Are changes in objective working hour characteristics associated with changes in work-life conflict among hospital employees working shifts? A 7-year follow-up

Kati Karhula, Aki Koskinen, Anneli Ojajärvi, Annina Ropponen, Sampsa Puttonen, Mika Kivimäki, Mikko Härmä

ABSTRACT
Objective To investigate whether changes in objective working hour characteristics are associated with parallel changes in work-life conflict (WLC) among hospital employees.
Methods Survey responses from three waves of the Finnish Public Sector study (2008, 2012 and 2015) were combined with payroll data from 91 days preceding the surveys (n=2 482, 93% women). Time-dependent fixed effects regression models adjusted for marital status, number of children and stressfulness of the life situation were used to investigate whether changes in working hour characteristics were associated with parallel change in WLC. The working hour characteristics were dichotomised with cut-points in less than or greater than 10% or less than or greater than 25% occurrence) and WLC to frequent versus seldom/none.
Results Change in proportion of evening and night shifts and weekend work was significantly associated with parallel change in WLC (adjusted OR 2.19, 95% CI 1.62 to 2.96; OR 1.71, 95% CI 1.21 to 2.44; OR 1.63, 95% CI 1.194 to 2.22, respectively). Similarly, increase or decrease in proportion of quick returns (adjusted OR 1.45, 95% CI 1.10 to 1.89) and long work weeks (adjusted OR 1.26, 95% CI 1.04 to 1.52) was associated with parallel increase or decrease in WLC. Single days off and very long work weeks showed no association with WLC.
Conclusions Changes in unsocial working hour characteristics, especially in connection with evening shifts, are consistently associated with parallel changes in WLC.

INTRODUCTION
In the 24/7 society, a strong need exists to facilitate combining work and life. As the number of women, dual-earner couples and single parents in the workforce will continue to increase, the relevance of work-life balance will also increase. European Agency for Safety and Health at Work Research has classified work-life conflict (WLC) as one of the most emerging psychosocial risk factors and highlights its negative consequences for the workforce.1

Mutually incompatible demands from the work and non-work domains are common in today’s work life and can lead to WLC.2 In general, WLC is more common among women than men,3 and the prevalence of WLC is higher among full-time than part-time workers.4 WLC has substantial consequences for employees, their family members and employers affecting well-being, productivity and costs. WLC is associated with negative consequences such as job strain, sleep complaints, depressive symptoms5,6 and increased sickness absence.7

In large-scale studies, the occurrence of WLC has consistently been higher among shift workers than among day workers.8,9 Nearly every third employee in rotating schedules reported poor work-life balance in the recent European Working Conditions Survey, compared with 16% of day workers.10 Among healthcare professionals, the occurrence of WLC has been remarkably high, ranging from one-third to up to or over 50%.11,12

There is a paucity of studies investigating the associations between different working time regimens and WLC. Most of the earlier studies excluded shift workers, and those among shift workers have mostly been cross-sectional.12,13,14

A prospective study indicated that a forward-rotating schedule was related to less work-family conflict and better sleep quality than backward-rotating schedule.15 An Australian study16 with a...
series of 2-year follow-ups showed that longer working hours distinguished those with a chronic work-family conflict from those whose WLC diminished. Additionally, employment in a high-status occupation has been associated with chronic work-family conflict in both genders. In a 4-year follow-up among physicians, on-call duties were associated with higher levels of work interference with family.22

To date, the majority of the studies have lacked objective data of working hours and have been based on self-reports to assess exposure to different aspects of working hours. Survey data can bias the assessment of shift work especially among shift workers without night shifts. Furthermore, the earlier studies of shift work and WLC have had other methodological problems, for example, homogenous populations, lack of or a short follow-up time, low overall or follow-up response rate and little adjustment for confounders. To tackle these earlier methodological challenges, this study had the unique opportunity to use a large cohort data with objective payroll data on working times and accounted for multiple confounders.

Unsocial working hour characteristics refer to long or non-standard working hour characteristics, that is, working at socially valuable times of the day and week and having time off during socially less valuable times. In a previous cross-sectional study, we found an increased likelihood of WLC in association with several unsocial working hour characteristics. With this follow-up data, we aimed to investigate whether changes in unsocial working hour characteristics (long weekly working hours, evening and night work, quick returns, single days off and weekend work) would result into parallel changes in WLC.

METHODS
Study sample
This study is part of the Finnish Public Sector (FPS) study comprising employees of 10 towns and six hospital districts in Finland. In this study, the inclusion criteria were survey data from 2008, 2012 and 2015 FPS surveys of the six hospital districts (response rates 72%, 71% and 69%, respectively), current contract of employment with period-based work (114:45 hours/3 week) and using Titania shift scheduling software. As described earlier, the individual surveys were linked to the payroll data of working hours from the 91 days prior to answering each of the questionnaires. Additionally, the employees were required to have a period-based work contract (114:45 hours/3 weeks) and to have at least 31 work shifts during the 91-day period (figure 1). Regular day workers were excluded as they do not work on a period-based work contract. Additionally, fixed evening and night shift workers were also excluded.

