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Job strain and supervisor support in primary care health centres and glycaemic control among patients with type 2 diabetes: a cross-sectional study

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ABSTRACT

Objectives: This study investigates associations between healthcare personnel's perceived job strain, supervisor support and the outcome of care in terms of glycaemic control among patients with type 2 diabetes.

Design: A cross-sectional study from 2006.

Setting: 18 primary care health centres (HCs) from five municipalities in Finland.

Participants: Aggregated survey data on perceived job strain and supervisor support from healthcare personnel (doctors, n=122, mean age 45.5 years, nurses, n=300, mean age 47.1 years) were combined with registered data (Electronic Medical Records) from 8975 patients (51% men, mean age 67 years) with type 2 diabetes.

Outcome measure: Poor glycaemic control (glycated haemoglobin (HbA1c) ≥7%).

Results: The mean HbA1c level among patients with type 2 diabetes was 7.1 (SD 1.2, range 4.5–19.1), and 43% had poor glycaemic control (HbA1c ≥7%). Multilevel logistic regression analyses, adjusted for patient's age and sex, and HC and HC service area-level characteristics, showed that patients' HbA1c-levels were less optimal in high-strain HCs than in low-strain HCs (OR 1.44, 95% CI 1.12 to 1.86). Supervisor support in HCs was not associated with the outcome of care.

Conclusions: The level of job strain among healthcare personnel may play a role in achieving good glycaemic control among patients with type 2 diabetes.

ARTICLE SUMMARY

Article focus

- This paper focuses on the association between job strain and supervisor support of healthcare personnel and the outcome of care among patients with type 2 diabetes.

Key message

- Glycated haemoglobin levels were less optimal in primary care health centres where healthcare personnel's perceived job strain was high compared with primary care health centres where the perceived job strain was low.

Strengths and limitations of this study

- Previous studies suggest that the organisation of care can affect the quality and outcome of care in diabetes. This study showed that job strain of healthcare personnel may be one key factor associated with glycaemic control among patients with type 2 diabetes.

- We did not have information on patients' health behaviour, medication and comorbidity associated with type 2 diabetes.

INTRODUCTION

Diabetes mellitus is an important and increasing public health problem worldwide.[1–3] In Finland, about 10% of the population has diabetes, of which a majority is type 2.[4] Primary healthcare faces a serious challenge to provide high-quality care in order to decrease complications, mortality and costs caused by this public health burden.

Healthcare organisations may differ in the quality of care.[5] However, we know only little about organisational aspects that promote good care of diabetes. One aspect may relate to the organisation of care. Collins et al[6] showed that compliance to diabetes care was better in structured general practitioner (GP) care than in traditional hospital care or in hospital/GP shared care. McLean et al[7] found that the intermediate outcome target in cholesterol measurement of diabetic patients was achieved more often in urban practices than in very remote rural practices. Medical outcomes of care in type 2 diabetes have been shown to be better in physician–nurse practitioner teams than in care provided by a physician alone.[8 9] Linzer et al[10] found that good organisational culture with high values alignment with leadership and work control was associated with higher quality care for diabetic patients. In the study

by Virtanen *et al*,[11] perception of procedural justice among staff was associated with more optimal glycaemic control among patients.

More research on the associations between organisational factors and the quality of care, especially the outcome of care, in diabetes is needed. Based on the theory of Karasek[12] and Karasek and Theorell,[13] equilibrium between personnel's job demands and job control as well as social support at work might be important organisational factors associated with the quality of care. Active work with high demands and high control most likely promotes high-quality care.[13] High demands give challenges, motivation and promote learning but, combined with high control, high demands do not cause negative psychological strain. Instead, high-strain work with high demands and low control exhausts personnel and decreases productivity. Low-strain work with high control and low demands may not offer optimal challenges, and passive work with low demands and low control may lead to apathy and loss of learnt skills and abilities. Besides an optimal balance between job demands and job control, social support at work is also likely to promote good health, learning and productivity.[13] Social support can, for example, buffer the negative effect of psychological stressors on employee health, and co-workers and supervisors are valuable sources of information and expertise.

