Work-schedule management in psychiatric hospitals and its associations with nurses' emotional exhaustion and intention to leave: A cross-sectional multicenter study

Beatrice Gehri [a,b], Stefanie Bachnick [c], René Schwendimann [a,d], Michael Simon [a,*]

[a] Institute of Nursing Science, Department of Public Health, University of Basel, Basel, Switzerland
[b] University Psychiatric Clinics, Basel, Switzerland
[c] HS-Gesundheit Bochum, University of Applied Sciences, Bochum, Germany
[d] University Hospital Basel, Basel, Switzerland

ARTICLE INFO

ABSTRACT

Background: Managing nurses' work schedules in hospitals is challenging because employer needs, like shift changes at short notice and overtime, may conflict with nurses' desires for a predictable and stable schedule. Nurses should have a certain degree of control over their work schedules, and their supervisors should support their needs in scheduling. How perceived control over work schedules, perceived support from supervisors in scheduling, shift changes at short notice, and overtime affect nurses' emotional exhaustion and intentions to leave has not been studied.

Objectives: The aims are (1) to describe perceived control, perceived supervisor support, shift changes at short notice, and overtime among nurses in psychiatric hospitals; (2) to assess the variation of these four factors between units at psychiatric hospitals; and (3) to investigate the association between these factors with nurses' emotional exhaustion and intentions to leave.

Design: Cross-sectional survey study.

Setting(s): Swiss psychiatric hospitals with 24-hour services.

Participants: Registered nurses (N = 994) from 114 adult-inpatient units.

Methods: To describe perceived control, perceived supervisor support, shift changes at short notice, and overtime among nurses, we calculated frequencies, percentages, means, and standard deviations of their responses to the survey. To assess the variation between units, we computed intraclass correlations for the four factors. We constructed random-effects models accounting for the clustering of nurses in units for emotional exhaustion and intentions to leave separately.

Results: Perception of work-schedule control was 3.32 (SD 1.39, range 0–5); perception of supervisor work-schedule support was 3.28 (SD 1.14, range 0–4). On average, 9 % of the nurses had to take over a shift at short notice at least three times per month, and 40 % worked at least 15 minute overtime on their most recent shift. Intraclass correlation for all four factors was higher than 0.05. Emotional exhaustion was significantly associated with supervisor support and overtime, and leaving intentions were significantly associated with perceived control, supervisor support and overtime.

Conclusion: Perceived control, perceived supervisor support, shift changes at short notice, and overtime are promising factors for interventions to prevent nurses' emotional exhaustion and allay their intentions to leave. Unit managers should provide nurses with increased predictability and influence on their work schedules. This could reduce early career endings and early retirement and counteract nurse shortages.

What is already known

- Managing nurses' work schedules is challenging because employer needs, may conflict with nurses' desires for a predictable and stable schedule.
- Work schedule factors can affect nurses' outcomes unfavorably.

* Corresponding author at: Institute of Nursing Science, Department of Public Health, University of Basel, Bernoullistrasse 28, 4056 Basel, Switzerland.
E-mail address: m.simon@unibas.ch (M. Simon).

What this paper adds

- Shift changes at short notice and overtime had a stronger impact on nurses' emotional exhaustion, whereas perceived work-schedule control and perceived work-schedule support from supervisors had a stronger influence on nurses' leaving intentions in psychiatric hospitals.
- Organizations should provide stable work schedules to reduce nurses' emotional exhaustion and contribute to a healthy workforce.

1. Background

Managing nurses' work schedules in hospitals with 24-hour nursing service is challenging because the requirements of hospitals in responding to patients' care needs must be balanced with nurses' availability to ensure adequate care (Kossek et al., 2020). The imbalance between care demand and supply can lead to impaired quality of care in general and psychiatric hospitals (Kilbourne et al., 2018; Musy et al., 2020) and to unfavorable nurse outcomes such as low work–life balance, burnout or intention to leave ratings (Holland et al., 2019; Zraychikova et al., 2023). Nurses expect a predictable and stable work schedule (Stimpfel et al., 2020), over which they have control (Steege and Rainbow, 2017). Appropriate work schedule management can balance care demand and supply in hospital nursing services and associations between work schedule flexibility and intention to leave have been reported (Leineweber et al., 2016).

Nurse preferences on shift work and patterns vary depending on their age and care responsibilities (Ejebu et al., 2021), so they should have a certain degree of control over their work schedules and be supported in their needs in scheduling by their supervisors (Dhaini et al., 2018; Vieten et al., 2022). Studies from acute-care hospitals in Europe have shown that a high perception of control over one's work schedule is positively associated with the expectation to remain in the same job until retirement (Liebermann et al., 2015) and have described supporting this perception as a promising approach to increasing nurse retention (Leineweber et al., 2016). A systematic review showed that the effect of a perception of control over scheduling on work–life balance is rather small but consistent, whereas evidence regarding its impact on health and well-being was inconsistent in the reviewed studies (Nijp et al., 2012). But since the effect sizes of these studies were rather small, this inconsistency could have been due to small sample sizes (Albrecht et al., 2020).

One key characteristic of work-schedule planning is the extent of staff overtime. Reasons for overtime can be involuntary due to high workload because of complex patient needs, sick leaves or due to conformity with colleagues' expectations (Watanabe and Yamauchi, 2018). But reasons for voluntary overtime have also been described, such as income, reputation, self-development, and the fun of work (Watanabe and Yamauchi, 2018). While voluntary overtime affects well-being beneficially, involuntary overtime is associated with decreased mental health and lower work engagement in nurses (Watanabe and Yamauchi, 2018). Additionally, working overtime is associated with an increased likelihood of errors by nurses, reduced cognitive function (Dall'Ora et al., 2016), poor quality-of-care ratings, and more nursing care left undone (Griffiths et al., 2014).

