Associations of self estimated workloads with musculoskeletal symptoms among hospital nurses

Shoko Ando, Yuichiro Ono, Midori Shimaoka, Shuichi Hiruta, Yoji Hattori, Fumiko Hori, Yasuhiro Takeuchi

Abstract

Objectives—To investigate the prevalence of neck, shoulder, and arm pain (NSAP) as well as low back pain (LBP) among hospital nurses, and to examine the association of work tasks and self estimated risk factors with NSAP and LBP.

Methods—A cross sectional study was carried out in a national university hospital in Japan. Full time registered nurses in the wards (n=314) were selected for analysis. The questionnaire was composed of items on demographic conditions, severity of workloads in actual tasks, self estimated risk factors for fatigue, and musculoskeletal pain in the previous month. Rate ratios (RRs) and 95% confidence intervals (95% CIs) were calculated by the Cox’s proportional hazards model to study the association of pain with variables related to work and demographic conditions.

Results—The prevalences of low back, shoulder, neck, and arm pain in the previous month were 54.7%, 42.8%, 31.3%, and 18.6%, respectively. The prevalence of musculoskeletal symptoms among hospital nurses was higher than in previous studies. In the Cox’s models for LBP and NSAP, there were no significant associations between musculoskeletal pain and the items related to work and demographic conditions. The RRs for LBP tended to be relatively higher for “accepting emergency patients” and some actual tasks. Some items of self estimated risk factors for fatigue tended to have relatively higher RRs for LBP and NSAP.

Conclusions—It was suggested that musculoskeletal pain among hospital nurses may have associations with some actual tasks and items related to work postures, work control, and work organisation. Further studies, however, are necessary, as clear evidence of this potential association was not shown in the study.

Keywords: workloads; musculoskeletal pain; nurses

Work related musculoskeletal disorders have been described as one of the main health problems among healthcare workers. A higher prevalence of low back pain (LBP) has often been shown among healthcare workers, particularly compared with other hospital and industrial workers. Most studies have focused on LBP among healthcare workers, but there are few studies on occupational cervicobrachial disorders or neck, shoulder, and arm pain (NSAP). Handling patients may cause not only LBP but also NSAP as it potentially exerts an excessive burden on the neck, shoulders, and arms.

Work related musculoskeletal disorders among nurses have been reported to have associations with tasks involved in handling patients, in particular lifting patients, and have been studied from both the physical and ergonomic viewpoints. Optimum patient handling skills have also been developed and proposed for the safety of both nurses and patients. Harber et al suggested that work related LBP is not associated only with transferring patients, and tasks other than patient handling are also considered to be hazardous to musculoskeletal systems, so the necessity of comprehensive task analysis has been emphasised. There are, however, few studies which have surveyed actual workloads and reported the associations between tasks and work related musculoskeletal disorders.

Thus, in the present study the prevalence of NSAP and LBP was investigated among hospital nurses. The purpose of this study was to analyse the association between NSAP and LBP and self estimated workloads, and to assess the actual tasks which have strong relations with musculoskeletal symptoms. If the tasks associated with NSAP or LBP could be detected, it would facilitate the planning of efficient and effective preventive strategies by allowing a focus on the main contributing tasks.

Subjects and methods

Subjects

This study was carried out in a national university hospital in Nagoya, Japan. There were 523 nurses and 806 beds in the 19 clinical wards of the hospital. Questionnaires were distributed to 508 eligible nurses after excluding those on leave (maternity, child care, or sick). The authors explained the purpose and contents of the questionnaire to the subjects beforehand, and asked their consent to participate in the study. Most of the nurses who returned the questionnaire (n=457, 90.0%) were women (n=448). Their mean (SD) age
Table 1  Demographic items for registered nurses (n=314)

<table>
<thead>
<tr>
<th>Demographic items</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>29.5 (8.5)</td>
</tr>
<tr>
<td>Duration of employment in present ward (y)</td>
<td>1.8 (3.0)</td>
</tr>
<tr>
<td>Cumulative duration of professional career (y)</td>
<td>7.7 (8.1)</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>156.5 (5.3)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>50.1 (5.9)</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>20.5 (2.2)</td>
</tr>
</tbody>
</table>

Table 2  Workplace and some personal characteristics of registered nurses (n=314)

