ISRCTN65218850 https://doi.org/10.1186/ISRCTN65218850

# Shift work, sleep, health, and safety among hospital employees

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| **Submission date**<br>27/02/2025 | **Recruitment status**<br>No longer recruiting | [X] Prospectively registered<br>[_] Protocol<br>[_] Statistical analysis plan<br>[_] Results<br>[_] Individual participant data<br>[X] Record updated in last year |
| **Registration date**<br>28/02/2025 | **Overall study status**<br>Completed | |
| **Last Edited**<br>28/02/2025 | **Condition category**<br>Other | |

## Plain English summary of protocol

Background and study aims
The healthcare sector in Norway, like many other European countries, is facing a significant demand for additional workforce due to an aging population and increasing healthcare needs. This demand is compounded by high turnover rates, significant sick leave, and declining applications to health-related education. Shift work, which is common among hospital workers, is associated with negative health effects, increased risk of accidents, and higher turnover intention. However, the causal factors and mechanisms are not fully understood. This study aims to explore the impacts of working time arrangements on sleep, health, safety, and staff turnover among hospital workers. By using new and better-quality data sources, we hope to identify effective interventions to improve the retention, well-being, and safety of hospital workers.

Who can participate?
Hospital employees at Haukeland University Hospital and Haraldsplass Deaconale Hospital who work regular and/or irregular rotating shifts and hold at least a 50 percent position are eligible to participate in this study.

What does the study involve?
Participants will use a sleep radar device called Somnofy® to record their sleep for a period of 2 months. This device uses radar technology to measure sleep duration, sleep quality, and sleep stages in a non-intrusive way. Participants will also complete a baseline questionnaire before starting the sleep measurements and a follow-up questionnaire after the 2-month period. The questionnaires will collect information on health, work-related conditions, and other relevant factors. Additionally, data on working hours and sickness absence will be retrieved from the hospitals' registers to analyze the impact of specific shift characteristics on health and work-related outcomes.

What are the possible benefits and risks of participating?
By participating in this study, healthcare workers will contribute to research that may lead to improved working conditions, a better understanding of the impacts of shift work, and the development of interventions to enhance the well-being and safety of healthcare workers. Some participants may feel uncomfortable with the recording and analysis of personal information, even though it is treated confidentially. Being part of the study might increase

awareness of health challenges related to shift work, potentially leading to increased stress or concern. Additionally, changes in work schedules based on study results may not be positively received by everyone and could require adjustments in an already demanding work environment.

Where is the study run from?
The study is conducted among employees at Haukeland University Hospital and Haraldsplass Deaconale Hospital in Bergen, and Voss Hospital in Voss, Norway.

When is the study starting and how long is it expected to run for?
November 2023 to December 2025

Who is funding the study?
Research Council of Norway

Who is the main contact?
Øystein Vedaa, oystein.vedaa@fhi.no

# Contact information

### Type(s)
Public, Scientific, Principal investigator

### Contact name
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# Additional identifiers

### Clinical Trials Information System (CTIS)
Nil known

### ClinicalTrials.gov (NCT)
Nil known

### Protocol serial number
335746

# Study information

### Scientific Title

How shift work influences sleep, health, safety, and staff turnover among hospital employees

## Acronym
WeBeSafe

## Study objectives
Research Question A: What characterizes the sleep pattern of hospital workers when working different shifts and how this relates to turnover intention?

Hypotheses:
1. Sleep will be shorter and of poorer quality between night shifts, before early morning shifts, and with quick returns (late/early shift), compared with day shifts and days off.
2. Sleep will be more superficial (light sleep) before early morning shifts and with quick returns, and there will be more deep sleep associated between two evening shifts and two days off.
3. Exposure to unfavourable shifts (e.g., night shifts and quick returns) will be associated with higher turnover intention, and this relationship will be mediated by disturbed sleep.

Research Question B: To what extent do sleep duration and sleep quality mediate the negative effects of shift work?