Another important factor in work scheduling is the demand to change shifts at short notice (Min and Hong, 2022). The reasons might again be absences in a given shift due to sickness or high demands from patients because of either the number of occupied beds or the patients' underlying characteristics. Shift changes at short notice have been associated with sleep disturbance in nurses (Min and Hong, 2022). Such ad hoc changes contradict nurses' desire for a predictable and stable schedule (Stimpfel et al., 2020).

In earlier work we investigated emotional exhaustion and work-schedule flexibility in non-psychiatric hospitals with a composite score based on four items: swapping shifts, taking over shifts, desire to change the schedule, and perceived influence on shift planning (Dhaini et al., 2018). This did not allow us to differentiate between nurses' perception of support from supervisors regarding the work schedule and structural characteristics, like overtime or frequency of taking over shifts at short notice. In particular the latter two structural characteristics could serve as clear targets for improvement efforts.

The relationship of nurses' overtime and perception of work-schedule control to emotional exhaustion and intention to leave has been studied (Shariifard et al., 2019; Vieten et al., 2022). However, while shift changes at short notice and support from supervisors in work scheduling are considered relevant factors in emotional exhaustion and intention to leave, they have been not examined.

1.1. Aims

The study has three main objectives. Firstly, we aimed to provide a comprehensive description of several work schedule factors among nurses in Swiss psychiatric hospitals, including perceived work-schedule control, perceived work-schedule support from supervisors, shift changes at short notice, and overtime. Secondly, it seeks to assess the variation of these factors across different units within the psychiatric hospitals in Switzerland. Lastly, the study aims to investigate the relationship between these factors and nurses' emotional exhaustion and intention to leave the organization.

2. Method

2.1. Design

Match^{RN} Psychiatry is a cross-sectional multicenter study at Swiss psychiatric hospitals.

This analysis is part of the project Matching Registered Nurse Services with Changing Care Demands in Psychiatric Hospitals (Match^{RN} Psychiatry; Gehri et al., 2021).

2.2. Setting and sample

Psychiatric hospitals represented by a member of the Swiss Psychiatric Nursing Leaders' Association (VPPS) (n = 40) were invited to participate in this study. Thirteen accepted, resulting in a convenience sample of 114 care units for adult inpatients. Nonforensic units were eligible for inclusion in Match^{RN} Psychiatry if they provided 24-hour services for adult psychiatric inpatients. All nurses (licensed practical nurses and registered nurses) who were working on these 114 care units and were involved in direct patient care were invited to participate in the study (n = 1691), and 1185 nurses responded.

2.3. Data sources, collection, and management

The survey was fielded from September 2019 to March 2020. Each of the thirteen participating psychiatric hospitals designated a local coordinator as a contact person for data collection. The hospitals could decide whether they preferred a paper or an online survey. Ten hospitals opted for the paper version, while three hospitals chose to conduct the survey online using Unipark (Tivian, 2019). A total of 956 paper and 735 online nurse surveys were distributed. After two and four weeks of data collection, the local coordinators were informed about their hospitals' response rates and asked to send out reminders to the eligible nurses. The overall average response rate of the study Match^{RN} Psychiatry was 71.5 %. Further details about the study are described in the Match^{RN} Psychiatry study protocol (Gehri et al., 2021). The survey responses were entered by an external data-entry service. To detect any systematic errors, 5 % of the surveys were entered twice and underwent quality checks by the external data-entry service. The Match^{RN} Psychiatry study team checked the data for consistency and plausibility.

2.4. Variables and measurements

2.4.1. Outcome variables

Emotional exhaustion was assessed with five items from the Copenhagen Psychosocial Questionnaire (COPSOQ) (Kristensen et al., 2005): (1) "How often are you physically exhausted?"; (2) "How often are you emotionally exhausted?"; (3) "How often do you feel exhausted?"; (4) "How often do you come to work even though you feel very sick and uncomfortable?"; and (5) "How often are you unable to leave work behind in your free time?" The ordinal answer options were 1 = "almost never/never," 2 = "seldom," 3 = "sometimes," 4 = "often," and 5 = "always." We summarized them by their mean. Cronbach's alpha was acceptable at 0.75 (95 % CI = 0.72–0.77).

Nurses' intention to leave the organization was measured with a single item from the NEXT survey (Hasselhorn et al., 2005): "How many times during the past 12 months have you thought about looking for a new job (e.g., in another psychiatric hospital, a hospital, in home care, a nursing home)?" Possible answers were: 1 = "never," 2 = "several times a year," 3 = "a few times a month," 4 = "a few times a week," and 5 = "every day."

2.4.2. Independent variables

We adapted the approach to work-schedule flexibility in Dhaini et al. (2018), resulting in variables for perceived work-schedule control and perceived work-schedule support from their supervisor.

We calculated nurses' *perceived work-schedule control* as the mean over five dichotomized items (minimum = 0 and maximum = 5). The items were: (a) "Do you have the possibility to switch shifts at short notice?" (0 = "no or swapping is very difficult"; 1 = "swapping is quite simple"); (b) "How much influence do you have on planning your own shifts?" (0 = "very little or little"; 1 = "some, quite a lot, or a lot"); (c) "How many options do you have in choosing your holidays or days off?" (0 = "very few or few"; 1 = "some, many, or very many"); (d) "How many options do you have regarding the start and finish of your work schedule or the planning of your work week?" (0 = "very few or few"; 1 = "some, many, or very many"); and (e) "How often can you have the choice to take a few hours off?" (0 = "very rarely or rarely"; 1 = "sometimes, often, or very often"). Cronbach's alpha was acceptable at 0.76 (95 % CI = 0.74–0.79).

