High Fatigue Scores Among Older Dutch Nurse Anesthetists

Vera Meeusen, CRNA, PhD, MA
Jaap Hoekman, CRNA
André van Zundert, MD, PhD, FRCA, EDA, FANZCA

In the Netherlands, hospital care production pressure recently increased substantially, while the number of nurse anesthetists available did not match this rise. The longtime existing norm of no night shifts for nurses beyond the age of 55 years was increased to age 57 to meet the demand for more nurse anesthetists. In this pilot study, we aimed to determine the level of fatigue and its correlation with demographic items among this category of employees. A validated questionnaire was distributed to all Dutch nurse anesthetists above 50 years of age working in Dutch hospitals, which asked for their level of fatigue. The Checklist Individual Strength Questionnaire was used to measure fatigue.

Overall, 105 of 115 potential participants completed the questionnaire (response rate, 91%). The mean scores (± standard deviation) were as follows: total fatigue, 81.3 ± 8.3; subjective fatigue, 31.4 ± 3.2; physical activity, 13.1 ± 2.2; motivation, 16.8 ± 2.6; and concentration, 20.0 ± 3.8. No correlation could be demonstrated between demographic characteristics and fatigue. Dutch nurse anesthetists above the age of 50 years show a high fatigue score and therefore need special attention to prevent them from harmful physical and psychological effects and to sustain maximal patient safety.

Keywords: Fatigue, nurse anesthetist, on-call shifts.

Until 2009, nurses older than 55 years of age were not obliged to perform night shifts in the Dutch healthcare sector. However, healthcare production pressure in the Netherlands has forced mandatory night shifts on nurse anesthetists up to the age of 57 years, and this could have patient safety implications. Reilly et al[1] demonstrated that aging is associated with a decreased tolerance of late-night shift work. Negotiations between Dutch healthcare employers and the national labor unions in 2009 resulted in the age increase for night duties. However, it is questionable whether older employees at the last phase of their career are fit enough for the job to perform night shifts and whether it is a safe practice for their patients.

Human physiologic design dictates circadian patterns of alertness and performance, which includes a vital need for sleep. The human circadian (*circa* meaning around and *dies* a day) timekeeper is located in the suprachiasmatic nucleus of the hypothalamus, is an active pacemaker for internal 24-hour rhythm,[2] and controls performance levels.[3] Humans are programmed for increased sleepiness at 2 approximate times each day: 3 to 7 AM and 1 to 4 PM.[3,4] The lowest levels of activity, alertness, and performance are also the moments with greatest vulnerability to errors, incidents, and accidents, which typically occur around 3 to 7 AM.[5,6] Researchers for the Australian Incident Monitoring Study (AIMS) identified the period between 2 AM and 6 AM as the "danger zone".[7]

Job demands requiring too much effort are associated with building up negative load effects that spill over to the home domain. Therefore, it is more difficult to recover at home sufficiently from the effort one has put into the job. Employees with a prolonged recovery time after work must exert additional effort the next working day to cope with the job demands. When job demands are high in the long term, this process starts a vicious circle in which a high need for recovery after work requires additional effort the next day. This cycle may result in a progression from acute to chronic sleep deprivation, and then to exhaustion and burnout.[8,9] Recovery time and physiologic damage increases with every phase in this process.[10]

Fatigue is a feeling of weariness, tiredness, or lack of energy and can develop in response to physical exertion, emotional stress, boredom, alcohol, medication, or lack of sleep.[11-14] Whatever the underlying cause may be, fatigue is a reduced capacity for cognitive performance.[11,13]

Fatigue among healthcare personnel is predictable, with very little interindividual variability, and can harm both the patient and the healthcare worker.[15] Numerous physiologic effects are caused by fatigue, such as dysphoria[16]; increased reaction time; worsened situational analysis; increased anxiety, anger, duration of eye blinking,[17] plasma glucose levels, and glucose resistance[18]; and increased risk for hypertension, obesity, depression, myocardial infarction, and stroke.[13]

Particularly vulnerable to the effects of fatigue are the cognitive demands of personnel in patient care, which

requires data collection; evaluation of the relevance of the data to patient status; development and implementation of plans to restore, maintain, or improve the desired patient status; and monitoring of the outcome of interventions. These complex tasks require sustained attention or "vigilance".[19-22]

In anesthesia personnel, fatigue results in not reacting to subtle changes such as recovery from neuromuscular blockade or an empty intravenous bag,[10] risk of syringe swap increased by a factor of 4, and the risk of underdosage or overdosage by a factor of 2.[23]

The aim of this study was to explore the subjective levels of fatigue on nurse anesthetists older than 50 years of age and possible correlations between demographic factors and fatigue levels. The results of this pilot study can be used to explore fatigue in the overall profession of nurse anesthesia, resulting in a discussion about staffing, the role of the older employee during night shifts, and safety in anesthesia care.