Hypotheses:
1. Sleep duration and sleep quality are significant mediators of the relationship between shift work and self-reported physical and mental health, fatigue, the incidence of work-related accidents and adverse events, and turnover/turnover intention.
2. There will be a significant main effect of evening shifts, night shifts, and quick returns on the risk of sickness absence (from registers) and self-reported work productivity, and sleep duration and sleep quality are significant mediators of this relationship.

## Ethics approval required
Ethics approval required

## Ethics approval(s)
approved 21/06/2024, Regional Committees for Medical and Health Research Ethics (Gullhaugveien 1-3, Oslo, Postboks 1130, Norway; +47 (0)22 84 55 11; rek-sorost@medisin.uio.no), ref: REK: 2024/761517

## Study design
Observational cohort study with a cross-sectional component

## Primary study design
Observational

## Study type(s)
Other

## Health condition(s) or problem(s) studied
Shift work

## Interventions

Participants will be recruited from Haukeland University Hospital and Haraldsplass Diakonale Hospital in Bergen, Norway, targeting 150 employees who work regular and/or irregular rotating shifts in at least a 50 percent position.

Objective data will be retrieved from two registers: the working time register (payroll data) and sickness absence records (short- and long-term) from the two hospitals. The variables collected from the working time register include the identification number for each employee, working hours (date, start and end time for each shift), and background information (gender, age, seniority, percentage of full-time position, job category, and unit level such as medicine, psychiatry, rehabilitation, etc). The sickness absence register provides information on the start and end dates of sickness absence, the percentage of sick leave, whether the absence was self-certified or doctor-certified, and whether the absence was due to a sick child.

To answer the research questions, new data will be collected from approximately 150 employees using the sleep monitor (radar) Somnofy® to record their sleep over a period of 60 days (approximately 2 months) in their homes. The participants will have reading access to their own sleep data through the Somnofy Research app. Data from Somnofy® includes sleep duration, sleep onset latency (SOL), wake after sleep onset (WASO), time spent in bed (TIB), sleep efficiency, as well as the time spent in different sleep stages through the sleep period. This data will be linked to the register data on working time and sickness absence over the same period.

Questionnaire data will also be collected. Participants will provide simple demographic information when they sign the consent form and receive the sleep radar. After the 2-month registration period, they will complete a slightly longer questionnaire.

The total duration of observation and follow-up for each participant is approximately 2 months. This comprehensive data collection will provide a detailed understanding of working hours and absence patterns in relation to sleep quality and health, which is central to the research project's objectives.

## Intervention Type
Other

## Primary outcome(s)
Sleep monitor variables:
1. Sleep duration (total sleep time) for the primary sleep period is objectively measured daily by a sleep monitor (Somnofy) for 2 months
2. Time in light sleep for the primary sleep period is objectively measured daily by a sleep monitor (Somnofy) for 2 months
3. Time in deep sleep for the primary sleep period is objectively measured daily by a sleep monitor (Somnofy) for 2 months
4. Time in rapid eye movement(REM)-sleep for the primary sleep period is objectively measured daily by a sleep monitor (Somnofy) for 2 months

## Key secondary outcome(s))
Sleep monitor variables:
1. Sleep onset latency (the duration of time from turning the light off to falling asleep) for the primary sleep period is objectively measured daily by a sleep monitor (Somnofy) for 2 months.
2. Wake after sleep onset (time spent awake after falling asleep) for the primary sleep period is objectively measured daily by a sleep monitor (Somnofy) for 2 months.

3. Sleep efficiency (total sleep time/time in bed) for the primary sleep period is objectively measured daily by a sleep monitor (Somnofy) for 2 months.

Register data variables:
4. Sickness absence (number of days and number of spells) is measured by register data (the hospital's day-to-day registration of participants' working hours and sick leave) over the 2-month sleep registration period.

