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**The impact of shift work on intensive care nurses' lives outside work: a cross-sectional study**

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## **ABSTRACT**

### **Aims and Objectives**

To examine how shift work affects intensive care nurses' lives outside work.

### **Background**

Shift work is unavoidable for many nurses. When attempting to minimise negative effects of shift work it is important to identify areas which affect nurses working shifts.

### **Design**

A cross-sectional study.

### **Methods**

A questionnaire survey among Danish intensive care nurses concerning experiences with shift work and family life, spare time activities, sleep and health.

### **Results**

A total of 114 nurses (88%) participated. Shift work was found to influence the opportunities for spare time activities, and about 25% of both evening and night shift groups found that working shifts sometimes led to social isolation. A total of 58% of nurses working evening-shifts sometimes to very often experienced having trouble falling asleep when working shifts. Night-shift workers had a higher percentage of physical and mental symptoms when working shifts compared with evening-shift workers, with mood swings and headaches being the most common. The median score for thriving on working shifts was 8 (IQR 5-9) for evening-shift

workers and 8 (IQR 7-9) for night-shift workers (scale 0-10 with 10 being the highest level of thriving).

### **Conclusion**

Shift workers reported that working shifts had a negative impact on life outside work. Opportunities for participating in spare time activities and difficulties falling asleep after shifts were the main issues for evening-shift workers, whereas physical symptoms such as headaches and mood swings were more dominant among night-shift workers. Despite the negative effects, the participants generally thrived on working shifts.

### **Relevance to clinical practice**

By identifying modifiable areas which negatively influence life outside work when working shifts, it will be possible subsequently to plan interventions aimed at decreasing the negative effects. Interventions may include nurses having increased influence on their work schedules and education in sleep hygiene and dietary habits.

## **WHAT DOES THIS PAPER CONTRIBUTE TO THE WIDER GLOBAL CLINICAL COMMUNITY?**

- Knowledge about areas outside work which are negatively influenced by shift work:
  - Opportunities for participating in spare time activities and difficulties falling asleep after shifts are the main issues for evening-shift workers
  - Physical and mental symptoms such as headaches and mood swings are dominant among night-shift workers.
- This knowledge can be used to intervene against negative effects of shift work

## INTRODUCTION

As hospital patients need care 24 hours a day, shift work is a necessary part of working life for a substantial number of nurses. When attempting to minimise negative effects of shift work it is important to identify areas which affect nurses working shifts.

## BACKGROUND

Working shifts can negatively affect health (Matheson *et al.* 2014): in the short term, with physical and mental symptoms like fatigue (Akerstedt and Wright 2009), eating disorders (Wong *et al.* 2010), and poor quality of sleep (Akerstedt *et al.* 2010; Axelsson *et al.* 2004), and in the long term, with increased risks of becoming overweight and developing impaired glucose tolerance (Proper *et al.* 2016), shift work disorder, anxiety and depression (Kalmbach *et al.* 2015), cardiovascular diseases (Frost *et al.* 2009) and cancer (Wang *et al.* 2011). Night shifts have been specifically associated with breast cancer (Bonde *et al.* 2012). Apart from impacting on health, shift work may also affect life outside work in regard to family (Agosti *et al.* 2015, Newey and Hood 2004, Yildirim and Aycan 2008) and spare time activities (Agosti *et al.* 2015).

There has been an increased focus on the negative effects of shift work over the last decades and different interventions have been examined. Power-napping during night shifts may decrease sleepiness and improve sleep-related performance (Ruggiero and Redeker 2014). Controlled light exposure may improve sleep efficiency (Neil-Sztramko *et al.* 2014), and physical activity and education in sleep hygiene may likewise improve sleep quality (Neil-Sztramko *et al.* 2014). Some studies have reported improved sleep quality by changing to forward (clockwise) rotating shifts and (Neil-Sztramko *et al.* 2014), and rapidly rotating shifts (1-2 consecutive nights) are recommended due to less disruption of the circadian rhythm (Bonde *et al.* 2012). Flexible working conditions and nurses' influence on their work

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schedule planning may have a positive impact on the balance between work and private life, as long as flexible working interventions are not dictated by organisational interests (Albertsen *et al.* 2014, Joyce *et al.* 2010).