Materials and Methods

Before sending the questionnaire to all participants, we tested it among a small group of older recovery room nurses to be sure the questions were understood in the correct way. In September 2012, all Dutch nurse anesthetists older than 50 years and working in Dutch hospitals were approached to respond to an online multiple-choice questionnaire consisting of demographic and fatigue-related items. Every nurse could complete the questionnaire only once. The Dutch Society of Nurse Anesthetists approved this pilot study. The online questionnaire was closed 2 months later. The demographic characteristics collected in the survey included age and gender; percentage of employment (part-time or full-time); number of day, evening, and night shifts in the last 2 weeks; and whether they perform on-call shifts. Because recovery time is essential in developing fatigue, the number of weeks since their last holiday of at least 1 week was asked.

To measure fatigue, we used the Checklist Individual Strength Questionnaire, which was tested in many different populations but not among nurse anesthetists, and is a validated instrument for measuring fatigue by daily work.[24-26] The construct of fatigue exists for 20 items (Table 1) measured on a 7-point Likert scale (1 = this is totally true, 7 = this is totally untrue). Four subscales were used: (1) subjective fatigue; (2) physical activity; (3) motivation; and (4) concentration. Subscale scores were obtained by summing the individual scores. The total score was obtained by summing the subscale scores. Demographic items were used as control factors for statistical analysis (SPSS version 16.0, SPSS Inc). $P < .05$ was considered statistically significant.

Results

Of 115 Dutch nurse anesthetists older than 55 years of age, 105 completed the questionnaire. This study concentrates on the responses of 105 (91%) nurse anesthetists (37 women and 68 men) who filled out the questionnaire completely. Age ranged from 50 through 61 years, and 85% performed on-call shifts. On average, nurse anesthetists performed 7 day, 2 evening, and 2 night shifts during the last 14 days and enjoyed their last holiday 9 weeks earlier (Table 2).

No correlation could be demonstrated between the demographic items and subjective fatigue, physical activity, motivation, concentration, and total fatigue score. The mean total fatigue score was 81.3 ± 8.3, mean subjective fatigue score was 31.4 ± 3.2, mean physical activity score was 13.1 ± 2.2, mean motivation score was 16.8 ± 2.6, and mean concentration score was 20.0 ± 3.8.

1. I feel tired.
2. I feel very active.
3. Thinking requires effort.
4. Physically I feel exhausted.
5. I feel like doing all kinds of nice things.
6. I feel fit.
7. I do quite a lot within a day.
8. When I'm doing something, I can concentrate quite well.
9. I feel weak.
10. I don't do much during the day.
11. I can concentrate well.
12. I feel rested.
13. I have trouble concentrating.
14. Physically, I feel I'm in a bad condition.
15. I'm full of plans.
16. I get tired very quickly.
17. I have a low output.
18. I feel no desire to do anything.
19. My thoughts easily wander.
20. Physically I feel in a good shape.

Table 1. Checklist: Individual Strength
(From Vercoulen et al.[25])

Discussion

To our knowledge, this is the first pilot study that measures the fatigue levels of Dutch nurse anesthetists at the age of 50 years or above. Vercoulen et al[27] developed the CIS-instrument and measured fatigue in different populations, which included normal healthy persons (mean age, 37.1 years).In comparison, older Dutch nurse anesthetists in our study showed twice as high a level of fatigue. This is in line with the results of Gander et al,[28] who found twice as high a level of excessive sleepiness among junior doctors (Epworth Sleepiness Score) compared with normal healthy people. Recently, Chang et al[29] also found scores well above average sleepiness among full-time faculty anesthesiologists.

Statistical parameter	Age, y	Day shift	Evening shift	Night shift	Employment	Holiday
Mean	54.6	7.3	2.1	2.01	34.16	8.86
Median	55.0	8.0	2.0	2.0	36.0	8.0
Mode	57.0	8.0	2.0	1.0	36.0	12.0
Minimum	50.0	1.0	1.0	1.0	18.0	1.0
Maximum	61.0	12.0	11.0	10.0	43.0	28.0

Table 2. Mean, Median, Mode, Minimum, and Maximum of Demographic Variables[a]

[a] Day, evening, and night shifts indicate number of shifts during last 14 days; employment, average working hours per week; holiday, number of weeks since last holiday of at least 7 days.