AIM AND HYPOTHESES OF THE STUDY

The aim of this study was to investigate associations between healthcare personnel's perceived job strain, supervisor support and the outcome of care in terms of glycaemic control among patients with type 2 diabetes. We hypothesise that glycaemic control is best achieved in primary care health centres (HCs) where healthcare personnel have the possibility to work actively and receive high supervisor support.

METHODS
Study context

The study was conducted in 18 primary care HCs in five municipalities in Finland. Municipalities differed in size (about 7500–200 000 inhabitants) and the number of HCs in each municipality (1–10). In Finland, municipalities are responsible for organising primary healthcare services and cover the costs together with the state. Primary healthcare services are provided by HCs that offer a wide range of care services including doctor and nurse services[14] and have a central role in disease management for major chronic conditions like diabetes.[15] Three of the five municipalities had a family doctor system in their HCs. The two other municipalities had the traditional model in which appointments can be made with any doctor in the HC. All HCs had a diabetes nurse. One city also had a clinic specialising in the prevention and care of chronic conditions. Patients from HCs could be referred there for additional advice and care.

Data collection and participants

The data to this cross-sectional study were gathered in 2006. Information on job strain and supervisor support in 18 HCs is based on the responses of doctors (n=122, mean age 45.5 years) and nurses (n=300, mean age 47.1 years), who took part in the Finnish Public Sector Study,[16] a voluntary-basis survey addressing local government personnel of the participating towns (response rate 79%). Information on sex, age, the postal zip code of the area of residence and glycaemic control (glycated haemoglobin (HbA1c) values) of patients with a diagnosis of type 2 diabetes (N=8975, 51% men, mean age 67 years, SD 11, range 16–106 years) was collected from HC registers (Electronic Medical Records) by the contact persons who worked in HCs. They delivered anonymous data to researchers. Aggregated variables indicating the levels of job strain and social support (based on survey responses of doctors and nurses) were created for each HC and linked to patient data. Thus, each patient has information in his/her individual data on job strain and supervisor support in the HC that had responsibility for his/her diabetes care.

Because all patient data included only a very limited set of variables without any identification code, it was totally anonymous. Thus, no informed consent was needed. Instead, a written approval based on a brief description of the study was applied for and granted by all chief physicians responsible for the organisation and administration of primary care in the involved municipalities.

Measures
Job strain and supervisor support

An aggregated measure of job strain was derived from the responses of doctors and nurses (n=422) to questions measuring job demands (5 items) and job control (9 items) derived from the Job Content Questionnaire.[17] An aggregated measure of social support from the supervisor[18 19] (4 items) was derived from a standard survey instrument of Statistics Finland.[20] A five-point Likert-type response format ranging from 1 (totally agree) to 5 (totally disagree) was used for all items. A mean score for the constructs was computed and the individual scores were then used to measure the aggregated scores of job strain and supervisor support for each work unit (HC) based on the identification of each participant's work unit obtained from the employers' administrative records.

To create a job strain indicator for each HC, aggregated demands and control were split on the median and combined into four categories: low-strain jobs (low demands combined with high control, 4 HCs), active jobs (high demands combined with high control, 5 HCs), passive jobs (low demands combined with low control, 5 HCs) and high-strain jobs (high demands combined with low control, 4 HCs).[12] To create a supervisor support indicator for each HC, aggregated supervisor support was split into three equal groups indicating low, medium and high support (6 HCs in each group).

Job strain and supervisor support indicators for each HC were created based on the responses of doctors and nurses because doctors and nurses work quite independently in HCs and these two professional groups both affect the quality of care. The aggregated job demands of doctors were higher (mean 3.9, range 3–4.4) than the job demands of nurses (mean 3.5, range 2.8–4.3). The aggregated job control of doctors was also somewhat higher (mean 3.9, range 3.7–4.3) than the job control of nurses (mean 3.8, range 3.6–4.2). In aggregated supervisor support, there was no difference between doctors (mean 3.6, range 2.5–5) and nurses (mean 3.6, range 2.9–4.5).

