4-2023

Use of a Worksite Physical Activity to Improve Subjective Daytime Sleepiness among Night Shift Healthcare Workers: A Quality Improvement Project

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NU 824- BO: DNP Project Proposal Presentation

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March 16, 2023

This is to certify that the DNP Project Final Report by

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has been approved by the DNP Project Team on

April, 2023

for the Doctor of Nursing Practice degree

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Acknowledgments

I want to start by expressing my gratitude to the faculty of the FNP/DNP Program at Sacred Heart University Davis & Henley College of Nursing for providing me with the resources to pursue graduate study in nursing.

My most profound appreciation goes to Dr. Constance Glenn and Dr. Kassandra August-Marcuccio, my DNP advisor and mentor. The completion of this DNP project would not have been possible without their endless encouragement, assistance and wise counsel.

I would like to thank God, my loving sister Sarah, and my two wonderful children, Winnie and Mark-Anthony. It would have been impossible to finish my studies without their unwavering support over the past few years.

I would like to give special thanks to the nursing staff at the facility in the southern New England facility who participated in my DNP project.

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Abstract

Background and Significance: Shift work including work schedules beyond the typical "nine-to-five," causes the disruption of sleep-wake behaviors (Healy et al., 2021). The circadian misalignment is a potential pathway for the development of metabolic diseases, excessive daytime sleepiness, sleep deprivation, and declines in alertness and performance among night shift workers (James et al., 2017; McHugh et al., 2020; Parry et al., 2018). Emerging evidence suggests that physical activity synchronizes the sleep-wake cycles (Healy et al., 2021).

Purpose: This quality improvement project (QI) aimed to improve night-shift nurses 'subjective daytime sleepiness by incorporating a 4-week worksite walking activity during working hours.

Design: This QI used a pre-post-design to compare the subjective daytime sleepiness scores of the night shift nurses before and after the walking intervention (WI).

Methods: A convenience sample of 12 registered nurses (RNs) and nursing assistants (NAs) was identified from three in-patient units in the southern New England facility. The model of Improvement and a Plan-Do-Study- Act (PDSA) cycle were utilized to drive the QI. An Epworth Sleepiness Scale (ESS) survey was disseminated to the night-shift healthcare workers before and after the 4-week WI to evaluate the improvement of their subjective daytime sleepiness. The night-shift nursing staff walking activity was tracked using wrist-pedometers.

Results: Monitoring of the nursing staff' subjective daytime sleepiness was continued for 3 months. There was a decrease in the nurses' abnormal range of sleepiness from 33% at the beginning of the walking intervention (WI) to 16% post- WI.

CONCLUSIONS/IMPLICATIONS: This QI project did not induce a significant improvement but did create a decrease in subjective daytime sleepiness as well as a culture change among the night shift healthcare workers on the units at this facility where the WI was implemented.

Keywords: Sleep; daytime sleepiness; shift work; physical activity

Phase 1: Problem Identification and Evidence Review

Background and Significance of the Problem

In the healthcare industry, a 24/7 operation system is indispensable to ensure continuity of care in hospitals and residential facilities. An estimated 20 percent of American workers in the United States are engaged in night shift schedules (Ferri et al., 2016). While there are benefits associated with providing services around the clock, this has consequences since it requires many healthcare workers to conform to shiftwork schedules and other non-traditional working time arrangements. Working shift hours, particularly the night shift, is identified as one of the most frequent reasons for disrupting circadian rhythms, causing significant alterations in sleep and biological functions. Sleep displacement and the disruption of several biological processes are potential pathways to the development of fatigue, several physical and psychological diseases, declines in alertness and performance, and altered meal timing (James et al., 2017; McHugh et al., 2020; Parry et al., 2018).

Many studies have analyzed the negative consequences of shift work for staff and patient safety. A cross-sectional study conducted in 17 wards of a general hospital and a residential facility of a northern Italian city, involving 213 night-shift nurses, revealed that night-shift workers need special attention due to the higher risk for both job dissatisfaction and undesirable health effects (Ferri et al., 2016). Working permanent and frequent night shifts increases the risk of incident ischemic heart disease (Kader et al., 2022). Moreover, James et al. argued that circadian misalignment is associated with a range of short- and long-term adverse health

outcomes related to metabolic and gastrointestinal health, cancer, heart health, and mental health (James et al., 2017). Furthermore, a study conducted with Brazilian adolescents found that physical activity may protect them from excessive daytime sleepiness (Healy et al., 2021).. Adolescents who practice less physical activity reported higher daytime sleepiness than those who did not. Higher physical activity leads to less daytime sleepiness and lower odds of excessive sleepiness. Daytime sleepiness was defined as a great desire to sleep during the day or difficulty maintaining wakefulness. However, higher consumption of processed foods and higher social media use was also associated with higher daytime and excessive sleepiness (Malheiros et al., 2021).

Description of Local Problem/Organizational Priority

The southern New England facility where this study was conducted is a 216-bed teaching hospital that provides a full range of health services. It has historically attempted to implement work-based wellness activities for employees within the last decade. For instance, in 2018, this medical center introduced "Fresh air Walk," and in 2020, "Walk in My Shoes with Al & Team. These health initiatives were to help employees stay active (“US Department of Veterans Affairs,” 2020). However, these worksite wellness activities were performed during the daytime, mostly at lunchtime. No known attempts have been made to implement a work-based walking intervention for night shift nursing staff, nor has there been any formal educational

awareness on alertness-management strategies for shift workers.

At the southern New England facility, registered nurses and nurse assistants work morning, evening, and night shifts weekly from Monday to Sunday. Several nursing staff informally reported fatigue accompanied by an increased appetite during the night shift, leading to poor food choices and weight gain. Some shift –workers have additionally anecdotally mentioned a change in their sleep pattern with increased daytime sleepiness since starting shift hour work schedules. Despite the health hazards associated with shift work, some nursing staff elect to work shift hours for the higher rate of pay, the shortened workweek schedule, and the ability to have more time during the day to care for their loved ones. However, multiple studies support that shift workers may be susceptible to poor health behaviors such as insufficient or poor sleep, physical inactivity, and poor nutritional intake. Furthermore, shift work negatively impacts health through circadian misalignment and sleep loss (Crowther et al., 2022). Thus, it would be expected that evidence-based strategies to increase exercise at work can reset the molecular circadian clock, and effectively ameliorate the adverse effects of disrupted sleep patterns among shift workers (Salle et al., 2021; Gabriel & Zierath, 2019).