The general health and well-being of the nurse are associated with the quality of care he or she provides (Dall'Ora *et al.* 2016, Hall *et al.* 2016), but it is first and foremost important for the individual nurse. Effects of shift work are complex and individual (Dall'Ora *et al.* 2016). Knowledge which is focused on the personal experiences of shift workers and how shift work fits into the rest of their lives is needed (Matheson *et al.* 2014). The aim of this study was to examine how intensive care nurses experience the effects of shift work on life outside work.

## METHODS

### Design and instrument

The study design was cross-sectional, whereby a questionnaire survey concerning the experienced effects of shift work on life outside work was conducted. The questionnaire consisted of 49 questions with fixed response categories and an option for writing comments. The questionnaire was originally developed and validated by the National Research Centre for the Working Environment (NRCWE), Copenhagen based on work environment research. The NRCWE granted permission for its use in this project. As the original tool was developed for night-shift workers, a similar version for evening-shift workers was developed with identical questions apart from a question on the possibilities of power-napping during the night shift. A few questions about light exposure and health were added for both evening- and night-shift workers. The adapted questionnaires were pilot tested for face and content validity on six intensive care nurses, both evening- and night-shift workers. Based on their comments a few changes were made, most significantly, an extension of response categories for most questions from three to five (originally: always, sometimes, never; changed version:

very often/always, often, sometimes, rarely, never) as all pilot participants found the response options non-exhaustive. This correlated with a high ceiling effect. Subsequently the updated questionnaires were tested again on the pilot study group, now without comments.

The study was part of a larger intervention study examining the impact of dynamic light on nurses' circadian rhythms (measured by melatonin profiles from saliva samples), quality of sleep (sleep efficiency, number of awakenings and subjective assessment of sleep; measured by sleep monitors and sleep diaries), and subjective experiences of sleep quality (measured by a sleep questionnaire survey).

### **Population**

Inclusion criteria: ICU nurses who worked shifts either full time in the evening, full time at night or a combination of either daytime/evening, daytime/night or daytime/evening and night. Both nurses working full time (37 hours a week) and part time were included. The participants were divided into two groups: evening-shift workers and night-shift workers. Nurses working both day, evening and night shifts were placed in the group (evening or night-shift) where they had most of their shifts. For example, if a nurse worked generally eight shifts per month and three of those were night shifts, she was placed in the evening shift group. If the shifts generally were evenly distributed between evening and night, the nurses were randomly assigned to one of the groups.

Eligible participants were informed about the study verbally and in writing. Consenting participants received the questionnaire by e-mail. A reminder was sent if the questionnaire was not completed within 10 days.

The participants came from two secondary general Danish Intensive Care Units (ICU) with 11 and 8 ICU beds, respectively. In both ICUs, nurses plan their own work schedule in an electronic work planning system. Before a set deadline, they plot their scheduling requests for a certain period and have the opportunity to reserve up to four shifts or days off as

important. After the deadline, a manager looks through the plan and marks days and shifts upon which there are either too many or not enough staff. Subsequently, the nurses have a new time period in which to change their individual plan to meet the needs of the ICU. After this deadline, the manager will make adjustments if any shift is still not balanced. However, days and shifts marked as important will not be changed. Generally, the manager only needs to make few adjustments in the plan meaning that most of the staff wishes are complied with.

### **Data Analysis**

The questionnaire was distributed through the electronic survey system SurveyXact and results were transferred to the statistical program Stata 13 for analyses. Descriptive analyses and comparative analyses were performed using the Chi square test, Fishers exact test or the Mann Whitney U-test. A p-value below 0.05 was considered significant. Data are presented by percentages or medians and interquartile range (IQR).

### **Ethics**

The study was approved by The Regional Committees on Health Research Ethics for Southern Denmark (S-20110140) and registered with The Danish National Data Protection Agency. All participants provided written informed consent.

## **RESULTS**

A total of 114 nurses (88% of eligible participants) agreed to participate and all filled in the questionnaire.

Table 1 shows background characteristics of the participants.