<table>
<thead>
<tr>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workplaces:</td>
</tr>
<tr>
<td>Internal medical wards</td>
</tr>
<tr>
<td>Surgical wards</td>
</tr>
<tr>
<td>Occupation:</td>
</tr>
<tr>
<td>Head nurses</td>
</tr>
<tr>
<td>Supervisors</td>
</tr>
<tr>
<td>Staff nurses</td>
</tr>
<tr>
<td>Married</td>
</tr>
<tr>
<td>Have children</td>
</tr>
</tbody>
</table>

Table 3  Association of low back pain and neck/shoulder/arm pain with demographic variables in ward nurses (n=314)

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>Independent variables</th>
<th>RR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low back pain</td>
<td>Workplace*</td>
<td>1.08</td>
<td>0.85 to 1.36</td>
</tr>
<tr>
<td></td>
<td>Duration of employment in present ward (y)</td>
<td>0.99</td>
<td>0.96 to 1.03</td>
</tr>
<tr>
<td></td>
<td>Age (y)</td>
<td>0.98</td>
<td>0.82 to 1.18</td>
</tr>
<tr>
<td></td>
<td>Height (cm)</td>
<td>1.07</td>
<td>0.86 to 1.33</td>
</tr>
<tr>
<td></td>
<td>BMI (kg/m²)</td>
<td>1.02</td>
<td>0.97 to 1.07</td>
</tr>
<tr>
<td></td>
<td>Marital status†</td>
<td>1.10</td>
<td>0.80 to 1.50</td>
</tr>
</tbody>
</table>

Neck, shoulder, or arm pain

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>Independent variables</th>
<th>RR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Workplace*</td>
<td>1.04</td>
<td>0.82 to 1.3</td>
</tr>
<tr>
<td></td>
<td>Duration of employment in present ward (y)</td>
<td>0.99</td>
<td>0.96 to 1.03</td>
</tr>
<tr>
<td></td>
<td>Age (y)</td>
<td>0.97</td>
<td>0.81 to 1.16</td>
</tr>
<tr>
<td></td>
<td>Height (cm)</td>
<td>0.96</td>
<td>0.77 to 1.20</td>
</tr>
<tr>
<td></td>
<td>BMI (kg/m²)</td>
<td>1.02</td>
<td>0.96 to 1.07</td>
</tr>
<tr>
<td></td>
<td>Marital status†</td>
<td>1.10</td>
<td>0.80 to 1.51</td>
</tr>
</tbody>
</table>

RRs (95% CIs) were calculated by the Cox’s model. RRs were calculated by postulating the differences of 10 years for age and 10 cm for height.

*Workplace: 0=internal medical wards, 1=surgical wards.
†Marital state: 0=unmarried, 1=married.

was 31.6 (10.3) years with a mean (SD) cumulative professional career of 9.1 (9.2) years.

Nursing tasks varied according to where the respondents worked—such as the type of ward, and in working in operating rooms, intensive care units, or outpatient units. It also varied with qualifications. There are few nursing assistants in large general hospitals in Japan. The proportion of assistants among nursing workers in the present hospital was <5%. Nurses usually performed patient handling tasks. In this study, we wanted to focus on actual tasks which ward nurses performed for patients in hospital, and the association of those workloads with NSAP or LBP. Thus, full time registered nurses in the wards (n=314) were selected for analysis. Their mean (SD) age was 29.5 (8.5) years with a mean (SD) cumulative professional career of 7.7 (8.1) years (table 1).

**Questionnaires**

A cross sectional study was carried out in July 1994. A questionnaire developed by the authors was given to the subjects and collected 2 weeks later. The questionnaire included items on demographic conditions, severity of workloads in the actual tasks performed, self estimated risk factors for fatigue, and musculoskeletal symptoms present in the previous month.

Demographic items were workplace, age, duration of employment in the present ward, cumulative duration of professional career as a nurse, height and weight, body mass index (BMI), occupational status, marital status, and number of children (tables 1, 2 and 3). The workplaces were classified into surgical wards for operative treatment and internal medical wards for chemotherapy and radiation. Respondents were grouped by occupational status into head nurses or supervisors, and staff nurses. The questionnaire included questions on complaints about 17 actual tasks, not all of which involved handling patients (table 4). The self estimated severity of workloads in actual tasks was categorised into (a) heavy, (b) moderate, (c) light, and (d) no such tasks. Then, categories for (a) heavy and (b) moderate were combined into one for the analysis. Twenty four self estimated risk factors for fatigue were grouped into four dimensions after varimax rotation by factor analysis (table 5). The first factor (factor 1) consisted of nine items suggesting work organisation. Factor 2 consisted of eight items related to work control. Factor 3 was the factor constructed of four items suggesting work postures. Factor 4 was composed of three items suggesting condition of the patients. Each item was dichotomised as either a possible cause or not (table 6). Musculoskeletal symptoms that subjects had had in the previous month included pains in the neck, shoulders, arms, and low back. The severity of the pains was ranked into three grades; continuous if the subject had a pain often or almost every day; occasional if she experienced pain occasionally at least two or three times during the previous month; and seldom or painless. Respondents were asked to select one of the three categories. Subjects with continuous or occasional pain were classified as having pain, whereas those with infrequent or no pain at all were classified as having no pain.