For nurses' *perceived work-schedule support from their supervisor*, we used the mean over four dichotomized items (minimum = 0 and maximum = 4). The items were: (a) "My supervisor adjusts my work schedule (hours, overtime, days off) so that I can meet my private obligations" (0 = "never or rarely"; 1 = "sometimes, often, or always"); (b) "My supervisor postpones my duties or professional obligations so that I can meet my private obligations" (0 = "never or rarely"; 1 = "sometimes, often, or always"); (c) "My supervisor exchanges ideas and advice with me" (0 = "never or rarely"; 1 = "sometimes, often, or always"); and (d) "My supervisor understands my work-schedule preferences" (0 = "never or rarely"; 1 = "sometimes, often, or always"). Cronbach's alpha was good at 0.84 (95 % CI = 0.82–0.86).

To check whether perceived work-schedule control and perceived work-schedule support from their supervisor were suitable for further modeling, we did a Mokken-scale analysis for both scales. We tested the scales for unidimensionality. Perceived work-schedule control indicated moderate scalability with a scalability coefficient (H) of 0.419 (SE = 0.024), and supervisor support showed good scalability with a scalability coefficient (H) of 0.648 (SE = 0.029) (Sijtsma and van der Ark, 2017). Both scales fulfill the criteria of monotonicity. Additionally, we used the Molenaar–Sijtsma method (Van der Ark, 2012), which is typically used in the context of Mokken-scale analysis; it revealed a good reliability (Rho = 0.67 and 0.76 respectively). For the Mokken analysis, we used the Mokken package for the statistical software R (Sijtsma and van der Ark, 2017; Van der Ark, 2012). Additionally, we assessed group-mean reliability for all four factors using ICC2. ICC2 describes the ratio of the group variance to the total variance. ICC2

typically ranges between 0.6 and 1.0; values closer to 1 indicate higher reliability (Snijders and Bosker, 2011). In our data, the ICC2 for nurses' perceived work-schedule control was 0.95, for perceived work-schedule support from their supervisor it was 0.93, for shift changes at short notice 0.91, and for overtime 0.92. For the analysis of ICC2, we used the R rptR package (Stoffel et al., 2017).

To assess *employer scheduling needs*, we used two dichotomized single items: (a) "How often do you have to take over a shift at short notice?" (0 = "never or 1–2 times per month"; 1 = "3–5 times per month or over 5 times per month") and (b) "How much overtime (in minutes) did you work on the last time on your most recent shift?" (0 = "less than 15 minutes"; 1 = "more than 15 minutes"). Cross-sectional studies are prone to information bias, which stems from assessing exposure and outcome at the same time through the same source. To address this issue and as we were interested in scheduling needs as a feature of the unit, we aggregated the two items at the unit level. The caterpillar plots illustrate the findings for each of the four factors (Fig. 1). The reliability measures for all four factors were high (perceived control 0.954, perceived supervisor support 0.919, change at short notice 0.915, overtime 0.927).

2.4.3. Professional characteristics of nurses

We gathered two professional characteristics for nurses: (a) employment percentage (three categories: 1 = "≤60 %"; 2 = "61–90 %"; 3 > "90 %"); and (b) years of professional experience (five categories: 1 = "≤3 years"; 2 = ">3–≤7 years"; 3 = ">7–≤15 years"; 4 = ">15–≤20 years"; and 5 = ">20 years").

2.5. Data analysis

To describe the nurses' characteristics, their perceived work-schedule control, their perceived work-schedule support from their supervisor, shift changes at short notice, and overtime (aim 1), we calculated frequencies (n), percentages (%), means, and standard deviations (SDs). To assess the variation between units (aim 2), we computed intraclass correlations (ICC1s) of perceived control, perceived supervisor support, shift changes at short notice, and overtime. We calculated ICC1 as a conditional generalized linear mixed model with a 95 % confidence interval to assess the uncertainty of the estimates. For this purpose ICC1 typically ranges between 0.0 and 0.3; values over 0.05 indicate nonrandom variation between clusters (LeBreton and Senter, 2008; Nakagawa and Schielzeth, 2010). To check the distribution of ICC1 over the units visually, we computed caterpillar plots for each of the four factors. The caterpillar plots show the estimate for each unit and whether it deviates positively or negatively from the overall mean across all the units. To analyze ICC1, we used the R rptR package (Stoffel et al., 2017). To investigate whether perceived control, perceived supervisor support, shift changes at short notice, and overtime were associated with emotional exhaustion and intention to leave the organization (aim 3), we constructed three random-effects models accounting for the clustering of nurses in units for each outcome. Model Ia presents the relation of emotional exhaustion to perceived work-schedule control and perceived work-schedule support from their supervisor; model IIa the relation of emotional exhaustion to shift changes at short notice and overtime; and model IIIa the relation of emotional exhaustion to all four factors. Models Ib, IIb, and IIIb consider the same factors, respectively, in relation to intention to leave. To increase interpretability, we used z-transformed values for all four independent variables, so each variable had a mean of zero and a standard deviation of one. Using the R lme4 package (Bates et al., 2015) and sjPlot (Lüdecke, 2022), we calculated the estimates, their 95 % CIs, and their *P* values. To compare the relative fit of the models, we used Akaike's information criterion (AIC). Lower AIC values indicate a better fit. To describe the proportion of total variance explained by each model, we calculated two types of R^2. To represent the proportion of total variance explained by the fixed effects, we calculated marginal R^2, and to explain the fixed
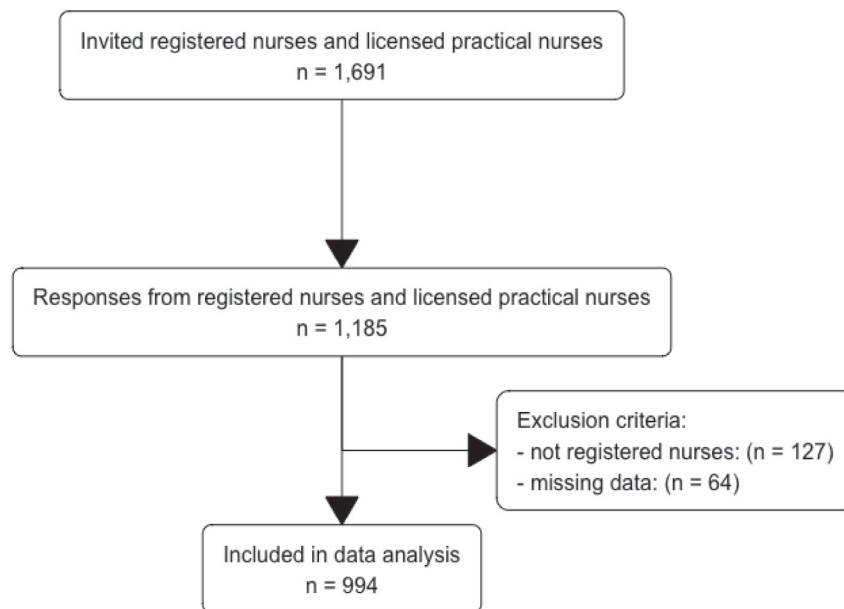
Fig. 1. Flowchart of sampling procedure.