Glycaemic control

Glycaemic control was determined by 1 year measurements of HbA1c value. In case of several control measurements, the mean HbA1c value was calculated (mean number of measurements was 2.1, range 1–15). Of the patients, 35% had one measurement. Based on the standards of medical care in diabetes,[21][22] we used a value under 7% to indicate good glycaemic control and a value of 7 or higher to indicate poor glycaemic control. For an additional secondary analysis, we used HbA1c value of 8% as a cut point.

Background variables
Patient characteristics
Information on age, sex and the postal zip code of the area of residence of each patient was obtained from the HC's registers.

HC characteristics
The proportion of temporary employees and the mean rate of sickness absence days in the work unit in 2006 were drawn from employers' registers.[23]

HC service area characteristics
By using the patient postal zip codes and data obtained from Statistics Finland, we formulated the average educational level (percentage of adults aged >18 years whose highest education level is elementary school), the median income and the unemployment rate (unemployed persons belonging to the workforce divided by total workforce) of the residents in the HC catchment area, that is, the population-weighted means for residents in the specific areas that each HC served. The mean for each variable for each HC was calculated and linked to individual data on each patient. Educational level, income and unemployment rate are standard variables to characterise areal disadvantage and deprivation.[24][25]

Statistical analysis
The statistical data analysis was carried out within individual patient data (N=8975) with HC characteristics on an aggregated level. Descriptive statistics were estimated and the baseline associations between independent variables, covariates and glycaemic control were tested with Pearson χ^2 tests or one-way analysis of variance depending on the measurement scale of the variable of interest. Because the patients were nested within the 18 HC units, we used a two-level modelling to account for the data structure with job strain (or supervisor support) at the second level and the outcome—patient-level glycaemic control—at the first level. We fitted five models using the multilevel logistic regression analysis. The first model, an empty model including only the random effect variable, was used to examine the clustering of the outcome between the 18 HCs. Then we added job strain (or supervisor support) to examine its associations with the outcome. Next, we added patient-level confounders, after that HC characteristics and finally, variables describing the socioeconomic composition of the HC service area (unadjusted model, models I, II and III). Because we used register data combined with aggregated variables describing HCs and HC catchment areas, there were only a few missing cases, which were not included in the analyses. Statistical analyses were performed using the SPSS V.19.0 and R-program, V.2.13.0.

RESULTS
Tables 1 and 2 show baseline associations between independent variables, covariates and glycaemic control. The mean HbA1c level of patients was 7.1 (SD 1.2, range 4.5–19.1, Q1=6.3, median 6.8, Q3=7.6), and 43% had poor glycaemic control (≥7%). HCs did not differ in the mean HbA1c-levels, but the percentage of poor glycaemic control was highest in high-strain HCs.

The mean percentage of temporary employees in HCs was 22% and the average amount of sickness absence days was 14 days. The socioeconomic characteristics of the HC service areas were as follows: the mean proportion of residents in the patients' neighbourhood with only basic education was 27%, the median yearly income was 17 203 euros, and the mean unemployment rate was 7% (table 1). The mean rates of job control, job demands and supervisor support in the HCs were 3.9, 3.6 and 3.6, respectively.

Tables 3 and 4 show that, after adjustment for all covariates (model III), glycaemic control among patients was less optimal in HCs where care personnel's perceived job strain was high compared with HCs where the job strain was low. Active and passive work HCs did not differ statistically significantly from low-strain HCs in the outcome of care. Also, supervisor support was not associated with patients' glycaemic control (table 5).

DISCUSSION
This study showed that the perceived job strain of healthcare personnel may be associated with the outcome of diabetes care. Glycaemic control among type 2 diabetes patients was less optimal in high-strain HCs than in low-strain HCs. Supervisor support was not associated with the outcome of care.