Questionnaire data variables:
5. Turnover intention is measured using the Turnover Intention Scale (TIS) at 2-month follow-up.
6. Psychological detachment is measured using the relevant scale from the Recovery Experience Questionnaire (REQ) at 2-month follow-up.
7. Patient-related burnout is measured using the relevant scale from the Copenhagen Burnout Inventory (CBI) at 2-month follow-up.
8. Work-related negative incidents (e.g. dozing off at work, causing harm to patients/others) are measured using a reduced version of the work-related negative incidents questionnaire at 2-month follow-up.
9. Self-reported medication errors (e.g. administered wrong drug dosage, administered drug to wrong patient) at the workplace are measured using self-developed questions at 2-month follow-up.
10. Self-reported injuries (e.g. needlestick or sharp objects) at the workplace are measured using self-developed questions at 2-month follow-up.
11. Self-reported exposure to hazardous chemicals (e.g. chemotherapy) at the workplace is measured using self-developed questions at 2-month follow-up.
12. Self-reported threats/violence (e.g. verbal threats) at the workplace is measured using self-developed questions at 2-month follow-up.
13. Anxiety is measured using the Subjective Health Complaints (SHC) scale at 2-month follow-up.
14. Depression is measured using the Subjective Health Complaints (SHC) scale at 2-month follow-up.
15. Insomnia is measured using the Bergen Insomnia Scale (BIS) at 2-month follow-up.
16. Work ability is measured using the Work Ability Score (WAS) at 2-month follow-up.
17. Sleepiness/tiredness at work, related to different shifts (day, evening, night, quick return, and long shifts), is measured using a revised version of the Bergen Shift Work Sleep Questionnaire (BSWSQ) at 2-month follow-up.
18. Sleepiness/tiredness during free time on different shift work days (day, evening, night, quick return, and long shifts) is measured using a revised version of the Bergen Shift Work Sleep Questionnaire (BSWSQ) at 2-month follow-up.
19. Sleepiness/tiredness when not working/on vacation is measured using the Bergen Shift Work Sleep Questionnaire (BSWSQ) at 2-month follow-up.
20. Leader support is measured using an adapted version of the leader support scale by Esther Greenglass at 2-month follow-up.
21. Shift work preferences (e.g. preferred monthly frequency of day shifts) is measured using self-developed questions at baseline and 2-month follow-up.

### Completion date
31/12/2025

## Eligibility

### Key inclusion criteria

1. Employees at Haukeland University Hospital and Haraldsplass Deaconal Hospital
2. Working regular and/or irregular rotating shifts
3. At least a 50 percent position
4. Aged 18-70 years

### Participant type(s)
Health professional, Employee

### Healthy volunteers allowed
No

### Age group
Adult

### Lower age limit
18 years

### Upper age limit
70 years

### Sex
All

### Key exclusion criteria
1. Do not have WiFi at home for radar monitoring

### Date of first enrolment
28/02/2025

### Date of final enrolment
01/11/2025

## Locations

### Countries of recruitment
Norway

### Study participating centre
**Haukeland University Hospital**
Haukelandsveien 22
Bergen
Norway
5009

### Study participating centre
**Haraldsplass Deaconal Hospital**
Ulriksdal 8

Bergen
Norway
5009

**Study participating centre**
**Voss Hospital**
Sjukehusvegen 16
Voss
Norway
5704

# Sponsor information

**Organisation**
The Research Council of Norway

**ROR**
https://ror.org/00epmv149

# Funder(s)

**Funder type**
Research council

**Funder Name**
Norges Forskningsråd

**Alternative Name(s)**
Forskningsrådet, Norwegian Research Council, Research Council of Norway, The Research Council of Norway

**Funding Body Type**
Government organisation

**Funding Body Subtype**
National government

**Location**
Norway

# Results and Publications

## Individual participant data (IPD) sharing plan

The datasets generated during and/or analysed during the current study are not expected to be made available due to ethical restrictions.

## IPD sharing plan summary

Not expected to be made available

## Study outputs

| Output type | Details | Date created | Date added | Peer reviewed? | Patient-facing? |
|---|---|---|---|---|---|
| Participant information sheet | Participant information sheet | 11/11/2025 | 11/11/2025 | No | Yes |
| Study website | Study website | 11/11/2025 | 11/11/2025 | No | Yes |