and the random effects, we calculated conditional R^2 (Nakagawa and Schielzeth, 2010). For all statistical analyses, we used the software R, version 4.2.1 for MacOS (R Core Team, 2022). A P value <0.05 was considered significant.

We conducted sensitivity analysis to evaluate our models' robustness. A particular concern in the analysis of cross-sectional data is the influence of confounding variables not included in the analysis. We ran each model adjusted for gender and checked whether other work-environment factors like team collaboration and staffing level would substantially change coefficients in our models.

2.6. Ethical considerations

The responsible ethics commission (Ethics Commission Northwest and Central Switzerland) ruled that the study Match[RN] Psychiatry was exempt from the Swiss human-research act (project ID: Req-2019-00589). The research team's data collection procedure was approved by the University of Basel's data-protection officer. Nurse surveys were distributed with a cover letter explaining the study's purpose and data-protection measures, assuring anonymity and emphasizing that participation was entirely voluntary. Filling out and submitting the surveys were considered informed consent. Data protection and confidentiality were ensured by using codes for each psychiatric hospital and unit: only the study team at the University of Basel's Institute of Nursing Science was able to identify the study sites and units.

3. Results

3.1. Nurse characteristics and independent variables

We analyzed data from 994 registered nurses (see flowchart in Fig. 1) working on 114 units at 13 psychiatric hospitals (71.5 % response rate). Most registered nurses were female ($n = 681$, 68.5 %) with a mean age of 41.1 years (SD 12.40). Most registered nurses ($n = 421$, 42.2 %) were working with employment percentages of 61–90 %. On average, they had 14.6 years (SD 11.07) of professional experience in nursing. The measurement for the outcome emotional exhaustion was 2.54 (SD 0.73), which is located between "sometimes" and "seldom" (scale range 1–5). The measurement for an intention to leave the organization was 2.02 (SD 0.93), which corresponds to thinking about leaving

"several times a year." Perceived work-schedule control was 3.32 (SD 1.39, range 0–5); perceived work-schedule support from their supervisor was 3.28 (SD 1.14, range 0–4). On average, 9 % of the nurses had to take over a shift at short notice at least three times per month, and 40 % had worked at least 15 minute overtime on their most recent shift (Table 1).

3.2. Variation of work-schedule factors between psychiatric-hospital units

The ICC1 for all four work-schedule factors on the unit level was higher than 0.05 (perceived control 0.154, perceived supervisor support 0.091, shift changes at short notice 0.086, overtime 0.1), and as expected lower on the hospital level (perceived control 0.075, perceived supervisor support 0.021, shift changes at short notice 0.018, overtime 0.03) (Fig. 2).

3.3. Factors related to emotional exhaustion and intention to leave an organization

Emotional exhaustion correlated inversely with a lower employment percentage in all three models, meaning that nurses who work less than 60 % were less likely to be emotionally exhausted (Table 2). In model Ia, perceived work-schedule control and perceived work-schedule support from their supervisor were negatively associated (95 % CI -0.12 to -0.00, 95 % CI -0.15 to -0.04, respectively) with emotional exhaustion; in model IIa overtime was positively associated (95 % CI 0.05–0.47) with emotional exhaustion. When combining all four factors in model IIIa, perceived work-schedule control and shift changes at short notice were not significant.

Intention to leave an organization was positively associated with professional experience in all three models, meaning that nurses with less experience think more often about leaving than nurses with over 20 years of experience (Table 3). Again, in model Ib, perceived work-schedule control and perceived work-schedule support from their supervisor were negatively associated (95 % CI -0.24 to -0.10, 95 % CI -0.22 to -0.08, respectively) with an intention to leave. In model IIb, shift changes at short notice and overtime were both positively associated (95 % CI 0.03–0.18, 95 % CI 0.00–0.16, respectively) with an intention to leave. When combining all four factors in model IIIb, shift changes at short notice was no longer significant. The effects of

Table 1
Descriptive statistics, nurse characteristics, outcomes, and independent variables.

