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Effects of Full-Time Hospital Nurses' Work Schedules are Evaluated

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Abstract

Nurses' work schedules are known to impact their well-being and job performance. pandemic further intensified the workload and stress levels of hospital nurses, leading to potential changes in their work schedules and conditions. This study aimed to evaluate and compare the work schedules of full-time hospital nurses before and during the pandemic, focusing on shift patterns, working hours, and related factors.This study was conducted at a regional secondary care hospital. Work schedule data were collected from handwritten records and analyzed using IBM SPSS Statistics 26.0. The study included 24 nurses who met the inclusion criteria. Descriptive statistics, repeated measures t-tests, and independent t-tests were used to compare variables such as shift length, number of workdays, consecutive shifts, and sick leave. Statistical significance was set at $p < 0.05$.Most nurses (75%) followed rotating shift patterns, though rotation direction was inconsistent. There was a significant increase in total annual working hours in 2024 compared to 2023. Nurses worked an average of three weekends per month, with fewer free weekends available in 2024. Sick leave usage nearly doubled in 2024, with 37.5% of nurses taking more than 10 sick days compared to 20.8% in 2023. Despite increased workload, quick returns between shifts were not observed.increase in nurses' working hours and sick leave usage, indicating heightened job demands and potential health impacts. The findings highlight the need for better scheduling strategies to support nurses' well-being, including more consistent shift rotations, adequate rest periods, and policies to mitigate excessive workload during health crises.

Keywords: *Hospital Nurses', Work Schedules.*

Introduction

Healthcare facilities, particularly hospitals, faced the challenge of enhancing their preparedness to accommodate patients needing hospitalization due to COVID-19 (1). The pandemic significantly impacted the mental well-being of nurses, leading to heightened levels of anxiety, depression, fear, and even suicide (2-4). The increased complexity and volume of their tasks amplified job demands (5,6). Furthermore, even in non-pandemic times, the conventional work schedule (from 7 am to 3 pm, with weekends off) is the

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exception rather than the rule for nurses (7). In the European Union, however, work hours are regulated by the EU Working Time Directive (European Parliament, 2003) (8).

Nurses' shift schedules can either follow a cyclic or non-cyclic model. In cyclic scheduling, fixed patterns of work and rest days are established, with staff continuously rotating through them (9). In contrast, non-cyclic scheduling allows nurses to choose shifts according to their preference, with new schedules created at the start of each month (10). Scheduling decisions often need to be adjusted daily, and shifts may change unexpectedly (11). The primary goal is to balance meeting individual preferences with reducing staffing costs (12,13).

When planning shift schedules, managers must consider several factors that could disrupt employees' circadian rhythms if not managed properly. Key aspects include rapid schedule changes (14,15), the speed and direction of shift rotations (16,17), the duration of shifts (especially 12-hour shifts) (14,17-21), start and end times of shifts (14), insufficient breaks between shifts or quick turnarounds (19,21-24), working on days off (25), and excessive work hours (over 60 hours per week) (26). To mitigate these issues, experts recommend prioritizing sleep, adopting slow-forward shift rotations, ensuring shifts are rotated every two weeks, allowing an average of two days off per week (27), taking regular breaks (16), providing nurses with some control over their schedules (14), and, where possible, using 8-hour shifts (20). The structure of work in healthcare environments has been linked to the well-being of employees, with shift work being a significant risk factor for poor health (29,30).

This study sought to examine and compare the working hours and schedules of hospital nurses in 2023 and 2024. It was hypothesized that the COVID-19 pandemic would bring about significant changes in working hours and scheduling patterns in 2024. The specific objectives included answering the following questions: How did the nurses' work schedules differ between 2023 and 2024? How many hours and days do nurses work weekly or monthly? How many consecutive days do they work? What is the length of their shifts? What is the direction of shift rotations? Are quick turnarounds required? How many consecutive night shifts do nurses work? How many day/evening/night shifts do they complete annually? How many weekends are they off per year? Are there any unique aspects of nursing schedules that are not well-documented in the literature?

Gathering data about nurses' working conditions is crucial. While most studies on nurses' work hours and schedules have been conducted in high-income countries, using shift scheduling software or self-reported data, this research can provide valuable insights into how nurses' schedules operate in developing countries. Understanding these patterns is important for addressing potential negative impacts of scheduling practices and improving nurses' working conditions. This knowledge is critical for designing interventions that can mitigate adverse effects linked to schedule changes.

