sick: workplace presenteeism. Soc Sci Med 2005; 60: 2273–82.
37) Duijts SF, Kant I, Swaen GM, van den Brandt PA, Zeegers MP. A meta-analysis of observational studies identifies predictors of sickness absence. J Clin Epidemiol 2007; 60: 1105–15.
38) Ybema JF, van den Bos K. Effects of organizational justice on depressive symptoms and sickness absence: a longitudinal perspective. Soc Sci Med 2010; 70: 1609–17.
39) Labriola M, Lund T, Burr H. Prospective study of physical and psychosocial risk factors for sickness absence. Occup Med (Lond) 2006; 56: 469–74.
40) Camerino D, Sandri M, Sartori S, Conway PM, Campanini P, Costa G. Shiftwork, work-family conflict among Italian nurses, and prevention efficacy. Chronobiol Int 2010; 27: 1105–23.