Focused Search Question

In healthcare professionals working night shift at the southern New England facility (P), does a walking intervention during working hours (I), compared to no intervention (C), improve subjective daytime sleepiness among those shift workers (O)? over three months (T)?

Evidence Search

A search of three databases (CINAHL, MEDLINE, and the Cochrane Database of Systematic Reviews) included articles from 2017 to 2022 written in English. Extracted literature

included healthcare professionals, daytime sleepiness and shift work, sleepiness, nurses, walking and shift work, physical activity and shift work, and physical exercise intervention focused on sleep quality (See appendix A).

Evidence Appraisal, Summary, and Recommendations

Thirteen articles were reviewed focusing on physical activity, shift work, fatigue prevention or management, and hospital healthcare professionals. Several studies supported a physical activity intervention for shift workers and fatigue countermeasures. There are five level I, three level II, one III, and four level IV EBP implementations. The following search engines were used CINAHL, MEDLINE, and the Cochrane Database of Systematic Reviews. Search terms were combined using Boolean operators to narrow the results, such as “Sleep quality AND shift work”, “Shift work AND Physical activity, or” Sleepiness OR Alertness AND Shift work” (See Appendix B).

Phase 2: Project Planning

Project Goals

1. Develop, implement, and evaluate a pedometer-based walking intervention targeted to healthcare workers at the southern New England facility subjective daytime sleepiness, measured by the Epworth Sleepiness Scale (ESS) by March 2023 (See Appendix C). The effectiveness was measured by comparing the percentage of night shift workers with a target ESS score (less than 10) in the pre-intervention Phase at the beginning of the project to the percentage of the workers post-intervention at the end of the implementation.

2. Examine the worksite physical activity of night shift nurses at the West Haven VA Medical center at the end of January 2023, reflected by number of daily total steps objectively measured with a pedometer. It was hypothesized that the night shift healthcare workers at the facility in-patient units receiving the 4-week walking intervention would achieve better daily steps count measured objectively with a pedometer.
3. Investigate the need for education about shift work and alertness to resynchronize the circadian system among nurses' shift workers. Since the ESS scale data reveals a score of <ten being normal range, high number of participants with an ESS score >10 may imply a need for a voluntary training program for employees working shift hours by the end of 2024 (Steffen et al., 2015; van Elk et al., 2022).

Framework

- The evidence-based practice (EBP) process, steps 0-3, identified the best worksite physical interventions practices for the shift workers (Melnyk & Fineout-Overholt, 2019)
- The Institute for Healthcare Improvement (IHI) Model for Improvement was used as a framework, along with the PDSA (Plan-Do-Study-Act) cycle for implementing, testing, and evaluating the utility of a physical activity intervention for improving the subjective excessive daytime sleepiness among night-shift nurses at the facility. The PDSA model is considered reliable and presents a logical scientific method for testing changes or improvements in healthcare systems. This model uses four cyclical steps for continuous quality improvement (Appendix J). The initial step, 'Plan,' starts by identifying the problem, defining the targeted outcome, and developing a process for the desired change, along with a

method for evaluating or monitoring the change. The next step, 'Do,' pertains to implementing the change process and collecting the data. The 'Study' step involves reviewing results, completing data analysis, and comparing the actual and desired outcomes. Finally, the ‘Act’ step implies identifying any needed modifications and acting on what was learned (Reed & Card, 2016; Taylor et al., 2014).

- The Epworth Sleepiness Scale (ESS) was used to examine the self-reported daytime sleepiness scale of night shift nurses participating in the project (See Appendix C). ESS is a tool for assessing subjective daytime sleepiness in non-clinical and clinical settings. Moreover, ESS is the most widely used and validated sleep questionnaire and provides a self-assessment of daytime sleepiness (Hurlston et al., 2019).

Context

The southern New England facility in which this study was performed provides a full range of state-of-the-art technology and a renowned research program. Comprehensive health care is provided through primary, acute, tertiary, and long-term care in medicine, surgery, psychiatry, physical medicine and rehabilitation, neurology, oncology, dentistry, geriatrics, extended care, and Women's Health Center. This hospital has 216 operational beds. The participants included registered nurses and nurse assistants working shift hours at this facility The project was implemented in the psychiatric emergency room (PER), the medical emergency room (MER), and 8E (in-patient psychiatric unit).

Key Stakeholders

- Participants (registered nurses, nurse assistants, and physicians).

- Nursing managers of medical emergency room (MER), psychiatric emergency room (PER), and in-patient psychiatric acute unit (8E) floors.
- Leadership at the facility (human resources, education department, nursing chief officer).

Possible Barriers to Implementation

- Increased nursing time- Shift workers may view the time to complete surveys and a walking intervention as time-consuming.
- Resistance to change routine at work. Shift Healthcare workers may be reluctant to take a walk while working at night. Most night-shift nursing personnel at would rather nap or eat during their break.

Methods and Analysis

Study Design and Setting

This quality improvement (QI) project was an observational, prospective, quality improvement pilot study undertaken at the southern New England facility. The setting of this project included a 12-bed PER, 10-bed MER, and 16-bed psychiatric in-patient unit within veteran acute care teaching hospital. These units operate with full-time, part-time, and per diems nursing staff. This QI project targeted a modifiable factor affecting daytime sleepiness among shift workers and was implemented in three phases: pre-implementation, implementation, and post-implementation.

Timeline (See Appendix E).

Study Subjects and recruitment procedure

The QI pilot study was conducted from November 2022 to January 2023, involving nursing personnel of both sexes. The recruitment of the participants led by the QI implementer took place during nursing huddles, and an email was sent out to the night shift nursing staff in the PER, MER, and 8E so that the interested subjects could contact the QI team lead. The inclusion criteria for this pilot study were (a) age (being over 18 years old); (b) working full-time at night for at least six months at this facility; and (c) having the ability to mobilize independently. The exclusion criteria were (a) inability to ambulate independently; (b) working as per diem nursing staff; or (c) medical restriction that might render the participant incapable of completing the exercise intervention. 16 out of 20 nursing shift workers were recruited from the following units: PER, MER, and 8E. Since no restriction was made regarding the program's frequency, intensity, or duration, participants independently determined their step count goal. However, the QI implementer encouraged each participant to increase their step count weekly.