Value	n (%)	Mean (SD)	Missing (%)	Range
Total	994 (100)			
Age (years)	980 (98.6)	41.1 (12.40)	14 (1.4)	
Gender	990		4 (0.4)	
Female	681 (68.5)			
Male	309 (31.1)			
Employment percentage	972		22 (2.2)	
≤60	159 (16.0)			
61–90	421 (42.2)			
>90	392 (39.4)			
Professional experience in nursing (years)	921	14.6 (11.07)	73 (7.3)	
≤3	151 (15.2)			
>3–≤7	160 (16.1)			
>7–≤15	221 (22.2)			
>15–≤20	131 (13.2)			
>20	258 (26.0)			
Emotional exhaustion	984 (99.0)	2.54 (0.73)	10 (1.0)	1–4.8
Intention to leave the organization	987 (99.3)	2.02 (0.93)	7 (0.7)	0–5
Perceived work-schedule control	962 (96.8)	3.32 (1.39)	32 (3.2)	0–5
Perceived work-schedule support from supervisor	977 (97.9)	3.28 (1.14)	21 (2.1)	0–4
Unit level variables (n = 114 units)				
Shift changes at short notice in unit		0.09 (0.13)	0	0.00–1.00
Overtime in unit		0.40 (0.23)	0	0.00–1.00

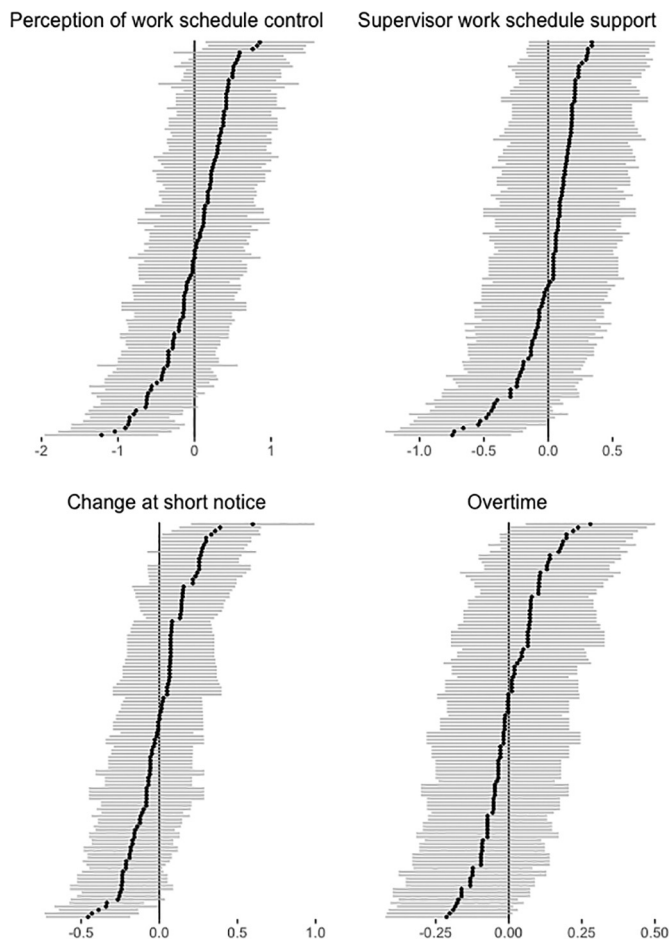Note. n = sample size; % = percentage; SD = standard deviation.

Fig. 2. Caterpillar plots of independent variables on an individual level. In each plot, the vertical lines represent the units, the dot in each line is the Empirical Bayes estimate, and the whiskers are the 95 % CI of the variable on a unit. The vertical line represents the grand mean of the variable. If the horizontal line does not touch the vertical line, the result for the unit differs significantly from the grand mean. Units on the bottom left scored significantly lower on the variable; units on the top right scored significantly higher on the variable.

perceived work-schedule control and perceived work-schedule support from their supervisor on an intention to leave were each twice as strong as the effects of shift changes at short notice and overtime.

4. Discussion

This analysis of Match[RN] Psychiatry study data explored work-schedule management in psychiatric hospitals and its associations with emotional exhaustion and the intention to leave an organization from a supply and demand perspective in nursing care. Overall, nurses' perceived work-schedule support from their supervisor was only slightly higher than their perceived work-schedule control. Working overtime was more frequent than shift changes at short notice. Of the two outcomes, emotional exhaustion was more common than an intention to leave an organization.

Perceived control, perceived supervisor support, shift changes at short notice, and overtime all showed relatively high ICC1s, confirming that there is nonrandom variability between units. This indicates that organizations, and units in particular, have a critical role in supporting nurses by matching scheduling needs in the unit with nurses' individual needs, and it reflects common practice in Switzerland, where the unit manager creates the work schedule. Although the effects in our models are rather small, our analysis revealed differential effects of the employer's scheduling needs on nurses' emotional exhaustion and intention to leave. Specifically, shift changes at short notice and overtime had a stronger impact on nurses' emotional exhaustion, whereas perceived work-schedule control and perceived work-schedule support from supervisors had a stronger influence on the nurses' intention to leave the workplace.

Our results show that emotional exhaustion is linked with employer scheduling needs, such as working overtime or shift changes at short notice. Working overtime is a frequent measure for nurses but does not necessarily mitigate staffing shortages. On the contrary, it contributes to higher levels of nursing care left undone, an increased risk of errors, and lower levels of reported quality of care and patient safety (Dall'Ora et al., 2016). Shift changes at short notice are associated with sleep disturbance (Min and Hong, 2022). Both of these factors should therefore be avoided to protect nurses, patients, and healthcare services. Organizations should provide predictable work schedules to prevent nurses' emotional exhaustion and contribute to a healthy workforce.

Table 2
Associations of emotional exhaustion with independent variables.