*(Table 1)*

Table 1 shows that there was no statistically significant difference in background characteristics between nurses working evening-shifts and nurses working night-shifts. Most were employed full-time (37 hours per week) or close to full-time. Almost all of the



participants reported that they had either total or some degree of influence over their work schedule.

For 97% of the participants, a normal shift was between 8-8½ hours, with 26% working 12 hour shifts at weekends. Total transportation time to and from work was < ½ hour for 45% and between ½ - 1 hour for 42% of participants. The most used modes of transportation were car (75%) and bike (20%) (data not shown).

Table 2 presents the participants' experiences of how shift work negatively affected family life, the possibilities for spare time activities and the feeling of being socially isolated. It also presents their experiences of quality of sleep and use of medication and alcohol in connection with sleep.

*(Table 2)*

The majority of both evening- and night-shift workers found that shift work sometimes or often had an impact on family life (Table 2). Particularly Especially in the case of nurses working evening-shifts, shift work influenced the opportunities for spare time activities. About 25% of participants from both groups found that working shifts sometimes led to social isolation, and 58% of nurses working evening-shifts reported that they sometimes to very often had trouble falling asleep when working shifts. Very few of the participants used sleep medication or alcohol to promote sleep.

For participants working night-shifts, 12% always or almost always had a power-nap, 44% often, and 44% sometimes (data not shown).

The median score (on a scale from zero to 10) for thriving on working shifts was 8 (IQR 5-9) for evening-shift workers and 8 (IQR 7-9) for night-shift workers ( $p=0.14$ ).

## Health

A total of 76% of evening-shift workers and 81% of night-shift workers assessed their general health as good or very good, and 95% and 90%, respectively, assessed their physical condition as average or good.

Table 3 shows the participants' experience of physical and mental symptoms when working shifts.

*(Table 3)*

A significantly higher percentage of night-shift workers had symptoms when working shifts compared with evening-shift workers, with mood swings and headaches being the most common (Table 3).

In regard to dietary habits, 57% of evening-shift workers and 61% of night-shift workers assessed their dietary habits as healthy in general, and 41% and 44%, respectively assessed their dietary habits as healthy when working shifts. Approximately 40% of both groups changed their dietary habits when working shifts (data not shown).

## DISCUSSION

The study shows that working evening and night shifts has an impact on family, spare time activities, sleep and health. In accordance with other studies, the majority of participants found that working shifts sometimes or often influenced family life (Newey & Hood 2004, Yildirim & Aycan 2008). As most of spare time activities take place in the afternoons and evenings, it is natural that a higher percentage of nurses working evening-shifts found that shift work influenced their opportunities to participate in activities outside work. About a quarter of participants in both groups found that working shifts to some extent induced social isolation. However, whereas shift work in general is found to have negative effects on life outside work, it may also help to balance private and work life if it is possible to create a

work schedule that fits the individual nurse (Agosti *et al.* 2015). This was also found in this study, where the median assessment on how well the participants thrived on working shifts was eight out of ten. One of the reasons for this high rating might be that participants had influence on their working schedule and thus were better able to balance demands from family and spare time life with work. Having the opportunity to plan your work schedule (Joyce *et al.* 2010, Albertsen *et al.* 2014) or being satisfied with the shift schedule (Axelsson *et al.* 2004) has been found to be an important factor in minimising the negative effects of shift work, and the results from this study support this.

In regard to health, it is recommended that a maximum of two night-shifts at a time are scheduled to minimise disruptions in the circadian rhythm (Bonde *et al.* 2012). For a nurse with a median of seven shifts per month, this may seem problematic as there will be a lot of shifting between day- and night-shifts. However, in order to balance health-promoting interventions and life outside work, individual influence on work schedules is important.

Disturbed circadian rhythms and sleep disorders have been found to be some of the most important factors for long-term consequences of shift work (Matheson *et al.* 2014) but are also factors affecting physical and mental well-being (Gamaldo *et al.* 2014). Therefore, interventions that help nurses improve sleep such as light exposure at work (Brawley 2009, Bonde *et al.* 2012, Czeisler 2013, Neil-Sztramko *et al.* 2014, Jensen *et al.* 2015,) and instructions for best sleep practice (Matheson *et al.* 2014, Neil-Sztramko *et al.* 2014) are also recommended.