The sample included 2481 employees of which 93% (n=2 303) were women and 7% men (n=178). Employees’ average age was 44 years (SD 8.15), and they had on average 15 years shift work experience (SD 9.83). Majority of participants had a full-time work (87%, n=2 155) and children under 18 years living in the same household (90%, n=1 278). The employees’ most common job titles were nurse (40%, n=966), departmental secretary (10%, n=238), practical nurse (6%, n=138), laboratory nurse (4%, n=107) and X-ray nurse (4%, n=103).

Payroll data
The payroll-based daily working hour data was retrieved from the shift scheduling programme (Titania, CGI Finland, Helsinki, Finland). Validated sampling software (provided by CGI Finland) was used to retrieve the data from realised rosters (see Härmä et al for further details).

The payroll data that were used in this study have been described in detail earlier. The working hour characteristics were those previously used. We utilised dichotomised variables of percentage of long work weeks (cut-point >25% for 40 hour/week and cut-point >25% for 48 hour/ week), percentage of evening and night shifts of all the work shifts (cut-point >10%), percentage of quick returns (<11 hour shift interval) of all shift intervals (cut-point >25%), percentage of weekend work of all the weekends (cut point >25%) and percentage of single free days of all the free days (cut-point >25%). Each shift-dependent
characteristics occurred approximately once a week and week-related characteristics (weekly working hours) once a month. The cut-points are included in FIOH’s current recommendations for acceptable working hour characteristics in the FPS.

Survey variables
WLC was surveyed with a question: ‘How often you feel that your work takes too much time or energy from your family-life or life?’ with a five-point Likert-type scale from never to very often adapted from. The answers ‘often’ and ‘very often’ were dichotomised as having WLC.

Ethical issues
The hospital districts gave written permission to the Finnish Institute of Occupational Health to use the employers’ working time registries. All data were anonymised. Answering to the FPS survey was voluntary and the completed questionnaire acted as an informed consent.

Statistical methods
The statistical analyses were conducted with SAS V.9.4 and IBM SPSS Statistics V.24. Fixed effects time-dependent logistic regression analysis was used to test whether significant increase or decrease in unsocial working hour characteristics would show a parallel change in WLC (increase in working hour characteristic—increase in WLC or decrease in working hour characteristic—decrease in WLC). The fixed effects regression model has the advantage that each individual serves as his or her own control and time-invariant (fixed) confounding (non-observed characteristics) are eliminated. First, a crude model was used and then model adjusting for various covariates. The covariates were marital status (married or cohabiting vs divorced, estranged, single or widow), number of small children (0–6 years) and school-aged (7–18 years) children, stressfulness of the overall life situation during the past 12 months (a five-point Likert-type scale from not burdensome to extremely burdensome) and perceived health (a five-point Likert-type scale from good to poor). The number of small children was classified into zero children, one child, at least two children and missing information, whereas the number of school-aged children was classified into zero children, one child, two children, at least three children and missing information. We tested interactions by age (≤39, 40–49 and ≥50 years) and sex and performed stratified analysis for interactions with P<0.10.

RESULTS
The proportion of employees with perceived WLC was similar through the follow-up (35% in 2008, 34% in 2012 and 2015). The employees with increased or decreased WLC (one or two changes during the 7-year follow-up) were included in the analysis and, respectively, the employees with stable low or stable high WLC were excluded (table 1).

The average proportions of the studied working hour characteristics were rather stable over time (table 2).

DISCUSSION
This prospective study with objective working hour data and a 7-year follow-up investigated whether changes over cut-point in proportions of unsocial working hour characteristics result in parallel change in WLC among hospital employees. The main result shows that increase or decrease in the proportion of evening shifts is followed by parallel increase or decrease in WLC. Similarly, the increase or decrease in proportion of night shifts, weekend work, quick returns and long work weeks were associated with parallel change in WLC. Proportion of single days of and very long work weeks seemed not to be associated with parallel change in WLC. No significant age or sex interactions were found in any of the studied working hour characteristics. (table 3).

Table 1 Changes in work-life conflict during the follow-up 2008–2015

<table>
<thead>
<tr>
<th></th>
<th>2008 (%)</th>
<th>2012 (%)</th>
<th>2015 (%)</th>
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<tbody>
<tr>
<td>Stable low†</td>
<td>950 (43.3)</td>
<td>134 (6.1)</td>
<td>94 (4.3)</td>
</tr>
<tr>
<td>Stable high†</td>
<td>344 (15.7)</td>
<td>337 (15.3)</td>
<td>335 (15.3)</td>
</tr>
<tr>
<td>Increased</td>
<td>920 (42.8)</td>
<td>26.6 (22.8)</td>
<td>22.7 (19.6)</td>
</tr>
<tr>
<td>Decreased</td>
<td>920 (42.8)</td>
<td>40 (10.0)</td>
<td>3.1 (6.7)</td>
</tr>
<tr>
<td>Two changes over time: increase—decrease</td>
<td>134 (6.1)</td>
<td>11.2 (13.6)</td>
<td>9.5 (12.6)</td>
</tr>
<tr>
<td>Two changes over time: decrease—increase</td>
<td>94 (4.3)</td>
<td>7.9 (15.1)</td>
<td>19.1 (11.4)</td>
</tr>
</tbody>
</table>

*Employees with no change in work-life conflict excluded from further analysis.