Interventional Activities

- Use of the Epworth Sleepiness Scale (ESS) questionnaire permission was requested from the author of the validated scale.
- Informed consent was distributed electronically to each eligible night shift registered nurse and nurse assistant interested in participating in the pilot study.
- The 4-week walking intervention was based on participants using the pedometer to record steps during each night shift and logging their weekly steps in an Excel spreadsheet.
- The QI team leader scheduled meetings with the floor managers and participants who signed and returned their consents. During these meetings, information was provided, and questions were answered about the QI pilot study.

- All participants received a pedometer and education given regarding the use of pedometers.
- ESS survey was administered to each subject in the QI pilot study before and after the start of the 4-weeks physical activity intervention.
- The results of the beginning and ending ESS were compared to evaluate for improvement in subjective daytime sleepiness and physical activity.

Measures

The primary outcome of the nursing staff's subjective daytime sleepiness was measured using the Epworth Sleepiness Scale (ESS) questionnaire following receipt of permission to use the scale from the author of the scale. The ESS consists of eight questions distinguishing dozing behavior from feelings of fatigue and drowsiness/ sleepiness. Daytime sleepiness was defined as a great desire to sleep during the day or difficulty maintaining wakefulness (Malheiros et al.,2021). Scores range from 0 to 24; the reference range of 'normal' ESS scores is zero to 10. This sleep measurement tool has been validated to assess excessive daytime sleepiness (Walker et al., 2020). Nursing ESS scores and weekly step count showed a negative correlation, with nursing ESS decreasing with an increase in weekly step count. Survey responses were recorded twice during the QI pilot study to assess nursing daytime sleepiness prior to the physical activity intervention and after the implementation of walking activity. The secondary outcome of this study was to evaluate the daily step count of each nursing participant. An individual hand-watch pedometer assessed the nursing worksite activity for each participant.

Resources and Budget

The cost for this QI pilot study included money spent on purchased hand watch pedometers and nursing staff luncheons. Sixteen hand-watch pedometers were purchased. All communication with night shift nursing staff was in–person or electronically**.** Meetings with participants were held during break time.

Review for Ethical Considerations

- Quality Improvement project- IRB required and approved by the facility (See Appendix M), and SHU IRB, receiving exempt status by the SHU IRB (See Appendix L).
- Table 1 indicates that the Quality Improvement Project criteria have been met.
    - An answer of yes to all the items in l-l0 and no to all the items in 11-I4
    - The project did not qualify as human subjects' research and was submitted to the Institutional Review Board at Sacred Heart University, qualifying for exempt status.
- See the Practice Site Mentor letter of agreement (Appendix F).

Ethical Considerations

This QI project was reviewed by Sacred Heart University (SHU) faculty and was determined to qualify as an evidence-based change in practice project rather than a Human Subjects Research. Moreover, the institutional review board (IRB) at the facility provided permission to complete the quality improvement project. The QI implementer obtained informed consent from the night shift nursing staff. The healthcare workers' names were de-identified by assigning numeric (1, 2, 3,4, etc.) designations in the Microsoft Office Excel program and anonymized before analysis. Data stored on the computer were entered into the Excel

spreadsheet. Excel files were kept on the author's personal password-protected computer. The decision regarding participation in the study was voluntary.

Table 1. Ethics Review

Differentiating Quality Improvement and Research Activities Tool

Question	Yes	No
1. Is the project designed to bring about an immediate improvement in patient care?	X	
2. Is the purpose of the project to bring new knowledge to daily practice?	X	
3. Is the project designed to sustain the improvement?	X	
4. Is the purpose of measuring the effect of a process change on the delivery of care?	X	
5. Are findings specific to this hospital?	X	
6. Are all patients who participate in the project expected to benefit?	X	
7. Is the intervention at least as safe as routine care?	X	
8. Will all participants receive at least the usual care?	X	
9. Do you intend to gather just enough data to learn and complete the cycle?	X	
10. Do you intend to limit the time for data collection in order to accelerate the rate of improvement?	X	
11. Is the project intended to test a novel hypothesis or replicate one?		X
12. Does the project involve withholding any usual care?		X
13. Does the project involve testing interventions/practices that are not usual or standard of care?		X
14. Will any of the 18 identifiers, according to the HIPAA Privacy Rule, be included?		X

Adapted from Foster, J. (2013). Differentiating quality improvement and research activities. Clinical Nurse Specialist, 27(1), 10–3. https://doi.org/10.1097/NUR.0b013e3182776db5

Phase 3: Implementation

Project Implementation

Plan Phase

During the plan phase, the QI project leader conducted activities as follows:

- Develop project SMART goals & objectives in collaboration with Faculty Project advisor Dr. Constance Glenn and mentor Dr. August-Marcucio, Kassandra to drive the pilot
- Submit Oral presentation for approval by SHU
- Prepare DNP project proposal for IRB review at the facility and Sacred Heart University.
- Identify the pilot team, recruit the night shift workers, and obtain participants' informed consent.
- Select and order pedometers to be used by night-shift participants
- Approval requested from appropriate sources to utilize the ESS tool (Appendix K)).

Do Phase

The DNP project implementation phase began in November 2022 (see Appendix J, diagram of the implementation process). The DNP student worked with the research manager at the facility and obtained IRB approval before implementing the pilot project (See Appendix M). Individuals were recruited during unit meetings. Before being included in the project implementation, healthcare workers were provided with detailed information about what their participation would entail. Participants were recruited if they were at least 18 years old, healthy enough to walk briskly, not pregnant or breastfeeding. and had worked full-time (35+ hours per week) at night for at least the past six months at the facility as a healthcare worker.

During the information session, all healthcare workers were encouraged to provide their written consent forms and received pedometers with instructions. Sixteen of the invited workers volunteered for this DNP project, of whom 14 adhered to the pilot study and were equipped with a pedometer. Participants were encouraged to wear their pedometers only when working at night

at the New England facility. Those participants were asked to record their daily step count in diary sheets. During the 4-week walking intervention, each participant could pause the daily walking activity for a maximum of a week and catch up upon return to work. The questionnaire assessing the perceived daytime sleepiness was administered to all participants at the beginning of the QI (baseline) and after the walking intervention (follow-up). Participants were asked to complete the questionnaire online.

Barriers to Implementation

During the 4-week implementation phase, several limitations need to be clarified. First, the small number of healthcare shift workers who participated in the QI study. The facility has a significant percentage of nurses working shift hours. However, only some nurses were interested in the study for unknown reasons. Second, a particular aspect of each participant's health, like sleep apnea, could have also affected daytime sleepiness. One nurse dropped out of the study because of health issues.