Although for many years it has been known that dietary habits influence general well-being and health, approximately 40% of the participants changed their dietary habits when working shifts. The percentage of nurses rating their diet as healthy decreased during shift work, which has also been found in other studies (Wong *et al.* 2010). Chronically eating at unusual circadian times creates a metabolic disturbance which may induce a health risk

(Gonissen *et al.* 2012). The results from this study imply that there may be a need to elucidate the importance of healthy dietary habits to shift workers (Berger and Hobbs 2006).

While the participants found that shift work negatively influenced life outside work, the participants also thrived on working shifts, as found in other studies (Agosti *et al.* 2015). To maintain or improve satisfaction with shift work, interventions which decrease the negative effects are important.

Strengths of the study include a detailed mapping of effects of shift work and the high response rate which minimises the risk of response bias. Limitations include the self-reported data and the cross-sectional design which only provides the participants' subjective assessment of how shift-work affects their life outside work. A total of 29% worked both evening and night shifts. They were placed in the group where they had most of their shifts or randomly assigned to a group if the number of shifts were evenly distributed. For the small sub-sample having an even distribution of evening and night shifts, their experiences may have been affected by working both shifts which may reduce the differences between the groups. However, the questions they responded to clearly asked for experiences in regard to either evening or night shifts. Only two Danish ICUs participated in the study which decreases the possibilities for generalisation. As ICU patients require intensive care 24 hours per day, the percentage of shifts is generally higher in an ICU compared with other hospital departments. However, working shifts will likely have a similar effect on nurses from other departments working the same amount of shifts and having the same opportunities to plan their own work schedule, whereas fewer shifts per month may have fewer negative effects on life outside work. As almost all ICU nurses work shifts, it was not possible to compare the results with nurses only working day time. Other factors than shift work such as the ICU environment itself may have influenced the experiences.

## CONCLUSION

Shift workers reported that working shifts had a negative impact on life outside work in regard to family, spare time activities, sleep and health. Opportunities for participating in spare time activities and difficulties falling asleep after shifts were the main issues for evening-shift workers, whereas physical and mental symptoms such as headaches and mood swings in connection with shift work were more dominant among night-shift workers.

## RELEVANCE TO CLINICAL PRACTICE

By identifying modifiable areas which negatively influence life outside work it will be possible subsequently to plan interventions to decrease these negative effects. Interventions may include nurses having an increased influence on their work schedules and education in sleep hygiene and dietary habits.

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## TABLES

**Table 1. Background characteristics**

	Evening-shift (n=56)		Night-shift (n=58)		p <sup>2</sup>
	Median	IQR <sup>1</sup>	Median	IQR	
<b>Age</b>	44	(37-53)	40	(35-50)	0.17
<b>Years employed in the ICU</b>	6	(5-13)	7	(3-13)	0.53
<b>Work hours per week</b>	37	(32-37)	36	(32-37)	0.42
<b>Number of shifts per month<sup>3</sup></b>	8	(6-9)	7	(6-9)	0.88
	n	%	n	%	p <sup>4</sup>
<b>Live with partner</b>	45	(80)	48	(83)	0.74
<b>Children living at home</b>	35	(62)	36	(62)	0.96
<b>Shift type</b>					
Day/evening or night	34	(61)	38	(66)	0.76
Day/evening and night <sup>5</sup>	16	(29)	17	(29)	
Only evening or night	5	(9)	3	(5)	
<b>Years with shift work</b>					
< 1 year	2	(4)	0	(0)	0.36
1 - < 10 years	26	(46)	23	(40)	
10 år - < 20 years	15	(27)	22	(38)	
20 years or more	13	(23)	13	(22)	
<b>Influence on planning shifts</b>					
Yes, totally	13	(23)	12	(21)	0.91
Yes, to some degree	43	(77)	45	(78)	
Yes, but minimally	0	(0)	1	(2)	

1. Inter-quartile range

2. Mann-Whitney U-test

3. Excluding those working full time evening or night. The number of shifts includes both evening and night shifts for those working both.

4. The Chi-square test or Fishers Exact test as appropriate

5. Nurses working both day, evening and night shifts were placed in the group (evening or night-shift) where they had most of their shifts.