**Data Analysis**

Rate ratios (RRs) and 95% confidence intervals (95% CIs) were calculated by the Cox’s proportional hazards model to study the association between LBP and demographic items (workplace, age, duration of employment in present ward, height, BMI, and marital status). The cumulative duration of a nurse’s professional career and occupational status were omitted from the model to avoid multicollinearity, because those items had a high correlation with age (r=0.98, p<0.0001), (r=0.68, p<0.0001), respectively. Similarly, the number of children was also omitted from the model as it had a high correlation with marital status (r=0.68, p<0.0001). Additionally, weight was omitted from the model, as it had a high correlation with BMI (r=0.82, p<0.0001).

The associations between LBP and NSAP and actual tasks were studied by the Cox’s models controlling for workplace, age, duration of employment in present ward, height, BMI, and marital status. The Cox’s models were also applied to study the associations of LBP and NSAP with self estimated risk factors for fatigue. In this study, significance was indicated...
Self estimated workloads and musculoskeletal symptoms among hospital nurses

Results

The prevalences of pain in the low back, shoulder, neck, and arm in the previous month were 54.7%, 42.8%, 31.3%, and 18.6%, respectively. In the Cox's models, LBP and NSAP had no significant associations with demographic variables (table 3). There were also no significant associations between musculoskeletal pains and actual tasks or self estimated risk factors for fatigue in the workplace by factor analysis with varimax rotation.

Table 4 Association of low back pain and neck, shoulder, or arm pain with complaints of actual tasks (n=314)

<table>
<thead>
<tr>
<th>Independent variables (actual tasks)</th>
<th>Responses</th>
<th>Low back pain RR (95% CI)</th>
<th>Neck/shoulder/arm pain RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accepting emergency patient</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transferring patient</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moving beds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helping patient to bathe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helping patient to shampoo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changing incontinence pads</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repositioning patient in bed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bed bath</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Care of patient with serious disabilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taking patient to an operation room and receiving</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feeding bedridden patient</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undressing patient</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treating a dead body</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sending patient to an exam and receiving</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Making bed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helping incoming or discharged patient</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RRs (95% CIs) were calculated by the Cox’s model by controlling for workplaces, duration of employment in present ward, age, height, BMI, and marital state.

Discussion

The prevalences of LBP (54.7%) in the previous month was the highest in the four body regions neck, shoulders, arms, and low back. These

Table 5 Factor pattern of self estimated risk factors for fatigue in the workplace by factor analysis with varimax rotation (n=314)