Furthermore, the pedometer used did not allow for objective measurement of steps. Some participants reported that the pedometers were not counting steps when the arms were still. Third, the dropout rate of the participants could have limited the generalizability of the results of this QI. Four nurses dropped out of the study, one for health reasons and the others for unknown reasons. Lastly, the 4-week intervention was slightly short because nurses have different schedules. Some nurses work 12 hours shifts three times a week. Others took vacation days during the holiday season.

Study Phase

The study's target population was healthcare professionals working the night shift in the psychiatric emergency room, the medical emergency room, and the in-patient psychiatric unit in a facility in southern New England. There were 20 total registered nurses and certified nurse assistants who met the inclusion criteria. Sixteen registered nurses and certified nurse assistants from November 2022 thru January 2023 in the medical emergency room (MER), the psychiatric emergency room (PER), and the in-patient psychiatric unit (8E) were enrolled in the QI study. The project implementer (PI) communicated with the nurse managers in these respective units throughout the QI study. All 20-night shift healthcare workers were invited to participate in a 4-week intervention involving completing a pre/post survey and wearing a pedometer to measure daytime sleepiness and physical activity. Sixteen of the invited shift workers (80% enrollment) volunteered for this study, of whom 14 registered nurses and nurse assistants agreed to the QI protocol and provided sufficient data for analysis. The PI emailed the ESS survey to each of the 14 participants' employees before and after the 4-week intervention. The participants were asked to record their daily steps at work on the computer. The PI sent an email weekly to remind each participant to wear their pedometer only at work and record their step count. Baseline online survey data assessing daytime sleepiness were collected one week before the walking intervention.

Evaluation

Process Measurement

The subjective excessive daytime sleepiness of the nursing staff was measured using the ESS test, a reliable tool for measuring daytime sleepiness (Walker et al., 2020). Data collection for subjective daytime sleepiness began one week before the 4-week walking intervention, then at

the end of project implementation. A copy of the ESS questionnaire went via email to each participant. Each question on the ESS clinical questionnaire was scored on a scale of 0 (low) to 3 (high). Subjects estimated worksite steps were measured using wrist-based pedometers (NAME pedometers). The nursing staff was encouraged to wear their wrist- pedometers while at work. For days when a nurse was absent from work, the nurse was instructed to catch up the following week. The night shift was defined as a shift starting at 07:00 or 11:30 pm and ending at 8 am. In estimating physical activity at night, the incremental steps recorded per night worked at this New England facility. The adherence to the walking activity was verified through the weekly records completed by the subjects.

Outcome Measurements

All participants completing at least four weeks of physical activity while working at night were eligible for outcome measurement. The first expected outcome ~~is~~ was reduction in excessive sleepiness among night shift nursing staff undergoing the 4-week worksite walking intervention program. The secondary outcomes-was improved self-reported work-based physical activity assessed and verified through daily step count and the participant's adherence to the physical activity program.

Statistical Analysis

Night shift nursing staff who worked full-time for at least one month were included in the analytic sample. The primary outcome of participants' excessive daytime sleepiness score was summarized using total count and percentage pre-and post-implementation of the walking intervention. All participants' ESS total scores were compared weekly. For the secondary outcome, baseline measurements of participants' step count and results after walking intervention

were expressed as mean and standard deviation. These data were summarized using tables. The participants' ESS scores and estimated incremental steps were recorded and analyzed using Microsoft Excel.

Results

The QI project period was from November 2022 to January 2023. The results of this QI pilot study were expected to show that night shift nursing staff presented a significant reduction in excessive daytime sleepiness and a significant improvement in worksite step count when participating in a 4-week unsupervised walking program. A comparison of the results of the beginning walking intervention (WI) and the ending of WI showed:

- Of the twelve nursing shift workers selected for analysis, 33% self-reported an ESS score > 10 at the beginning of the WI, while 16% self-reported an ESS score >10 post-WI
- Participants weekly total step count increased in week three and week 4.

Discussion

Findings from this QI study indicated that participation in a 4-week worksite walking intervention targeting night shift nurses appeared to be associated with reduced daytime sleepiness and increased physical activity. However, pre-implementation data indicated that 8 out of 12 nursing shift workers had an ESS score between 0 and 10, while four out of 12 had an ESS score above 10. Moreover, the post-implementation data revealed that two out of 12 shift nurses had an ESS score of 10 or above. The change in ESS score did not significantly improve if the baseline ESS score > 10 was approximately 33%. Furthermore, comparing the participants' weekly step counts appeared inconsistent with the change in the ESS scores. Few night shift nurses showed a reduction in ESS score with increased step count.

There may be several underlying reasons for needing more significant improvement in ESS scores. For one, the night shift nursing staff needed to understand the ESS scale and were unaware that the ESS score was the primary outcome of this QI study. Another reason is the low adherence to the walking intervention. If our QI initiative was a supervised or semi-supervised physical activity, the results might have demonstrated improved ESS values. For example, a study testing a semi-supervised home exercise program among sedentary elderlies noted significant improvement in sleep quality and a reduction of self-reported excessive daytime sleepiness (Brandão et al., 2018). Although physical activity may protect from excessive daytime sleepiness, other factors such as screen time activities and diet patterns may have been possible causes for this poor improvement in ESS scores and physical activity at night (Malheiros et al., 2021). Night shift nursing staff at the New England facility were observed spending more time on screen activities to complete their nursing tasks.

Additionally, these shift workers reported consuming food during their break time rather than walking. Another area for improvement is the underreporting of step count. Nursing staff may have performed more steps while working at night but have yet to record them due to disruption in the workflow or the absence of a wrist pedometer. Consequently, it could also inaccurately lower the measurement of physical activity at night. Furthermore, during the implementation of this QI pilot study, all the variables that may be leading to excessive daytime sleepiness were not addressed.

Dissemination Plan

Implications of Project Results to Organization and Practice and Community

Findings from the walking intervention phase of the project suggested that worksite walking intervention targeting night shift nursing staff may lead to some improvement in daytime sleepiness. These data highlighted the need for future studies of workplace interventions directed at night shift workers and for incorporating physical activity programs for shift workers. Some nursing staff participants subjectively reported changing their routine at night. These night shift nurses were observed taking time at night to walk post-implementation of the QI.