Predictors	Model Ia			Model IIa			Model IIIa		
	Estimates	CI	P	Estimates	CI	P	Estimates	CI	P
(Intercept)	2.53	2.41–2.65	<0.001***	2.51	2.39–2.62	<0.001***	2.53	2.41–2.64	<0.001***
Professional experience (years)									
≤3	0.19	0.04–0.34	0.015*	0.19	0.05–0.34	0.01*	0.17	0.02–0.32	0.027*
>3–≤7	0.12	−0.03–0.26	0.123	0.1	−0.04–0.25	0.164	0.11	−0.04–0.26	0.141
>7–≤15	0.11	−0.02–0.25	0.104	0.11	−0.02–0.24	0.096	0.11	−0.02–0.24	0.108
>15–≤20	0.04	−0.12–0.19	0.654	0.01	−0.14–0.16	0.878	0.04	−0.11–0.20	0.572
>20 (reference)									
Employment percentage									
≤60	−0.2	−0.34 to −0.06	0.006**	−0.2	−0.34 to −0.06	0.005**	−0.2	−0.34 to −0.06	0.005**
61–90	−0.04	−0.15–0.06	0.445	0	−0.11–0.10	0.957	−0.03	−0.14–0.07	0.554
>90 (reference)									
Perception of control	−0.06	−0.12 to −0.00	0.04*				−0.06	−0.11–0.00	0.052
Supervisor support	−0.09	−0.15 to −0.04	0.001**				−0.09	−0.15 to −0.03	0.002**
Change at short notice				0.04	−0.02–0.10	0.166	0.02	−0.04–0.08	0.457
Overtime				0.11	0.05–0.17	<0.001***	0.12	0.06–0.18	<0.001***
Random effects									
σ^2	0.47			0.47			0.47		
τ_{00}	0.05_unit			0.04_unit			0.04_unit		
ICC	0.09			0.09			0.07		
N	114_unit			114_unit			114_unit		
Observations	854			896			854		
Marginal R^2/conditional R^2	0.052/0.137			0.053/0.133			0.082/0.148		
AIC	1891.986			1986.477			1889.186		

Note. Model Ia: relation of emotional exhaustion to perceived work-schedule control and perceived work-schedule support from their supervisor; model IIa: relation of emotional exhaustion to shift changes at short notice and overtime; model IIIa: relation of emotional exhaustion to all four factors; CI = confidence interval; σ^2 = residual variance; τ = rank correlation coefficient; ICC = interclass correlation; R^2 = R squared; AIC = Akaike's information criterion.

* $P < 0.05$.
** $P < 0.01$.
*** $P < 0.001$.

Intention to leave is more strongly associated with perceived work-schedule control and perceived work-schedule support from their supervisor than with employer scheduling needs. Previous studies on work-schedule control have also found small but consistent effects on employees' higher musculoskeletal symptoms, depressive symptoms, and work–life balance (Albrecht et al., 2020; Nijp et al., 2012). Higher levels of perceived work-schedule control may protect nurses from psychological preoccupation with work in their free time and thus prevent emotional exhaustion (Vieten et al., 2022). Nurses' preferences on shift work and schedule patterns vary depending on their age or caregiving

Table 3
Associations of intention to leave an organization with independent variables.

Predictors	Model Ib			Model IIb			Model IIIb		
	Estimates	CI	P	Estimates	CI	P	Estimates	CI	P
(Intercept)	1.77	1.62–1.91	<0.001***	1.74	1.59–1.88	<0.001***	1.76	1.62–1.91	<0.001***
Professional experience (years)									
≤3	0.49	0.30–0.67	<0.001***	0.49	0.30–0.67	<0.001***	0.47	0.29–0.65	<0.001***
>3–≤7	0.53	0.35–0.71	<0.001***	0.53	0.35–0.71	<0.001***	0.52	0.34–0.70	<0.001***
>7–≤15	0.35	0.19–0.52	<0.001***	0.36	0.20–0.53	<0.001***	0.35	0.19–0.52	<0.001***
>15–≤20	0.21	0.02–0.40	0.027*	0.15	−0.04–0.34	0.132	0.22	0.03–0.41	0.024*
>20 (reference)									
Employment percentage									
≤60	−0.12	−0.30–0.05	0.163	−0.11	−0.28–0.06	0.219	−0.13	−0.30–0.05	0.151
61–90	−0.06	−0.18–0.07	0.391	0.03	−0.10–0.16	0.666	−0.04	−0.17–0.08	0.495
>90 (reference)									
Perception of control	−0.17	−0.24 to −0.10	<0.001***				−0.17	−0.23 to −0.10	<0.001***
Supervisor support	−0.15	−0.22 to −0.08	<0.001***				−0.14	−0.21 to −0.07	<0.001***
Change at short notice				0.11	0.03–0.18	0.004**	0.07	−0.00–0.13	0.053
Overtime				0.08	0.00–0.16	0.038*	0.07	0.00–0.14	0.036*
Random effects									
σ^2	0.71			0.75			0.7		
τ_{00}	0.04_unit			0.07_unit			0.04_unit		
ICC	0.06			0.09			0.05		
N	114_unit			114_unit			114_unit		
Observations	857			900			857		
Marginal R^2/conditional R^2	0.143/0.194			0.083/0.163			0.160/0.204		
AIC	2224.164			2399.879			2227.735		

Note. Model Ib: relation of intention to leave to perceived work-schedule control and perceived work-schedule support from their supervisor; model IIb: relation of intention to leave to shift changes at short notice and overtime; model IIIb: relation of intention to leave to all four factors; CI = confidence interval; σ^2 = residual variance; τ = rank correlation coefficient; ICC = interclass correlation; R^2 = R squared; AIC = Akaike's information criterion.

* $P < 0.05$.
** $P < 0.01$.
*** $P < 0.001$.

responsibilities (Ejebu et al., 2021). Individual work-schedule needs could therefore be managed in a team mixed by age and caregiving responsibilities. Therefore, hospitals have a responsibility as employers to create a work environment that fosters team stability. Additionally, self-administrated work scheduling could be a promising approach to supporting nurses' individual needs, if implemented thoughtfully (Wynendaele et al., 2021). Studies have shown that work-schedule components tend to be similar in nurses from the same unit, meaning that unit culture may also have an effect on these similarities (Cho et al., 2021). Unit managers and organizations should foster and support a workplace culture that respects nurses' needs regarding work-schedule management and considers working overtime and shift changes at short notice as exceptions and not as common practice.