Materials and Methods

This study was carried out to examine and describe the working conditions of nursing staff in 2023 and 2024. Data collection was conducted by the principal investigator.

The study was conducted in a regional secondary care hospital with 26 specialty departments and approximately 300 beds. The hospital employs about 430 nursing personnel, with the majority being nursing technicians (NT) (n=280; 65.12%) and a smaller proportion of registered nurses (RN) (n=150; 34.88%). The hospital handles approximately 20,000 annual episodes under a prospective payment system and has an annual bed occupancy rate of 62%. The focus was on a medical ward with 109 beds, which had 6,125 patients admitted in 2023 and 6,828 in 2024. For confidentiality, the hospital's identity was anonymized upon request by the management.

Participants and Data Sources

Permission for the study was obtained from the hospital's management, and the nursing manager invited all nurses from the medical ward to participate during a staff meeting. Although all nursing staff were

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invited, those with specific roles, such as the head nurse, nurses in charge of ordering supplements, , students, and those who resigned during the study period, were excluded from the sample. On January 1, 2023, there were 45 NT and 28 RN on the medical ward, while by December 31, 2024, the numbers were 51 NT and 28 RN. A total of 71 eligible nurses were initially considered, but only 24 (33.8%) met the study's criteria and were included in the analysis. Of these, 10 (41.7%) were RNs and 14 (58.3%) were NTs. Among the participants, 5 (20.8%) were male. The average age of the nurses was 31 to 40 years (54.2%), with the rest spread across other age groups. Nurses in the sample had between 4 and 33 years of experience in nursing, with an average of 14.67 years (SD = 9.47).

Variables

Independent variables included: (a) observation year (2023, 2024); (b) demographic data (gender, age, number of children, age of youngest child, years of nursing experience, usual shift worked); (c) educational status (RN, NT).

Dependent variables included: (a) schedule characteristics, such as shift hours, long workweeks (> 40 hours/week), consecutive night shifts, the number of day, evening, and night shifts per year, the number of free weekends per year, and the rotation direction of shifts; (b) work hour characteristics, such as weekly working hours, number of working days, sick days, education days, annual leave, and working hours per day.

Shifts were categorized by time of day: day shifts (06:00–15:00), evening shifts (14:00–21:30), and night shifts (19:00–07:30). Shifts exceeding 9 hours were considered long shifts. A distinction was made between working days and shifts, as nurses could work multiple shifts in a day. Net working hours accounted for actual work time, while gross hours included leave, sick days, and education time. Quick returns were defined as shifts with less than 11 hours of rest between them.

Rotation directions referred to whether shifts followed a forward (clockwise) or backward (counter-clockwise) order. Work patterns were assessed based on combinations of shifts, with categories for long workweeks, consecutive workdays, and free weekends.

The data from the 24-month nursing schedules (12 months each from 2023 and 2024) were obtained, which were handwritten and formatted in A3 size. These schedules were anonymized, and nurses were assigned identification numbers that remained consistent across both years.

Statistical Methods

Data analysis was performed using IBM SPSS Statistics 26.0, with reliability ensured through random selection of nurses who met the inclusion criteria. The data were first explored for inconsistencies. Descriptive statistics were used for analysis, including mean (M), standard deviation (SD), frequency (n), percentage (%), and Pearson's correlation (r). Correlation strengths were interpreted as follows: 0-0.09 (no correlation), 0.1-0.3 (weak correlation), 0.31-0.6 (moderate correlation), and 0.61-1 (strong correlation) (31).

Statistical tests included the repeated measures t-test and independent groups t-test to compare means between groups, with a significance level set at $p < 0.05$. Cronbach's Alpha for the instrument used in the study was 0.895 (n=419).

Results and Discussion

A majority of the nurses (75%, n = 18) followed rotating shifts, while a smaller proportion (12.5%, n = 3) worked exclusively during the day or evening without covering night shifts. An additional 12.5% (n = 3) had alternative schedules. Collectively, 24 nurses accumulated 54,166.26 gross working hours in 2023 and 54,707.91 in 2024.