Key Lessons Learned

Some key lessons are to consider for this project. First, the one-week education during the pre-interventional period may have needed longer to capture all nursing staff, considering that nurses have different working schedules. Additionally, this pilot study was implemented during the holiday season. Second, this QI project had a small sample size. Fourteen night-shift nurses were selected, and only twelve were completed. The project implementer could have included multiple in-patient units to provide more statistical power. Third, the QI project leader must initiate the IRB approval process earlier. This project implementer was unaware that the facility had recently changed its IRB approval process and resulted in approximately six months to receive IRB approval. Finally, the last key to learn from this QI project is that nursing managers must be more interested in the worksite walking initiative. Overall, all facets of this QI pilot study were inexpensive, low-risk, and easy to implement.

Sustainability Plan

The next logical step in improving shift workers' daytime sleepiness at the is incorporating an educational program targeting shift work and sleep quality. Moreover, this project's sustainability may involve the responsibilities of interdisciplinary team members,

including the nursing education department, human resources personnel, night nursing staff, and nursing leadership members. The Project Preceptor and Case Coordinator suggested using posters on the units to promote the worksite physical activity initiative among nursing shift workers. However, policies and procedures are not easily modifiable at this facilty.

This project evaluated the effectiveness of a work-based walking intervention on night-shift healthcare workers. However, the differences observed in daytime sleepiness between pre- and post-walking intervention implementation were not statistically significant. Although the worksite walking intervention did not effectively alter night-shift nurses' ESS scores, there were some improvements in the nursing participants' weekly step count. Therefore, further research is required to determine the appropriateness of physical activity to improve shift workers' daytime sleepiness.

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Appendix A

Description of Evidence Search

A search of the following databases was conducted; CINAHL, MEDLINE, and the Cochrane Database of Systematic Reviews. The key words searched were healthcare professionals, sleep and night shift, sleep quality and shift work, fatigue and night shift, and educational interventions focused on sleep quality and daytime sleepiness. The search was narrowed by adding “sleep health,” “fatigue prevention,” or “shift work.” Limits and filters for all searches pertaining to sleep health and fatigue prevention included, English language, nurses or physicians in hospitals, night shift work, fatigue interventions, sleep hygiene, sleep education, shift work, fatigue management, fatigue prevention, and sleep quality and published between 2017- 2022. Inclusion criteria for article selection were, sleep education, sleep hygiene, shift work, night shift, walking intervention, fatigue prevention, and shift work. Tables 1 through 3 display the database, search terms and results of search.

PICOT question:

In healthcare professionals working night shift at the Veteran's Affairs Hospital in West Haven, Connecticut (P), does a walking intervention during working hours (I), compared to no intervention (C), improve subjective daytime sleepiness among those shift workers (O)? over three months (T)?

Table A1. Search Terms and Search Results by Database [CINAHL]

Search Terms	Number of hits	Number of title & abstract reviewed	Number of full-text articles reviewed	Number of articles selected for this review without duplicates
sleep health or sleep hygiene	3,602	5		
Fatigue and shift work	116	4	1	1
Fatigue education and night shift	128	3		
Education AND sleep quality	763	5	2	1
Sleep hygiene and night shift	97	0	1	
Sleep education or sleep hygiene and shift work	104	5	2	2
Fatigue prevention and shift work	358	5	1	
Sleep quality and shift work	6	0		
Sleep education and fatigue prevention and night shift	11	1	1	1

Table A2. Search Terms and Search Results by Database [Medline]

Search Terms	Number of hits	Number of title & abstract reviewed	Number of full-text articles reviewed	Number of articles selected for this review without duplicates
sleep health or sleep hygiene	27,094	8	2	
Fatigue and shift work	272	3	1	1
Fatigue education and night shift	7	1		
Education AND sleep quality	631	4		
Sleep hygiene and night shift	3,062	3		1
Sleep education or sleep hygiene and shift work	31	4	2	1
Fatigue prevention and shift work	35	4	1	
Sleep quality and shift work	142	5	0	0
Sleep education and fatigue prevention and night shift	11	1		1

Table A3. Search Terms and Search Results by Database [Cochrane Database of Systematic Reviews]

Search Terms	Number of hits	Number of title & abstract reviewed	Number of full-text articles reviewed	Number of articles selected for this review without duplicates
sleep health or sleep hygiene	10	2	1	
Fatigue and shift work	1			
Fatigue education and night shift	20	2		1
Education AND sleep quality	8	3	1	1
Sleep hygiene and night shift	1	1		
Sleep education or sleep hygiene and shift work	1	1		
Fatigue prevention and shift work	2	2	1	1
Sleep quality and shift work	5	1		
Sleep education and fatigue prevention and night shift	6	2	1	1
sleep health or sleep hygiene	11			
Fatigue and shift work	10	1	1	1

Appendix B

Search Question in PICO format: In healthcare professionals working night shift at the Veteran's Affair Hospital in West Haven, Connecticut (P), does a workplace -walking intervention (I), compared to no intervention (C), improve sleep quality among those shift workers (O)? Over a period of three months (T)?

Article number	First author year	Purpose	Evidence type, level of evidence	Sample, setting	Major Variables Study and their Definitions	How major variables were measured	Findings that help answer question	Worth to practice/project, quality of evidence
1	Redeker et al., 2019	To synthesize the published literature that addresses employer-initiated interventions to improve the sleep of workers and in turn improve health, productivity, absenteeism, and other outcomes that have been associated	A systematic review (meta-synthesis) , **Level V**	219 publications	workplace contexts, occupations, interventions , and sleep outcomes		Reviewed literature suggests efforts by employers to encourage better sleep habits and general fitness result in self-reported improvements in sleep-related outcomes,	. Yes , article supports general fitness to improve sleep related outcomes

Article number	First author year	Purpose	Evidence type, level of evidence	Sample, setting	Major Variables Study and their Definitions	How major variables were measured	Findings that help answer question	Worth to practice/project, quality of evidence
		with sleep disorders or sleep deficiency.						
2	Wang & Boros, 2020	to evaluate the effect of daily walking exercise on sleep quality, perceived stress, and life satisfaction.	RCT **Level II**	54 research volunteers into two groups randomly from both university and non-university settings.	Sedentary behavior, Sleep quality, Stress level, and satisfaction with life	Pittsburgh Sleep Quality Index (PSQI) Perceived Stress Scale (PSS) Satisfaction With Life Scale (SWLS) Sedentary Behavior Questionnaire (SBQ)	incorporating daily aerobic walking exercise might be beneficial to sleep health.	Yes, article supports walking exercise to improve sleep quality Strength: Good quality,
3	Park & Suh, (2020).	to investigate the relationship between sleep quality and the	Cross sectional study, **Level IV**	185,958 subjects , employees of Kangbuk Samsung Hospital	Physical activity level, sleep quality, and shift work	PSQI, the International Physical Activity Questionnaires–Short	The effects of physical activity on sleep quality were lower in both male	Good quality, Not worth it Because In female shift workers,