4.1. Strengths and limitations

This study is the first multicenter survey to examine the associations of work-schedule management with emotional exhaustion and an intention to leave in a large sample of nurses in Swiss psychiatric hospitals. Regarding patient needs and nursing interventions, there are differences between general hospitals and psychiatric hospitals. However, these differences are not relevant to the care supply and demand perspective we have adopted in our study. Therefore, our findings are of interest to hospitals with diverse profiles. The inclusion of gender in the model did not result in a better fit. The higher proportion of males in nursing within the mental health setting does not limit the generalizability of the findings. To assess whether the independent variables were appropriate for model calculations, we thoroughly examined them using Mokken-scale analysis and ICC2 for assessing the reliability of the aggregated measure. However, our study has three main limitations. First, the cross-sectional design does not allow inferences about causality. Second, all the variables were self-reported by the nurses, which is a potential source of common-method bias, although this might have been mitigated by aggregate measures. Third, although this is a relatively large multicenter study, the sample was not randomly selected, which limits the generalizability of the findings.

5. Conclusions

Our study results indicate that the observed variation for perceived work-schedule control, perceived supervisor support, shift changes at short notice, and overtime between units are promising factors for interventions to prevent emotion exhaustion and an intention to leave an organization in nurses. Unit managers should try to increase the stability of work schedules and nurses' influence on their work schedules. Organizations should provide stable work schedules to reduce nurses' emotional exhaustion and contribute to a healthy workforce. This could consequently reduce early career endings and early retirement and counteract nurse shortages. Further studies will be necessary to examine which aspects of unit culture are relevant for work-schedule management. Additionally, using longitudinal data would allow more robust inferences and reduce the bias inherent in cross-sectional studies.

Funding

CRediT authorship contribution statement

Beatrice Gehri: Conceptualization, Formal analysis, Project administration, Writing – original draft. **Stefanie Bachnick:** Conceptualization, Writing – review & editing. **René Schwendimann:** Conceptualization, Writing – review & editing. **Michael Simon:** Methodology, Supervision, Writing – review & editing.

Data availability

All data files are available from https://doi.org/10.5281/zenodo.7609447.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Albrecht, S.C., Kecklund, G., Leineweber, C., 2020. The mediating effect of work–life interference on the relationship between work-time control and depressive and musculoskeletal symptoms. Scand. J. Work Environ. Health 46 (5), 469–479. https://doi.org/10.5271/sjweh.3887.

Bates, D., Mächler, M., Bolker, B., Walker, S., 2015. Fitting linear mixed-effects models using lme4. J. Stat. Softw. 67, 1–48. https://doi.org/10.18637/jss.v067.i01.

Cho, H., Han, K., Ryu, E., Choi, E., 2021. Work schedule characteristics, missed nursing care, and organizational commitment among hospital nurses in Korea. J. Nurs. Scholarsh. 53 (1), 106–114. https://doi.org/10.1111/jnu.12612.

Dall'Ora, C., Ball, J., Recio-Saucedo, A., Griffiths, P., 2016. Characteristics of shift work and their impact on employee performance and wellbeing: a literature review. Int. J. Nurs. Stud. 57, 12–27. https://doi.org/10.1016/j.ijnurstu.2016.01.007.

Dhaini, S.R., Denhaerynck, K., Bachnick, S., Schwendimann, R., Schubert, M., De Geest, S., Simon, M., Group, M. R. study, 2018. Work schedule flexibility is associated with emotional exhaustion among registered nurses in Swiss hospitals: a cross-sectional study. Int. J. Nurs. Stud. 82, 99–105. https://doi.org/10.1016/j.ijnurstu.2018.03.019.

Ejebu, O.-Z., Dall'Ora, C., Griffiths, P., 2021. Nurses' experiences and preferences around shift patterns: a scoping review. PLoS One 16 (8), e0256300. https://doi.org/10.1371/journal.pone.0256300.

Gehri, B., Bachnick, S., Schwendimann, R., Simon, M., 2021. Matching registered nurse services with changing care demands in psychiatric hospitals: protocol for a multicenter observational study (MatchRN Psychiatry Study). JMIR Res. Protocol. 10 (8), e26700. https://doi.org/10.2196/26700.

Griffiths, P., Dall'Ora, C., Simon, M., Ball, J., Lindqvist, R., Rafferty, A.-M., Schoonhoven, L., Tishelman, C., Aiken, L.H., Consortium, R., 2014. Nurses' shift length and overtime working in 12 European countries: the association with perceived quality of care and patient safety. Med. Care 52 (11), 975–981. https://doi.org/10.1097/MLR.0000000000000233.

Hasselhorn, H.-M., Müller, B.H., Tackenberg, P., Kümmerling, A., Simon, M., 2005. Berufsaustieg bei Pflegepersonal. Arbeitsbedingungen und beabsichtigter Berufsaustieg bei Pflegepersonal in Deutschland und Europa. Wirtschaftsverlag NW.

Holland, P., Tham, T.L., Sheehan, C., Cooper, B., 2019. The impact of perceived workload on nurse satisfaction with work–life balance and intention to leave the occupation. Appl. Nurs. Res. 49, 70–76. https://doi.org/10.1016/j.apnr.2019.06.001.

Kilbourne, A.M., Beck, K., Spaeth-Rublee, B., Ramanuj, P., O'Brien, R.W., Tomoyasu, N., Pincus, H.A., 2018. Measuring and improving the quality of mental health care: a global perspective. World Psychiatry 17 (1), 30–38. https://doi.org/10.1002/wps.20482.

Kossek, E.E., Rosokha, L.M., Leana, C., 2020. Work schedule patching in health care: exploring implementation approaches. Work. Occup. 47 (2), 228–261. https://doi.org/10.1177/0730888419841101.