For those on rotating shifts, the rotation pattern was inconsistent, fluctuating between forward and backward directions. Due to this variability, it was not feasible to determine a fixed rotation pattern. Notably,

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none of the nurses experienced quick returns in their shifts. A statistically significant increase in total annual working hours was observed in 2024 compared to 2023 (Table 1). Most nurses worked three weekends per month, with annual free weekends ranging from a minimum of 5 (2023, 2024) to a maximum of 44 (2023) and 42 (2024). However, the number of free weekends available to nurses decreased in 2024.

The annual sick leave data revealed a significant difference between the two years, with the average number of sick days nearly doubling in 2024. In 2023, sick leave ranged from a minimum of 0 to a maximum of 16 days, whereas in 2024, it varied from 0 to 50 days. Approximately 20.8% (n = 5) of nurses had more than 10 sick days in 2023, increasing to 37.5% (n = 9) in 2024 (Table 2).

The number of consecutive workdays ranged from an average of 3.75 in 2023 and 3.17 in 2024 to a maximum of 8.08 and 8.83, respectively. The total number of education hours significantly decreased in 2024 compared to 2023. The frequency of night shifts rose from an average of 36 in 2023 to 39 in 2024. The mean number of consecutive night shifts dropped from 1.64 in 2023 to 1.28 in 2024, representing a statistically significant difference. No nurses worked four or more consecutive night shifts in either year. Among different categories of nurses, those with more than 50 night shifts per year varied, with 0% among RNs and 63.6% (n = 7) among NTs.

In contrast, the number of day shifts per year was significantly lower in 2024, while the frequency of extended shifts increased. The minimum number of long shifts per year was 6 in 2023 and 11 in 2024, while the maximum was 45 in 2023 and 57 in 2024. However, the frequency of extended workweeks exceeding 40 hours remained relatively stable across both years (t=-0.661, df=19, Sig. 0.516).

Correlations indicated that as nurses aged, they were more likely to work evening shifts (r=0.473, p=0.020). Additionally, the number of workdays per year increased as the youngest child of a nurse got older (r=0.466, p=0.022). When comparing two groups of nurses based on their educational background, significant differences were found in multiple aspects of their schedules and work hour patterns

One of the key findings of this study was the considerable variation in work schedules and shift characteristics between 2023 and 2024. Notably, certain differences were observed concerning nurses' educational backgrounds, the absence of quick returns, a restriction to a maximum of three consecutive night shifts per month, and relatively low sick leave rates.

Comparing the work schedules between the two years, it was evident that nurses in 2024 were assigned more long shifts. This finding aligns with prior research, which reported that approximately 17% of nurses experienced modifications to their schedules , primarily through increased long workdays (32, 33). Long work hours have been associated with fatigue, diminished job performance, obesity, injuries, and an array of chronic illnesses (34-36). Although extended shifts do not necessarily lead to adverse health effects if total work hours remain unchanged (37), the study sample revealed that nurses worked approximately 200 additional hours in 2024 compared to 2023. Given that prolonged workweeks have been linked to chronic fatigue, a heightened risk of diabetes, cardiovascular diseases, and musculoskeletal disorders (21, 37, 38), the observed schedules appear concerning. The findings suggest that the nursing administration may not have given adequate consideration to shift lengths. While some studies suggest that nurses favor longer shifts over standard eight-hour ones (36), others highlight discrepancies between actual working hours and preferred schedules (39). Implementing strategies to enhance working conditions could mitigate the need for additional hours (40), while scheduling software could provide better insight into workload distribution and prevent excessive work hours (41).

During 2024, fewer consecutive night shifts were observed compared to 2023. No nurse exceeded three consecutive night shifts per month, which contrasts with shift patterns seen in some other regions (42). Given that night shifts are associated with high fatigue levels (43), scheduling fewer than four consecutive night shifts aligns with best practice recommendations (37). While nurses in this study benefited from reduced consecutive night shifts, the unpredictable shift rotation patterns may have contributed to increased fatigue (17, 44).

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The reduction in free weekends in 2024 was also notable, with some NTs having as few as five free weekends in the entire year, while others had over 40. This disparity suggests inconsistencies in scheduling, which may lead to dissatisfaction and potential conflicts. Furthermore, limited free time for rest and recovery could negatively affect nurses' quality of life (45).