Article number	First author year	Purpose	Evidence type, level of evidence	Sample, setting	Major Variables Study and their Definitions	How major variables were measured	Findings that help answer question	Worth to practice/project, quality of evidence
		amount of physical activity by stratifying subjects into gender and shift-work subgroups.		healthcare center		Form (IPAQ-SF)	and female shift workers than in day workers.	there was no significant difference in sleep quality according to physical activity level. In male shift workers, sleep quality was better in the group with physical activity of 1,800–3,000 METs-min/week
4	Luciano et al., 2021	This study aimed at describing medicine students'	Cross-sectional study , **Level IV**	6th-year Italian medicine students (n = 714;	physical activity, sitting and sleep time	International Physical Activity Questionnaire Short Form	Sleeping less than recommended (<7h/night) was	Yes, Improving physical activity would be

Article number	First author year	Purpose	Evidence type, level of evidence	Sample, setting	Major Variables Study and their Definitions	How major variables were measured	Findings that help answer question	Worth to practice/project, quality of evidence
		behaviours during lockdown and comparing them with pre-lockdown data and current recommendations.		age=25 ± 2 y; female: 62%; male: 38%)		(IPAQ) and selected questions from Pittsburgh Sleep Quality Index were administered to evaluate physical activity, sitting and sleep time	associated with more sitting time and less energies to perform daily activities	beneficial for many medicine students, and reduce time sitting in their daily routine.
5	Robbin et al., 2021	Conduct a systematic review of workplace interventions on shift worker sleep.	Systematic reviews, **Level III,**	(n = 6,868 records)	workplace-based interventions Shift work, sleep duration.		improvement in the shift workers' sleep duration resulting from exposure to the various workplace-based health interventions	Work-place based interventions (yoga or mindfulness) , resulted in a desirable increase in sleep duration (55%)

Article number	First author year	Purpose	Evidence type, level of evidence	Sample, setting	Major Variables Study and their Definitions	How major variables were measured	Findings that help answer question	Worth to practice/project, quality of evidence
6	Kwiecień-Jaguś et al., 2019	To measure the number of steps, the distance and the energy expenditure in a 12-hour shift of ICU nurses in selected hospitals in Poland.	Quantitative research project, **Level VI**	200 Nurses from the anaesthesiology wards and ICUs from Pomorskie and Warminsko-Mazurskie areas	Sociodemographic, number of steps, distance covered, energy expenditure	Socio-demographic data were collected based on an original interview questionnaire. A pedometer) was used, a simple device measuring the number of steps and the distance covered and energy expenditure	The physical activity of the nursing staff was still inadequate. it is crucial to introduce programs that would promote a healthy lifestyle, particularly physical activity	Yes, this article supports the use workplace program to promote physical activity.
7	Ha et al., 2022	To examine the effectiveness of the mobile wellness program for	A cluster randomized controlled trial, **Level II**	60 registered nurses working 8-h rotating shifts in a university	Sleep quality, exercise self-efficacy, intrinsic motivation for exercise,	a Fitbit Versa 24 h a day to measure their daily steps,	The mobile wellness program using Fitbit, online exercise	Good quality, Yes , article is worth it, Supports the idea that

Article number	First author year	Purpose	Evidence type, level of evidence	Sample, setting	Major Variables Study and their Definitions	How major variables were measured	Findings that help answer question	Worth to practice/project, quality of evidence
		nurses with rotating shifts to promote physical activity and sleep quality.		hospital in Korea	self-rated fatigue, and wellness, Daily steps	the Pittsburgh Sleep Quality Index (PSQI-K) was used to assess sleep quality, The Korean version of the Self-efficacy for Exercise Scale (SEE-K), The Behavioral Regulation in Exercise Questionnaire-2 (BREQ-2) translated into Korean was used in this study to assess intrinsic	using Zoom, online health coaching on a Korean mobile platform, and motivational text messages effectively promoted physical activity and sleep quality for nurses with rotating shifts during the COVID-19 pandemic.	increased physical activity with a mobile wellness promotes sleep quality for shift nurses

Article number	First author year	Purpose	Evidence type, level of evidence	Sample, setting	Major Variables Study and their Definitions	How major variables were measured	Findings that help answer question	Worth to practice/project, quality of evidence
						motivation for exercise, The Multidimensional Fatigue Scale [22] translated into Korean was used to measure people's fatigue.		
8	Sun et al., 2019	(a) To review briefly the current literature on shift nurses' sleep patterns, sleep quality, and the existing interventions implemented in nursing settings; and	Systematic review of qualitative studies, **Level V**	Thirteen papers were included in this review	sleep patterns, sleep quality, and the existing interventions		Studies shown improve sleep time with Physical aerobic exercise (2–6 times per week)	Yes, article is worth it. Supports the use of physical exercise to improve sleep quality in shift workers.

Article number	First author year	Purpose	Evidence type, level of evidence	Sample, setting	Major Variables Study and their Definitions	How major variables were measured	Findings that help answer question	Worth to practice/project, quality of evidence
		(b) to propose solutions that target individual nurses, nurse managers, and health care organisations to improve sleep health in shift nurses.						
9	Mokarami et al., 2020	To design and test a model for health promotion of Iranian nurses. In this model, nurses' lifestyle was considered as the precedent,	Cross sectional study , Level IV	300 shiftworker nurses in Iran. nurses employed in hospitals of Bojnord city	lifestyle was considered as the precedent, physical and mental health as outcomes, and sleep disturbance and	Survey of Shift workers (SOS) Life Style Questionnaire	This study tested a model for health promotion of Iranian nurses. lifestyle was negatively associated with sleep disturbance and chronic	High quality evidence. This study shows that interventions and training courses on a healthy lifestyle, involving physical activity, smoking

Article number	First author year	Purpose	Evidence type, level of evidence	Sample, setting	Major Variables Study and their Definitions	How major variables were measured	Findings that help answer question	Worth to practice/project, quality of evidence
		physical and mental health as the outcomes, and sleep disturbance and chronic fatigue as the mediators.			chronic fatigue as mediators		fatigue	abstinence, and maintenance of a healthy body weight