Table 1 Patient, organisation and service area characteristics in primary care HCs varying in job strain

Job strain in primary care HC

	All HCs (N=18)	Low-strain job HCs ‡ (n=4)	Passive job HCs§ (n=5)	Active job HCs¶ (n=5)	High strain job HCs** (n=4)	p Value
Patient characteristics						
Percentage of men*	51	50	48	54	52	<0.001
Age (mean/SD)†	67 (11.2)	67 (11.6)	68 (10.9)	66 (11.2)	65 (11.2)	<0.001
HbA1c (mean/SD)†	7.1 (1.2)	7.1 (1.2)	7.1 (1.1)	7.1 (1.1)	7.1 (1.1)	0.349
Patients with poor glycaemic control (HbA1c≥7%) (%)*	43	45	42	42	46	0.021
N	8975	1999	2862	2707	1407	
Organisation characteristics						
Percentage of the temporary employees (mean, SD)†	22 (13.2)	28 (17.2)	12 (9.5)	30 (7.4)	16 (2.9)	<0.001
Staff sickness absence days (mean/SD)†	14 (5.3)	9 (4.3)	17 (2.3)	12 (5.4)	16 (5.5)	<0.001
Socioeconomic composition of HC service area						
Percentage of the lowest educational level (mean, SD)†	27 (5.5)	29 (7.4)	26 (2.8)	25 (5.8)	27 (4.7)	<0.001
Median income level in the HC service area, euros (mean, SD)†	17203 (2556)	15660 (3057)	16097 (756)	18951 (2166)	18280 (2301)	<0.001
Unemployment rate (mean, SD) †	7 (2.9)	7 (3.3)	10 (1.6)	4 (0.8)	6 (1.2)	<0.001

*χ^2 test.
†One-way ANOVA.
‡Low demands and high control.
§Low demands and low control.
¶High demands and high control.
**High demands and low control.
ANOVA, analysis of variance; HbA1c, glycated haemoglobin; HC, health centre.

Several studies have found strong associations between experienced workload and burnout, particularly its exhaustion dimension.[26–28] Emotional exhaustion is further associated with low job performance shown in job withdrawal, deterioration of productivity and effectiveness,[28] and the outcome of care.[5 29] Recent studies

Table 2 Patient, organisation and service area characteristics in primary care HCs varying in supervisor support

Supervisor support in primary care HC

	All HCs (N=18)	Low support HCs (n=6)	Moderate support HCs (n=6)	High support HCs (n=6)	p Value
Patient characteristics					
Percentage of men*	51	48	54	52	<0.001
Age (mean, SD)†	67 (11.2)	67 (11.3)	66 (11.0)	65 (11.6)	<0.001
HbA1c-value (mean, SD)†	7.1 (1.2)	7.1 (1.3)	7.1 (1.1)	7.0 (1.1)	0.082
Patients with poor glycaemic control (HbA1c≥7%) (%)*	43	44	44	41	0.076
N	8975	3911	3194	1870	
Organisation characteristics					
Percentage of the temporary employees (mean, SD)†	22 (13.2)	12 (6.8)	31 (14.0)	26 (7.9)	<0.001
Staff sickness absence days (mean, SD)†	14 (5.3)	15 (4.4)	14 (4.5)	10 (6.6)	<0.001
Socioeconomic composition of HC service area					
Percentage of the lowest educational level (mean, SD)†	27 (5.5)	28 (5.6)	26 (6.1)	25 (2.9)	<0.001
Median income level, euros (mean, SD)†	17203 (2556)	15173 (1510)	18971 (2009)	18429 (2055)	<0.001
Unemployment rate (mean, SD) †	7 (2.9)	10 (1.4)	5 (1.4)	5 (0.6)	<0.001

*χ^2-test.
†One-way ANOVA.
ANOVA, analysis of variance; HbA1c, glycated haemoglobin; HC, health centre.