Sick leave increased in 2024, consistent with findings from other studies, which identified pre-existing health conditions, exhaustion, and fear of infection as major predictors of absenteeism during the pandemic (46). However, no significant correlation was found between demographic or schedule characteristics and sick leave. This was unexpected, as previous research indicates that older employees and female staff are more likely to take sick leave (47, 48). The relatively low average sick leave per year—approximately 6 days in 2023 and 10 in 2024—was also surprising when compared to prior findings, which reported an average of 12 days annually (49).

The key strength of this study was the use of objective data, enabling an in-depth analysis of individual nurses' work schedules and shift characteristics. However, several limitations must be acknowledged: (1) a relatively small sample size; (2) difficulty in interpreting data from paper schedules; (3) the majority of studies focus on RNs rather than NTs or other nurse profiles; (4) a lack of detailed data on RN shift patterns, particularly when working multiple shifts in succession.

Future research should explore nursing schedules in healthcare systems that still rely on paper-based shift planning, as this can complicate schedule tracking and optimization. These findings underscore the increased work demands imposed on nurses during the COVID-19 pandemic and highlight the need for ongoing monitoring of work schedules over time.

Table 1. Distribution (%) of Working Hour Characteristics Summarized by Individuals

Variables		**% (n)**	
		2023	**2024**
Dayshift	0	0 (0)	0 (0)
	1 - 100	37.5 (9)	33.2 (8)
	101 - 200	62.5 (15)	66.7 (18)
	> 200	0 (0)	0 (0)
Evening Shift	0	12.5 (3)	16.7 (4)
	1 - 12	25 (6)	25 (6)
	13 - 50	25 (6)	8.3 (2)
	> 50	37.5 (9)	50 (12)
Nightshift	0	12.5 (3)	16.7 (4)
	1 - 12	16.7 (4)	8.3 (2)
	13 - 50	41.7 (10)	45.8 (11)
	> 50	29.2 (7)	29.2 (7)
Long Weeks (> 40h/week)	0	0 (0)	0 (0)
	1 - 12	0 (0)	0 (0)
	13 - 50	0 (0)	0 (0)
	> 50	100 (24)	100 (24)
Free Weekends	0	0 (0)	0 (0)
	1 - 12	8.3 (2)	25 (6)
	13 - 50	91.7 (22)	75 (18)
	> 50	0 (0)	0 (0)
Long Day Shift	0	0 (0)	0 (0)
	1 - 12	16.7 (4)	8.3 (2)
	13 - 50	83.3 (20)	83.3 (20)
	> 50	0 (0)	8.3 (2)
Sick Days	≤ 10 days	79.2 (19)	62.5 (15)
	> 10 days	20.8 (5)	37.5 (9)

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Legend: % = Percent, n = Number.

Table 2. Repeated Measures t-Test Results, Considering Year (df = 23)

Variables	Year	Statistics			
		Mean	SD	t	Sig.
Total Working Hours (neto)	2023	1698	135.92	-7.38	0.00
	2024	1901	169.72		
No. Consecutive Night Shifts	2023	1.64	0.87	4.12	0.00
	2024	1.281	0.85		
No. Free Weekends	2023	23.37	11.04	4.27	0.00
	2024	20.29	10.72		
No. Education Hours	2023	8.33	11.67	3.50	0.00
	2024	1.00	2.70		
No. Long Shifts	2023	24.29	11.63	-3.27	0.00
	2024	29.29	13.28		
No. Day Shifts	2023	113.83	39.84	2.16	0.04
	2024	105.29	43.73		
No. Sick Hours	2023	46.33	39.33	-2.12	0.04
	2024	85.33	84.75		
Continuous Working Days	2023	5.23	0.89	-1.56	0.13
	2024	5.47	1.25		
No. Evening Shifts	2023	35.29	30.06	-1.24	0.23
	2024	38.83	36.06		
No. Night Shifts	2023	36.83	29.69	-0.85	0.41
	2024	39.12	32.30		
No. Working Days	2023	202.79	14.31	-0.73	0.47
	2024	205.29	20.40		

Legend: No. = Number/Frequency, SD = Standard Deviation, t = t-test coefficient, Sig. = Statistical Significance.

Conclusion

While the nurse management in this study successfully handled certain scheduling aspects, ongoing efforts are needed to enhance and optimize shift planning. Increasing awareness and competency in schedule management is essential for improving working conditions. This research provides valuable baseline information for nursing administrators, encouraging the adoption of scheduling software to reduce errors and improve shift allocation efficiency.

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