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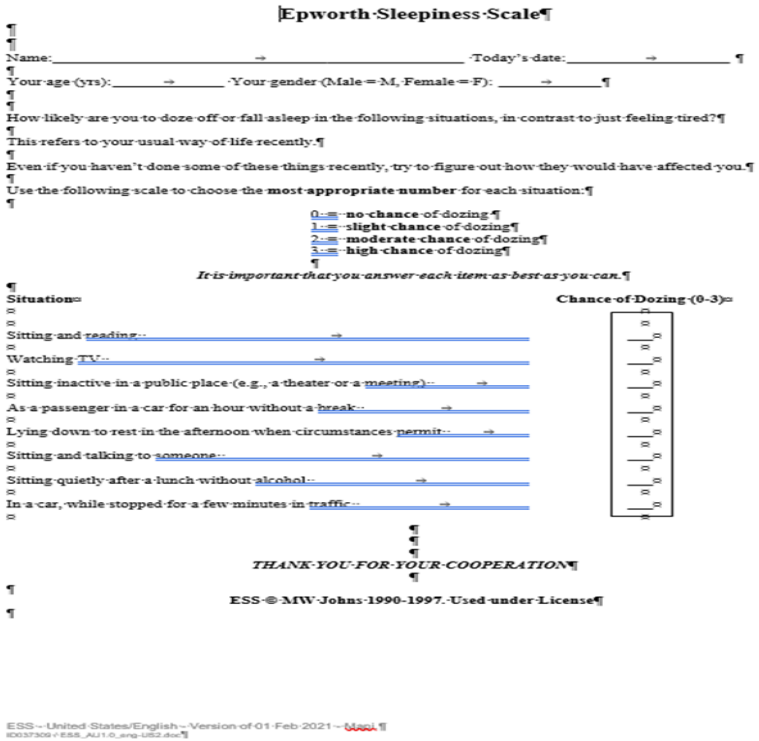
Appendix C

Epworth Sleepiness Scale



Epworth Sleepiness Scale

Name:_____ Today's date:_____

Your age (yrs):_____ Your gender (Male = M, Female = F): _____

How likely are you to doze off or fall asleep in the following situations, in contrast to just feeling tired?

This refers to your usual way of life recently.

Even if you haven't done some of these things recently, try to figure out how they would have affected you.

Use the following scale to choose the **most appropriate number** for each situation:

0 = **no chance** of dozing
1 = **slight chance** of dozing
2 = **moderate chance** of dozing
3 = **high chance** of dozing

It is important that you answer each item as best as you can.

Situation	Chance of Dozing (0-3)
Sitting and reading	
Watching TV	
Sitting inactive in a public place (e.g., a theater or a meeting)	
As a passenger in a car for an hour without a break	
Lying down to rest in the afternoon when circumstances permit	
Sitting and talking to someone	
Sitting quietly after a lunch without alcohol	
In a car, while stopped for a few minutes in traffic	

THANK YOU FOR YOUR COOPERATION

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Appendix D

Informed Consent

Inform Consent ¶
Use of a 4- Week Walking Intervention to Improve Subjective Alertness Among Night Shift Healthcare Workers¶

¶

You are invited to participate in a quality improvement (QI) project. This study is being conducted by Marthe Sooh Nkongo and is not sponsored by the VA hospital. The purpose of this QI study is to examine the impact of a 4-week walking intervention on subjective sleepiness among night shift workers. ¶

Your participation in this QI project is voluntary and confidential. You may terminate your involvement at any time if you choose without penalty or negative consequences.¶

You are eligible to participate in this study if you are a nurse or nurse assistant working night shift. You should not participate if you just work at night for overtime. ¶

Your participation will last for **4- 6 weeks**. You will receive a pedometer to count your steps during working hours for **4 weeks**. At the beginning and at the end of the project, you will be asked to fill out a survey.¶

It is hoped that the information gained in this QI project will benefit the night shift healthcare workers by improving their alertness, sleep quality, and general health. In addition, this QI ¶

You will not have any costs from participating in this project. Your responses to the surveys will be anonymous.¶

You are encouraged to ask questions at any time during this study. For further information about the study, please contact **Marthe.SoohNkongo@va.gov**, Registered Nurse, Psychiatric Emergency Room, phone number **202-725-5960**.¶

I have read and I understand the provided information and have had the opportunity to ask questions. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason and without cost. I understand that I will be given a copy of this consent form. I voluntarily agree to take part in this project.¶

¶

¶

Participant's Name (printed) _____ ¶

¶

_____ _____ ¶

Participant's Signature Date ¶

¶

¶

¶

Appendix E

DNP Project Timeline

Figure E1. DNP Project Timeline

Appendix F

Letter of Agreement

DR. SUSAN L. DAVIS, R.N.,
& RICHARD J. HENLEY
COLLEGE OF NURSING
Sacred Heart University

BSN- FNP/DNP Hybrid Program
DNP Project Practice Site Mentor — Letter of Agreement

A. Student and Faculty Information: (Please type)

Student Name; _____Sooh Nkongo Marthe Cathy _____

Student telephone # and email address: 202-725-5960 _and email_soohnkongom@mail.sacredheart.edu_

B. Faculty Project Advisor Name: and email address:
__ Dr. Constance Glenn, DNP, APRN FNP-BC, CNE
____glennc@sacredheart.edu_____
C. DNP Project Site Mentor Information (Please type)
Mentor's Name and Credentials__ ____ Dr. Kassandra August-Marcuccio, RN, DNP _____

Position and Title:___FNP_____

Facility Address:__950 Campbell Avenue _____

City, State, Zip_____West Haven, Connecticut, _ 06516-2770 _____

D. Consent to Mentor the Student for the DNP Project.

I am authorized to mentor and support the above student with the DNP project development and implementation at this facility. I received a copy of the DNP project course objectives, DNP project practice mentor overview, and student responsibilities workflow as it relates to my role in the project (attached below). If applicable, I will support the student with IRB application (or equivalent) for this project. I will provide feedback to the student during the course of the DNP project. I agree to participate in the final approval of the DNP project proposal and coordinate an opportunity for the student to present his/her final DNP project to the appropriate personnel at facility.