Kristensen, T.S., Hannerz, H., Høgh, A., Borg, V., 2005. The Copenhagen Psychosocial Questionnaire–a tool for the assessment and improvement of the psychosocial work environment. Scand. J. Work Environ. Health 31 (6), 438–449. https://doi.org/10.5271/sjweh.948.

LeBreton, J.M., Senter, J.L., 2008. Answers to 20 questions about interrater reliability and interrater agreement. Organ. Res. Methods 11 (4), 815–852. https://doi.org/10.1177/1094428106296642.

Leineweber, C., Chungkham, H.S., Lindqvist, R., Westerlund, H., Runesdotter, S., Smeds Alenius, L., Tishelman, C., consortium, R., 2016. Nurses' practice environment and satisfaction with schedule flexibility is related to intention to leave due to dissatisfaction: a multi-country, multilevel study. Int. J. Nurs. Stud. 58, 47–58. https://doi.org/10.1016/j.ijnurstu.2016.02.003.

Liebermann, S.C., Müller, A., Weigl, M., Wegge, J., 2015. Antecedents of the expectation of remaining in nursing until retirement age. J. Adv. Nurs. 71 (7), 1624–1638. https://doi.org/10.1111/jan.12634.

Lüdecke, D., 2022. sjPlot: data visualization for statistics in social science. In R package version 2.8.12. https://CRAN.R-project.org/package=sjPlot.

Min, A., Hong, H.C., 2022. Work schedule characteristics associated with sleep disturbance among healthcare professionals in Europe and South Korea: a report from two cross-sectional surveys. BMC Nurs. 21 (1), 189. https://doi.org/10.1186/s12912-022-00974-3.

Musy, S.N., Endrich, O., Leichtle, A.B., Griffiths, P., Nakas, C.T., Simon, M., 2020. Longitudinal study of the variation in patient turnover and patient-to-nurse ratio: descriptive analysis of a Swiss university hospital. J. Med. Internet Res. 22 (4), e15554. https://doi.org/10.2196/15554.

Nakagawa, S., Schielzeth, H., 2010. Repeatability for Gaussian and non-Gaussian data: a practical guide for biologists. Biol. Rev. 85 (4), 935–956. https://doi.org/10.1111/j.1469-185X.2010.00141.x.

Nijp, H.H., Beckers, D.G.J., Geurts, S.A.E., Tucker, P., Kompier, M.A.J., 2012. Systematic review on the association between employee worktime control and work-non-work balance, health and well-being, and job-related outcomes. Scand. J. Work Environ. Health 38 (4), 299–313. https://doi.org/10.5271/sjweh.3307.

R Core Team, 2022. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing. https://www.R-project.org.

Sharififard, F., Asayesh, H., Rahmani-Anark, H., Qorbani, M., Akbari, V., Jafarizadeh, H., 2019. Intention to leave the nursing profession and its relation with work climate and demographic characteristics. Iran. J. Nurs. Midwifery Res. 24 (6), 457–461. https://doi.org/10.4103/ijnmr.IJNMR_209_18.

Sijtsma, K., van der Ark, L.A., 2017. A tutorial on how to do a Mokken scale analysis on your test and questionnaire data. Br. J. Math. Stat. Psychol. 70 (1), 137–158. https://doi.org/10.1111/bmsp.12078.

Snijders, T.A.B., Bosker, R.J., 2011. Multilevel analysis: an introduction to basic and advanced multilevel modeling. https://uk.sagepub.com/en-gb/eur/multilevel-analysis/book234191.

Steege, L.M., Rainbow, J.G., 2017. Fatigue in hospital nurses—'supernurse' culture is a barrier to addressing problems: a qualitative interview study. Int. J. Nurs. Stud. 67, 20–28. https://doi.org/10.1016/j.ijnurstu.2016.11.014.

Stimpfel, A.W., Arabadjian, M., Liang, E., Sheikhzadeh, A., Weiner, S.S., Dickson, V.V., 2020. Organization of work factors associated with work ability among aging nurses. West. J. Nurs. Res. 42 (6), 397–404. https://doi.org/10.1177/0193945919866218.

Stoffel, M.A., Nakagawa, S., Schielzeth, H., 2017. rptR: repeatability estimation and variance decomposition by generalized linear mixed-effects models. Methods Ecol. Evol. 8 (11), 1639–1644. https://doi.org/10.1111/2041-210X.12797.

Tivian, 2019. Unipark. Tivian. https://www.unipark.com.

Van der Ark, L.A., 2012. New developments in Mokken scale analysis in R. J. Stat. Softw. 48 (5), 1–27.

Vieten, L., Wöhrmann, A.M., Michel, A., 2022. Work-time control and exhaustion: internal work-to-home interference and internal home-to-work interference as mediators. Int. J. Environ. Res. Public Health 19 (6). https://doi.org/10.3390/ijerph19063487.

Watanabe, M., Yamauchi, K., 2018. The effect of quality of overtime work on nurses' mental health and work engagement. J. Nurs. Manag. 26 (6), 679–688. https://doi.org/10.1111/jonm.12595.

Wynendaele, H., Gemmel, P., Pattyn, E., Myny, D., Trybou, J., 2021. Systematic review: what is the impact of self-scheduling on the patient, nurse and organization? J. Adv. Nurs. 77 (1), 47–82. https://doi.org/10.1111/jan.14579.

Zraychikova, E., Gehri, B., Zúñiga, F., Bachnick, S., Simon, M., 2023. The interaction between leadership, the patient-to-nurse ratio and nurses' work–life balance in the psychiatric inpatient setting in Switzerland: a secondary data analysis of cross-sectional data. Adm. Policy Ment. Health Ment. Health Serv. Res. 50 (2), 317–326. https://doi.org/10.1007/s10488-022-01239-6.