<table>
<thead>
<tr>
<th>Factor loading</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Factor 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequent bending forward or half sitting</td>
<td>0.182</td>
<td>0.124</td>
<td>0.688</td>
<td>0.090</td>
</tr>
<tr>
<td>Much static work posture</td>
<td>0.155</td>
<td>0.033</td>
<td>0.742</td>
<td>0.138</td>
</tr>
<tr>
<td>Frequent lifting and handling of objects</td>
<td>0.034</td>
<td>0.179</td>
<td>0.729</td>
<td>0.172</td>
</tr>
<tr>
<td>Frequent repetitive work with shoulders, arms, hands, or fingers</td>
<td>0.349</td>
<td>0.151</td>
<td>0.474</td>
<td>0.134</td>
</tr>
<tr>
<td>Much unplanned work</td>
<td>0.159</td>
<td>0.371</td>
<td>0.307</td>
<td>0.342</td>
</tr>
<tr>
<td>Difficulties in lowering work load at reduced working capacity</td>
<td>0.325</td>
<td>0.417</td>
<td>0.241</td>
<td>0.313</td>
</tr>
<tr>
<td>Too many different tasks</td>
<td>0.116</td>
<td>0.484</td>
<td>0.276</td>
<td>0.264</td>
</tr>
<tr>
<td>Too much responsibility</td>
<td>0.193</td>
<td>0.703</td>
<td>0.132</td>
<td>0.161</td>
</tr>
<tr>
<td>Too much work</td>
<td>0.175</td>
<td>0.591</td>
<td>0.386</td>
<td>0.390</td>
</tr>
<tr>
<td>Shortage of staff</td>
<td>0.239</td>
<td>0.353</td>
<td>0.145</td>
<td>0.338</td>
</tr>
<tr>
<td>Great time pressure</td>
<td>0.154</td>
<td>0.665</td>
<td>0.083</td>
<td>0.251</td>
</tr>
<tr>
<td>Much concentration required</td>
<td>0.248</td>
<td>0.549</td>
<td>0.030</td>
<td>0.009</td>
</tr>
<tr>
<td>Extra work due to poor physical condition of colleagues</td>
<td>0.423</td>
<td>0.219</td>
<td>0.155</td>
<td>0.121</td>
</tr>
<tr>
<td>Work after sick leave, maternity leave, and childcare leave</td>
<td>0.598</td>
<td>0.085</td>
<td>0.204</td>
<td>0.307</td>
</tr>
<tr>
<td>Difficulties in acting on one’s own ideas</td>
<td>0.728</td>
<td>0.229</td>
<td>0.100</td>
<td>0.135</td>
</tr>
<tr>
<td>Difficult human relations at work</td>
<td>0.612</td>
<td>0.301</td>
<td>0.189</td>
<td>0.083</td>
</tr>
<tr>
<td>Lack of frank discussion about work problems</td>
<td>0.752</td>
<td>0.282</td>
<td>0.031</td>
<td>0.022</td>
</tr>
<tr>
<td>Responsibilities other than tasks at work</td>
<td>0.475</td>
<td>0.199</td>
<td>0.083</td>
<td>0.286</td>
</tr>
<tr>
<td>Ambiguity in the workplace</td>
<td>0.828</td>
<td>0.051</td>
<td>0.197</td>
<td>0.114</td>
</tr>
<tr>
<td>Inexperienced in handling tasks</td>
<td>0.496</td>
<td>0.074</td>
<td>0.077</td>
<td>0.178</td>
</tr>
<tr>
<td>Many admissions and discharges</td>
<td>0.452</td>
<td>0.229</td>
<td>0.137</td>
<td>0.367</td>
</tr>
<tr>
<td>Many patients with serious disabilities</td>
<td>0.205</td>
<td>0.371</td>
<td>0.292</td>
<td>0.0684</td>
</tr>
<tr>
<td>Many patients with a sudden change in condition</td>
<td>0.283</td>
<td>0.328</td>
<td>0.207</td>
<td>0.755</td>
</tr>
<tr>
<td>Many admissions with emergencies</td>
<td>0.517</td>
<td>0.152</td>
<td>0.152</td>
<td>0.579</td>
</tr>
</tbody>
</table>
Table 6  Association of low back pain and neck, shoulder, or arm pain with self estimated risk factors for fatigue in the workplace (n=314)