We found no correlation between evening or night shifts and fatigue. This is comparable with other research,[29,30] which found no differences in physiologic sleepiness in baseline conditions in anesthesia trainees and anesthesiologists. Ulas et al[31] found high oxidative stress parameters, which are related to fatigue, at the end of the day and after night shifts. If baseline fatigue levels are high over a long time, this would mean that the job demands are constantly too high to recover fully, which suggests an unbalance between job demands and the capacities of the older nurse anesthetists. This is in line with earlier findings in which older Dutch nurse anesthetists suffered from higher levels of absenteeism and burnout than younger ones.[32] Absenteeism is considered a type of coping behavior used in situations where a longer recovery period is needed.[33]

However, a review article by De Cordova et al,[34] about the effects of night shifts among nurses, showed that most studies found a positive correlation between working during off-shift hours and fatigue, well-being, and sleep disturbances.

Other reasons for fatigue are long working hours and limited breaks. Especially working days with fewer than 4 hours of sleep is harmful.[6] Yet, the work hours of Dutch nurse anesthetists are restricted to a maximum 12 hours per day, 60 hours per week, including rest time of 30 minutes after 5.5 hours of work and afterward a minimal 11 hours of rest. Night shifts are restricted to a maximum of 10 hours per night, followed by at least 14 hours of rest. After 3 night shifts, a nurse anesthetist is obliged to get a minimum of 48 hours' rest. These limits conform to the limits recommended by, for example, the American Institute of Medicine and are well below the work hours considered harmful. However, forward-shift rotation, which causes less fatigue, is not compulsory but is advised.[35]

Anesthesia team members are exposed to the unpredictability of work, fear of litigation, pressures for competence, and the need for sustained vigilance as well as erratic opportunities for nutrition, hydration, and bathroom breaks; they work in isolation from other anesthesia colleagues, have a dynamically changing team membership, and have to integrate different professional cultures.[36-39] Nowadays, workload can also increase because of the pressure to take care of more patients instead of focusing on quality of care.

In this study, all nurses performed evening and night shifts in the last 2 weeks. Although no correlation to fatigue was found, the disruption of the normal circadian rhythm can be an explanation for higher fatigue levels. Considering the latter, enjoying a recent holiday had no impact on fatigue levels. This seems to be in contrast with the studies of Howard et al.[30] They found, after 4 cycles of 24 hours in a controlled situation with sleeping periods according to a healthy rhythm, that objective fatigue scores were significantly less among anesthesia trainees.

Our study has several limitations. Only the subjective fatigue levels of older nurse anesthetists were studied, and hence we cannot draw any causal conclusions. Second, we did not measure the fatigue level of the total population of nurse anesthetists and therefore cannot compare our findings with their younger counterparts. Third, we did not objectively measure the physiologic status of each participant in this pilot. According to Howard et al,[30] a discrepancy between reporting awake and actually being asleep exists in more than 50% of the cases. Finally, we did not include factors that may be involved in or mediated by the level of fatigue (eg, coping strategies, responsibilities).

In conclusion, this study demonstrated twice as high a fatigue level among nurse anesthetists above 50 years of age compared with that in normal healthy controls previously reported.[27] Further studies should include cohorts of younger (less than 55 years) nurse anesthetists compared with older nurse anesthetists as well as include cohorts of different healthcare professionals. Future research also should search more in-depth for causes of fatigue and study the interaction with other related variables such as perceived stress, teamwork, duration of rest breaks, basic knowledge about risks of fatigue, and sleep habits to clarify the associations between symptoms and risk factors. Hopefully, this pilot study can be a guide for future research because only then will it be possible to decrease the fatigue level of older nurse anesthetists and keep these nurses fit for the job. Addressing fatigue will require awareness within the hospital and its negative impact on patients' safety.

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AUTHORS

Vera Meeusen, CRNA, PhD, MA, is a nurse anesthetist in Brisbane, Australia. Email: verameeusen44@gmail.com.

Jaap Hoekman, CRNA, is a lecturer at Saxion University of Applied Sciences, Enschede, the Netherlands, and at Fontys University of Applied Sciences, Eindhoven, the Netherlands, and is president of the International Federation of Nurse Anesthetists.

André van Zundert, MD, PhD, FRCA, EDA, FANZCA, is professor and chairman, Department of Anesthesiology and Perioperative Medicine, University of Queensland, School of Medicine, Royal Brisbane and Women's Hospital, Herston-Brisbane, Queensland, Australia.