Table 3 Level of perceived job strain among the healthcare personnel (doctors and nurses) as a predictor of poor glycaemic control indicator (HbA1c$\geq$7%) in patients with type 2 diabetes (N=8975) in primary care HCs (N=18)

Job strain in the HCs	Unadjusted model		Model I*		Model II†		Model III‡	
	OR (95% CI)	p Value	OR (95% CI)	p Value	OR (95% CI)	p Value	OR (95% CI)	p Value
Fixed effects								
Low-strain job	1.00		1.00		1.00		1.00	
Passive job	0.96 (0.72 to 1.27)	0.752	0.96 (0.72 to 1.27)	0.760	0.97 (0.70 to 1.36)	0.871	1.08 (0.86 to 1.36)	0.497
Active job	0.89 (0.68 to 1.18)	0.430	0.89 (0.67 to 1.19)	0.438	0.91 (0.69 to 1.20)	0.484	1.17 (0.96 to 1.43)	0.114
High-strain job	1.08 (0.80 to 1.47)	0.603	1.09 (0.80 to 1.48)	0.586	1.10 (0.78 to 1.56)	0.572	1.44 (1.12 to 1.86)	0.004
Random effects								
HC variance	0.04		0.04		0.04		0.01	
(SE)	0.05		0.05		0.04		0.02	

Multilevel regression analysis.
*Adjusted for patient characteristics (sex and age).
†Adjusted as model I+organisation characteristics (the percentage of temporary employees and the mean rate of sickness absence days in the HC).
‡Adjusted as model II + HC service area characteristics (educational level of the residents, median income and unemployment rate).
HbA1c, glycated haemoglobin; HC, health centre.

Table 4 Level of perceived job strain among the healthcare personnel (doctors and nurses) as a predictor of poor glycaemic control indicator (HbA1c$\geq$8%) in patients with type 2 diabetes (N=8975) in primary care health centres (HCs, N=18)

Job strain in the HCs	Unadjusted model		Model I*		Model II†		Model III‡	
	OR (95% CI)	p Value	OR (95% CI)	p Value	OR (95% CI)	p Value	OR (95% CI)	p Value
Fixed effects								
Low-strain job	1.00		1.00		1.00		1.00	
Passive job	1.06 (0.72 to 1.58)	0.764	1.07 (0.73 to 1.57)	0.742	1.08 (0.71 to 1.64)	0.725	1.16 (0.89 to 1.51)	0.287
Active job	0.84 (0.57 to 1.25)	0.394	0.83 (0.57 to 1.22)	0.341	0.86 (0.60 to 1.23)	0.408	1.23 (0.96 to 1.56)	0.101
High-strain job	1.12 (0.73 to 1.71)	0.609	1.09 (0.72 to 1.65)	0.679	1.09 (0.71 to 1.69)	0.684	1.57 (1.17 to 2.12)	0.003
Random effects								
HC variance	0.07		0.07		0.06		0.01	
(SE)	0.06		0.06		0.06		0.02	

Multilevel regression analysis.
*Adjusted for patient characteristics (sex and age).
†Adjusted as model I+organisation characteristics (the percentage of temporary employees and the mean rate of sickness absence days in the HC).
‡Adjusted as model II+HC service area characteristics (educational level of the residents, median income and unemployment rate).
HbA1c, glycated haemoglobin; HC, health centre.

Quality of care in type 2 diabetes

Table 5 Level of perceived supervisor support among the healthcare personnel (doctors and nurses) as a predictor of poor glycaemic control indicator (HbA1c≥7%) in patients with type 2 diabetes (N=8975) in primary care health centres (HCs, N=18)

Supervisor support in the HCs	Unadjusted model OR (95% CI)	p Value	Model I* OR (95% CI)	p Value	Model II† OR (95% CI)	p Value	Model III‡ OR (95% CI)	p Value
Fixed effects								
High support	1.00		1.00		1.00		1.00	
Medium support	1.11 (0.86 to 1.43)	.415	1.11 (0.86 to 1.43)	.441	1.17 (0.90 to 1.53)	0.249	1.14 (0.95 to 1.36)	0.157
Low support	1.13 (0.88 to 1.45)	.334	1.13 (0.88 to 1.45)	.353	1.10 (0.84 to 1.44)	0.507	0.87 (0.65 to 1.16)	0.344
Random effects								
HC variance	0.04		0.04		0.03		0.01	
(SE)	0.05		0.05		0.04		0.02	

Multilevel regression analysis.
*Adjusted for patient characteristics (sex and age).
†Adjusted as model I + organisation characteristics (the percentage of temporary employees and the mean rate of sickness absence days in the HC).
‡Adjusted as model II + HC service area characteristics (educational level of the residents, median income and unemployment rate).
HbA1c, glycated haemoglobin; HC, health centre.

on physicians have shown that their experienced job strain, stress and burnout are associated with an increased risk of suboptimal patient care and likelihood of making errors.[30–33] Exhausted employees are not effective, accurate or innovative at work.[13] Instead, a favourable psychosocial work environment may enhance employee well-being and motivate healthcare personnel to invent new working methods and strengthen patients' motivation to self-care.