<table>
<thead>
<tr>
<th>Factors</th>
<th>Independent variables (self estimated risk factors for fatigue)</th>
<th>Yes</th>
<th>No</th>
<th>Low back pain RR (95% CI)</th>
<th>Neck, shoulder, or arm pain RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work postures</td>
<td>Frequent bending forward or half sitting</td>
<td>238</td>
<td>66</td>
<td>1.29 (0.97 to 1.70)</td>
<td>1.08 (0.82 to 1.43)</td>
</tr>
<tr>
<td></td>
<td>Much static work posture</td>
<td>220</td>
<td>81</td>
<td>1.20 (0.93 to 1.55)</td>
<td>1.08 (0.83 to 1.40)</td>
</tr>
<tr>
<td></td>
<td>Frequent lifting and handling of objects</td>
<td>58</td>
<td></td>
<td>1.16 (0.74 to 1.85)</td>
<td>1.00 (0.79 to 1.27)</td>
</tr>
<tr>
<td></td>
<td>Frequent repetitive work using shoulders, arms, hands or fingers</td>
<td>146</td>
<td>129</td>
<td>1.10 (0.86 to 1.43)</td>
<td>1.09 (0.86 to 1.37)</td>
</tr>
<tr>
<td>Work control</td>
<td>Much unplanned work</td>
<td>243</td>
<td>64</td>
<td>1.17 (0.88 to 1.55)</td>
<td>1.04 (0.78 to 1.36)</td>
</tr>
<tr>
<td></td>
<td>Difficulties in lowering work load at reduced working capacity</td>
<td>233</td>
<td>73</td>
<td>1.14 (0.87 to 1.50)</td>
<td>1.02 (0.78 to 1.34)</td>
</tr>
<tr>
<td></td>
<td>Too many different tasks</td>
<td>217</td>
<td>88</td>
<td>1.11 (0.86 to 1.43)</td>
<td>0.99 (0.77 to 1.28)</td>
</tr>
<tr>
<td></td>
<td>Too much responsibility</td>
<td>253</td>
<td>54</td>
<td>1.11 (0.82 to 1.50)</td>
<td>0.91 (0.67 to 1.23)</td>
</tr>
<tr>
<td></td>
<td>Too much work</td>
<td>225</td>
<td>80</td>
<td>1.11 (0.85 to 1.44)</td>
<td>0.95 (0.73 to 1.24)</td>
</tr>
<tr>
<td></td>
<td>Shortage of staff</td>
<td>245</td>
<td>61</td>
<td>1.06 (0.79 to 1.41)</td>
<td>1.07 (0.80 to 1.43)</td>
</tr>
<tr>
<td></td>
<td>Great time pressure</td>
<td>252</td>
<td>54</td>
<td>1.05 (0.78 to 1.42)</td>
<td>0.93 (0.69 to 1.25)</td>
</tr>
<tr>
<td></td>
<td>Much concentration required</td>
<td>277</td>
<td>32</td>
<td>0.92 (0.63 to 1.34)</td>
<td>0.87 (0.60 to 1.28)</td>
</tr>
<tr>
<td>Work organisation</td>
<td>Extra work due to poor physical condition of colleagues</td>
<td>136</td>
<td>168</td>
<td>1.14 (0.90 to 1.44)</td>
<td>1.12 (0.89 to 1.42)</td>
</tr>
<tr>
<td></td>
<td>Work after sick leave, maternity leave, and childcare leave</td>
<td>133</td>
<td>117</td>
<td>1.04 (0.80 to 1.35)</td>
<td>0.98 (0.76 to 1.27)</td>
</tr>
<tr>
<td></td>
<td>Difficulties in acting on one’s own ideas</td>
<td>164</td>
<td>140</td>
<td>1.03 (0.82 to 1.30)</td>
<td>1.05 (0.83 to 1.32)</td>
</tr>
<tr>
<td></td>
<td>Difficult human relations at work</td>
<td>171</td>
<td>132</td>
<td>1.01 (0.80 to 1.27)</td>
<td>0.99 (0.78 to 1.25)</td>
</tr>
<tr>
<td></td>
<td>Lack of frank discussion about work problems</td>
<td>166</td>
<td>136</td>
<td>1.02 (0.81 to 1.29)</td>
<td>1.00 (0.79 to 1.26)</td>
</tr>
<tr>
<td></td>
<td>Responsibilities other than tasks at work</td>
<td>157</td>
<td>128</td>
<td>1.00 (0.79 to 1.27)</td>
<td>1.05 (0.83 to 1.33)</td>
</tr>
<tr>
<td></td>
<td>Role ambiguity in the workplace</td>
<td>143</td>
<td>162</td>
<td>0.97 (0.77 to 1.22)</td>
<td>1.02 (0.80 to 1.28)</td>
</tr>
<tr>
<td></td>
<td>Inexperienced in handling tasks</td>
<td>195</td>
<td>112</td>
<td>0.89 (0.69 to 1.15)</td>
<td>0.94 (0.73 to 1.21)</td>
</tr>
<tr>
<td></td>
<td>Many admissions and discharges</td>
<td>164</td>
<td>138</td>
<td>0.89 (0.70 to 1.12)</td>
<td>1.02 (0.81 to 1.28)</td>
</tr>
<tr>
<td>Patient conditions</td>
<td>Many patients with serious disabilities</td>
<td>205</td>
<td>95</td>
<td>1.11 (0.87 to 1.42)</td>
<td>0.98 (0.76 to 1.25)</td>
</tr>
<tr>
<td></td>
<td>Many patients with a sudden change in condition</td>
<td>181</td>
<td>111</td>
<td>1.09 (0.85 to 1.38)</td>
<td>0.99 (0.77 to 1.25)</td>
</tr>
<tr>
<td></td>
<td>Many admissions with emergencies</td>
<td>159</td>
<td>129</td>
<td>1.02 (0.81 to 1.30)</td>
<td>1.02 (0.80 to 1.29)</td>
</tr>
</tbody>
</table>

RRs (95% CIs) were calculated by the Cox’s model by controlling for workplace, duration of employment in present ward, age, height, BMI, and marital state.