**Table 2. Effect of shift-work on life outside work**

	Very often /always		Often		Sometimes		Rarely		Never		p <sup>1</sup>
	n	%	n	%	n	%	n	%	n	%	
Family life											
Evening-shifts	4	(7)	10	(18)	25	(45)	11	(20)	6	(11)	0.62
Night-shifts	3	(5)	10	(17)	30	(52)	13	(22)	2	(3)	
Spare time activities											
Evening-shifts	6	(11)	11	(20)	23	(41)	13	(23)	3	(5)	0.02
Night-shifts	0	(0)	7	(12)	21	(36)	25	(43)	5	(9)	
Social isolation											
Evening-shifts	2	(4)	1	(2)	14	(25)	24	(43)	15	(27)	0.68
Night-shifts	0	(0)	2	(3)	14	(24)	29	(50)	13	(22)	
Difficulty falling asleep 1 <sup>2</sup>											
Evening-shifts	3	(5)	6	(11)	20	(36)	25	(45)	1	(2)	0.66
Night-shifts	3	(5)	3	(5)	19	(33)	30	(52)	3	(5)	
Difficulty falling asleep 2 <sup>3</sup>											
Evening-shifts	11	(20)	1	(2)	20	(36)	20	(36)	4	(7)	<0.001
Night-shifts	0	(0)	2	(4)	9	(16)	30	(53)	16	(28)	
Restless and interrupted sleep 1											
Evening-shifts	2	(4)	18	(32)	25	(45)	10	(18)	1	(2)	0.67
Night-shifts	4	(7)	12	(21)	29	(50)	12	(21)	1	(2)	
Restless and interrupted sleep 2											
Evening-shifts	2	(4)	7	(13)	25	(45)	21	(38)	1	(2)	0.33
Night-shifts	5	(9)	14	(24)	20	(34)	18	(31)	1	(2)	
Possibility of quiet surroundings 1											
Evening-shifts	30	(54)	19	(34)	4	(7)	3	(5)	0	(0)	0.28
Night-shifts	30	(52)	20	(34)	8	(14)	0	(0)	0	(0)	
Possibility of quiet surroundings 2											
Evening-shifts	35	(64)	10	(18)	7	(13)	3	(5)	0	(0)	0.06
Night-shifts	28	(49)	23	(40)	5	(9)	1	(2)	0	(0)	
Use sleep medication 1											
Evening-shifts	0	(0)	0	(0)	2	(4)	4	(7)	50	(89)	0.89
Night-shifts	0	(0)	0	(0)	1	(2)	4	(7)	53	(91)	
Use sleep medication 2											
Evening-shifts	0	(0)	0	(0)	0	(0)	4	(7)	52	(93)	1.00
Night-shifts	0	(0)	0	(0)	0	(0)	4	(7)	53	(93)	
Use alcohol 1											
Evening-shifts	0	(0)	0	(0)	0	(0)	4	(7)	50	(89)	0.89
Night-shifts	0	(0)	0	(0)	3	(3)	3	(5)	53	(91)	
Use alcohol 2											
Evening-shifts	0	(0)	0	(0)	2	(4)	3	(5)	50	(91)	0.88
Night-shifts	0	(0)	0	(0)	1	(2)	3	(5)	53	(93)	

1. Chi-square test or Fishers exact test as appropriate

2. For all items, "1" indicates experiences in connection with sleep when not working shifts

3. For all items, “2” indicates experiences in connection with sleep when working shifts

**Table 3. Physical and mental symptoms when working shifts**

	Evening-shifts (n=56)		Night-shifts (n=58)		p <sup>1</sup>
	n	%	n	%	
<b>Headache</b>	4	(7)	18	(31)	<b>0.001</b>
<b>Dizziness</b>	0	(0)	3	(5)	0.24
<b>Nausea</b>	1	(2)	8	(14)	<b>0.03</b>
<b>Diarrhoea/constipation</b>	9	(16)	8	(14)	0.73
<b>Mood swings</b>	11	(20)	22	(38)	<b>0.03</b>

1. The Chi-square test or Fishers Exact test as appropriate