However, patients' glycaemic control was not best in active job HCs as predicted by us based on the job strain model.[13] This result is in line with the results of the study on clinicians in surgery by Klein et al.[31] They found that clinicians with active jobs reported suboptimal quality of care more often than clinicians with low-strain jobs. It is possible that active work assumption does not fit well in the healthcare sector. Active jobs give more challenges than low-strain jobs or passive jobs, but the motivational potential of the higher demands of active jobs may be lost if the demands are so high that they overwhelm the healthcare personnel's capacities. In that case, high control or other job resources may have only limited capability of buffering the undesired impact of high job demands.[26 34] Contrary to our prediction, social support from supervisors was not associated with the outcome of care. The fact that doctors and nurses in the Finnish HCs work quite independently is a potential explanation for this. Doctors and nurses consult patients alone in separate appointments. Therefore, supervisor support may not play a great role in daily appointments with patients and the outcome of care.

Register data give reliable care results but also have limitations. They do not give information on the patient's socioeconomic status, such as educational level, which is known to be strongly related to health behaviour, many unhealthy behaviours like smoking, poor dietary habits and physical inactivity being more prevalent in lower socioeconomic groups.[35] Again, healthy lifestyle is the key factor in the management of diabetes.[21] However, we were able to use disadvantage of the patient's residential area as a proxy for individual socioeconomic position. Indeed, the effect of job strain on glycaemic control emerged after adjustment of the educational level, income and unemployment rate in the HC catchment area. This result points to suppression, a situation in which the magnitude of the relationship between an independent variable and a dependent variable becomes larger when a third variable (or multiple variables) is included in the analysis.[36]

This was a cross-sectional study in which no causal inferences of the associations between independent and dependent variables could be made. Another limitation was that we did not have information on patients' medication and comorbidity associated with type 2 diabetes.[37] Neither did we have information on other aspects of the quality of care, such as the number of doctors or nurses per inhabitant in the HC service area indicating the sufficiency of staff. This is an important question for

further study. However, job strain can be seen as one indicator of sufficiency of staff.

Further, we did not have access to exact information on where the principal care responsibility of the patients was. In spite of the fact that the patients had HbA1c-values measured via the HC, it is possible that some of them, at least the younger ones, had also visited separate private or specialised public occupational healthcare units. In these cases, the psychosocial work environment of these units is more crucial for the outcome of care. However, the majority of the patients in the data were over 64 years of age with many visits to the HC during 2006. Thus, it is unlikely that their main care responsibility would have been somewhere else. Also, the municipalities now studied did not systematically differ in the availability of care from occupational healthcare units.

This and previous studies suggest that the organisation of care is associated with the quality and outcome of care.[5] [11] [31] However, research evidence is still limited. Further studies including all relevant confounding factors are needed. Some of those factors may be equally or more strongly associated with patients' glycaemic control than the organisation of care. In addition, follow-up studies investigating the effect of changes in the psychosocial work environment, for example, in job strain, of healthcare personnel on change in the glycaemic control of patients with type 2 diabetes, are needed as well as interventions aiming at improving psychosocial work environment in healthcare. The studies of Bourbonnais *et al*[38] [39] showed that such interventions may have a positive effect on the psychosocial work environment and mental health of healthcare personnel. Monitoring HbA1c-values might be a useful tool in the strategic leadership of HCs because maintaining good glycaemic control is essential to prevent micro and macrovascular complications of diabetes and costs caused by these chronic diseases related to type 2 diabetes.[1]

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