were also higher than in some other studies.5 24 39 40 49 Stubbs et al found that the annual prevalence of LBP among nurses was about 45% in England and Wales.7 Investigators in northern European countries have found prevalences of LBP of 40%–50%.5 39 40 Larese et al reported that 48% of the nursing staff of an urban general hospital in Italy had back pain related to work in the previous year.44 In our study, the prevalence of shoulder pain was 42.8%, which ranked second after LBP, followed by neck pain (31.3%), and arm pain (18.6%). These prevalences were higher than those in a study on nursing homes in The Netherlands by Engels et al, where the percentages of nurses with complaints about the neck, shoulders or upper arms and elbows or forearms were 27%, 22%, and 3%, respectively.7 Lagerström et al surveyed 821 hospital nurses in Sweden, with prevalences of self reported ongoing musculoskeletal symptoms in the neck, shoulders, low back, hands, and knees of 48%, 53%, 56%, 22%, and 30%, respectively.19 The prevalences in their study, however, are not comparable with ours, as they included diverse musculoskeletal symptoms other than pain. Direct comparisons between those studies are difficult as different populations were examined with various methods. Our study, however, suggests that the prevalence of musculoskeletal symptoms among hospital nurses in this survey might be higher than in most previous reports.

**Potential Risk Factors**

**Demographic items**

In the study sample, there were no significant associations between musculoskeletal symptoms and the demographic items of workplace, age, duration of employment in present ward, height, BMI, and marital status. This agrees with a prospective study by Mostardi et al, which found that variables related to strength and demographics were poor predictors of back injury among female nurses.32 Other studies have also reported poor associations between demographic items and musculoskeletal symptoms.15 41 However, other studies reported the opposite, with significant associations between them.42–44 Thus, further studies need to be carried out after reviewing these conflicting results and analysing the reasons for the disparities.

**Actual tasks**

Although no significant associations were found between musculoskeletal pain and actual tasks, some tasks such as accepting emergency patients, transferring patients, moving beds, helping patients to bathe, and helping patients to shampoo had relatively higher RRs for many tasks. There are few studies reporting an association between LBP and accepting emergency patients. Bongers et al, however, suggested a relation between time pressure and the musculoskeletal symptoms of workers.45 They postulated that time pressure may increase the number of hurried movements with quick accelerations or poor postures, thereby intensifying the mechanical load on workers. In accepting emergency patients, immediate treatment and resulting demands on quick responses from nurses in sending patients to operating or examination rooms often force them to assume unnatural postures.

In several studies, transferring patients has been reported to be associated with LBP.4 30 31 43 46–49 Owen et al showed that transferring patients from an origin to a destination was ranked the most stressful task among nursing assistants.9 To reduce the stress on the nurse’s back, Garg et al tried biomechanical and ergonomic evaluations of manual handling techniques and mechanical hoists for transferring patients.42 31 However, mechanical hoists for transferring patients are not broadly available in general hospitals in Japan, perhaps due to the long operating time and cost of the hoists. Although many researchers have reported an association between LBP and tasks...
Self estimated workloads and musculoskeletal symptoms among hospital nurses

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Thus, the suggestion about lifting (regarded as a risk factor for back problems) and other physical postures, such as forward, or half sitting postures, and asymmetric lifting (regarded as a risk factor for back disorders). Hence, the relation between independent and dependent variables may be subject to the general dissatisfaction of workers or their readiness to report complaints, which might have led to an overestimation of the effects of tasks and risk factors for pain.

LIMITATIONS

Some items related to work control, including unplanned work and difficulties in lowering workloads at reduced working capacity, tended to have relatively higher RRs for LBP. As nurses in hospital wards often have much unplanned work, as something unexpected may happen suddenly with any of the patients, controlling the amount of work is difficult. Even if nurses are not in very good physical condition, they are likely to have relatively higher RRs for LBP or NSAP. Work posture and LBP in this study may be influenced by the stress due to difficulties in controlling the amount of the work, regardless of the nurse’s physical condition.

Work organisation

The item extra work due to poor physical condition of colleagues tended to have relatively higher RRs for LBP or NSAP. If some nurses are in poor physical condition or suddenly absent on sick leave, their colleagues have to work harder to take care of all the team tasks with a reduced number of workers. Then, the patient care procedures must be done more hurriedly by nurses on the reduced staff. Nurses therefore often have no choice but to work despite their poor physical condition, as they are afraid of intensifying the workload of their colleagues by their absence.