Table 2 The average proportions (%) of working hour characteristics during past 91 days in 2008–2015

<table>
<thead>
<tr>
<th>Percentages of...</th>
<th>2008</th>
<th>2012</th>
<th>2015</th>
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<tr>
<td>&gt;40 hours work weeks of all work weeks</td>
<td>920</td>
<td>23.6 (17.2)</td>
<td>26.6 (22.8)</td>
</tr>
<tr>
<td>&gt;48 hours work weeks of all work weeks</td>
<td>920</td>
<td>3.1 (6.5)</td>
<td>4.0 (10.0)</td>
</tr>
<tr>
<td>Quick returns (&lt;11 hours) of all shift intervals &lt;48 hours</td>
<td>920</td>
<td>13.5 (14.8)</td>
<td>11.2 (13.6)</td>
</tr>
<tr>
<td>Single days off of all day off-periods</td>
<td>730</td>
<td>13.3 (9.7)</td>
<td>7.9 (15.1)</td>
</tr>
<tr>
<td>Evening shifts of all shifts</td>
<td>920</td>
<td>18.8 (16.8)</td>
<td>17.5 (17.3)</td>
</tr>
<tr>
<td>Night shifts of all shifts</td>
<td>920</td>
<td>8.5 (13.9)</td>
<td>7.9 (15.1)</td>
</tr>
<tr>
<td>Weekend work of all weekends</td>
<td>920</td>
<td>27.7 (25.4)</td>
<td>26.2 (25.6)</td>
</tr>
</tbody>
</table>
workplace characteristics but shows that especially evening work is detrimental for WLC. According to our results, it seems that experiencing WLC was similar in all the age groups when number of children was included in the analysis. Likewise, Rantanen et al. found that WLC is not limited to early part of employees’ working career. There are both earlier results showing that increasing number of children is associated with WLC and that number of children is not associated with WLC, but having a small child is. It is likely that the dual breadwinner model combined with external child and elderly care that is prominent in the Nordic countries partly explains the lack of sex differences in experiencing WLC.

Improving work-life balance is important among shift workers, as previous research shows an increased risk for changing from shift to day work or from full-time to part-time work as a consequence of WLC. In this data, nearly 90% of the employees were full-time workers and there was a slightly increasing proportion of full-time workers in the sample (data not shown). It seems presumable that hospital employees do not adjust their working hours as means of reducing WLC.

**Strengths and limitations**

The main strength of this study was the use of objective working hour data that allowed determining the exact proportion of, for example, evening shifts and quick returns and night shifts. This study strengthens previous results based on partially the same dataset, and earlier survey and mostly cross-sectional results, that long working hours, off days off periods, weekend work of all weekends, and full-time work weeks of all work weeks were associated with parallel change in WLC during past 91 days and change in work-life conflict. In a 7-year follow-up, changes in most of the studied unsocial working hour characteristics were associated with WLC in cross-sectional study design. The results of this study add to the previous results by showing that reducing the proportion of, for example, evening shifts and quick returns results in parallel decrease in WLC. This is only a small part of the Finnish healthcare sector. We analysed the data including women only, and the results did not change (data not shown). However, the results regarding men should be generalised and interpreted very carefully and replicated in further studies.

In our previous cross-sectional study, we found out that majority of unsocial working hour characteristics were associated with WLC in cross-sectional study design. The results of this study add to the previous results by showing that reducing the proportion of, for example, evening shifts and quick returns results in parallel decrease in WLC. The results can be used in reducing WLC by reducing the proportions of working hour characteristics that are associated with WLC. It would be important to impact on retaining competent employees in healthcare sector.

**CONCLUSION**

In a 7-year follow-up, changes in most of the studied unsocial working hour characteristics were associated with parallel change in WLC, especially in connection with evening shifts. Reducing the proportion of evening shifts, but also reducing the proportion of night shifts, weekend work and quick returns should be used to reduce WLC.

**Contributors** All the authors have participated in designing of the study and writing the manuscript. Statistical analyses were conducted by KK, AK and AO. We are in agreement with the content of the manuscript and with the order of authorship.

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**Competing interests** None declared.

**Ethics approval** The ethics committee of the Hospital District of Helsinki and Uusimaa (HUS) approved this study as part of the Finnish Public Sector study ethical approval (HUS 1210/2016).
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1 Kossek EE, Lewis S, Hammer LB. Work-life initiatives and organizational change: overcoming mixed messages to move from the margin to the mainstream. Hum Relat 2010;63:3–19.