Practice Mentor Signature_____

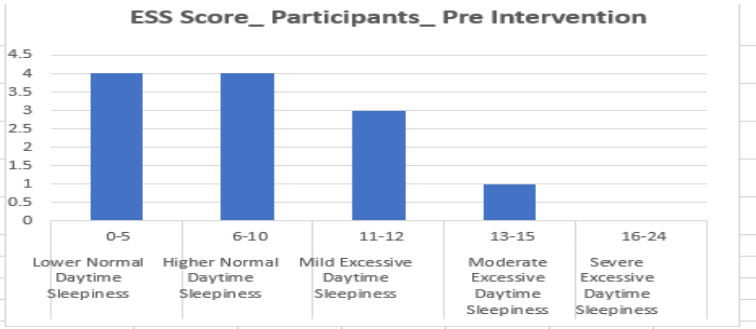
Updated Nov 2020

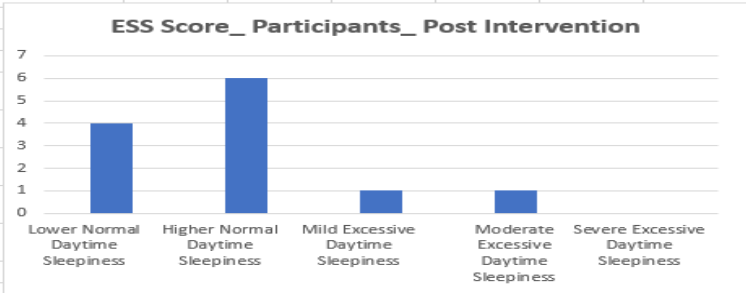
Appendix G

Sample Graphs

Figure G1. Sample Graph 1. Comparison of Participants ESS Total score pre/ post intervention

	Variables	Participants	Participants ESS_Score
Lower Normal Daytime Sleepiness	0-5	4	10
Higher Normal Daytime Sleepiness	6-10	4	7
Mild Excessive Daytime Sleepiness	11-12	3	7
Moderate Excessive Daytime Sleepiness	13-15	1	10
Severe Excessive Daytime Sleepiness	16-24	0	11
			3
Total (Pre- Intervention)		12	8
			13
			2
			7
			2
			4
Lower Normal Daytime Sleepiness	0-5	4	6
Higher Normal Daytime Sleepiness	6-10	6	5
Mild Excessive Daytime Sleepiness	11-12	1	5
Moderate Excessive Daytime Sleepiness	13-15	1	8
Severe Excessive Daytime Sleepiness	16-24	0	11
			3
Total (Post-Intervention)		12	6
			12
			2

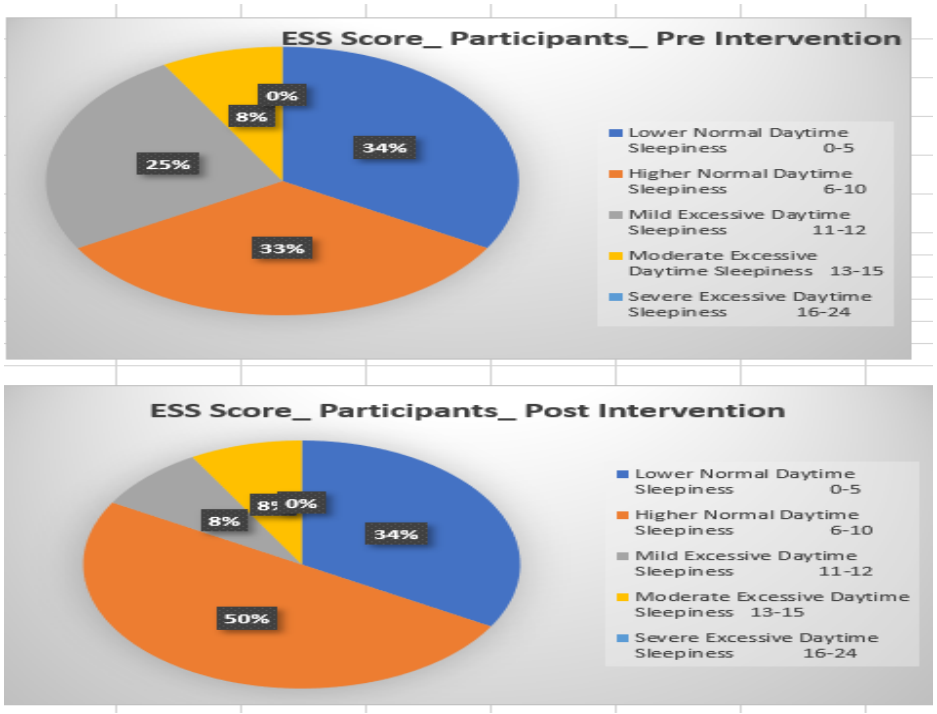




Appendix G

Sample Graphs

Figure G2. Sample Graph 2 Comparison of ESS Scores Pre and Post Intervention

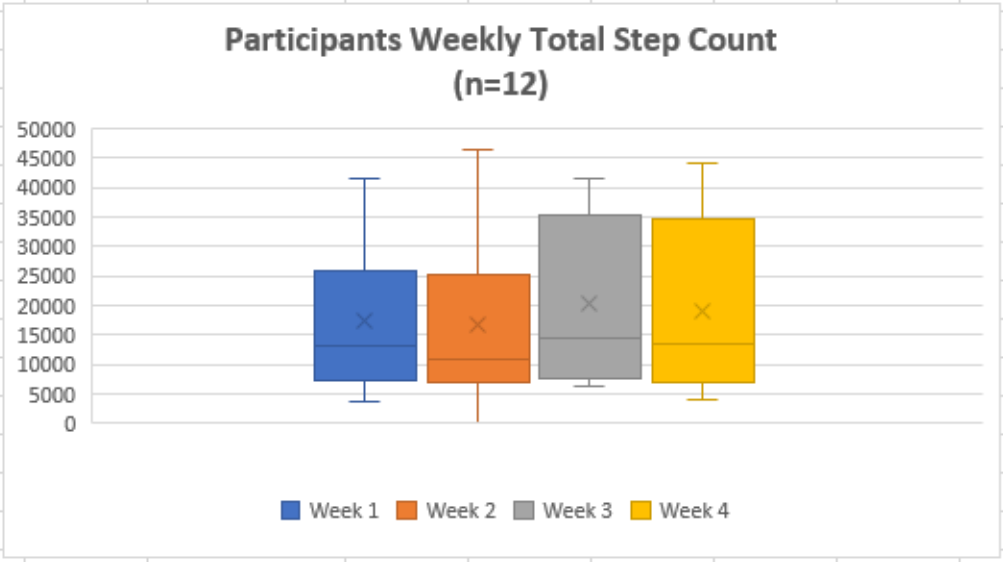


Appendix H

Weekly Comparison of Participants Total Step Count During the Intervention

Figure H1. Box Plot: Weekly Comparison of Participants Total Step Count During the Intervention

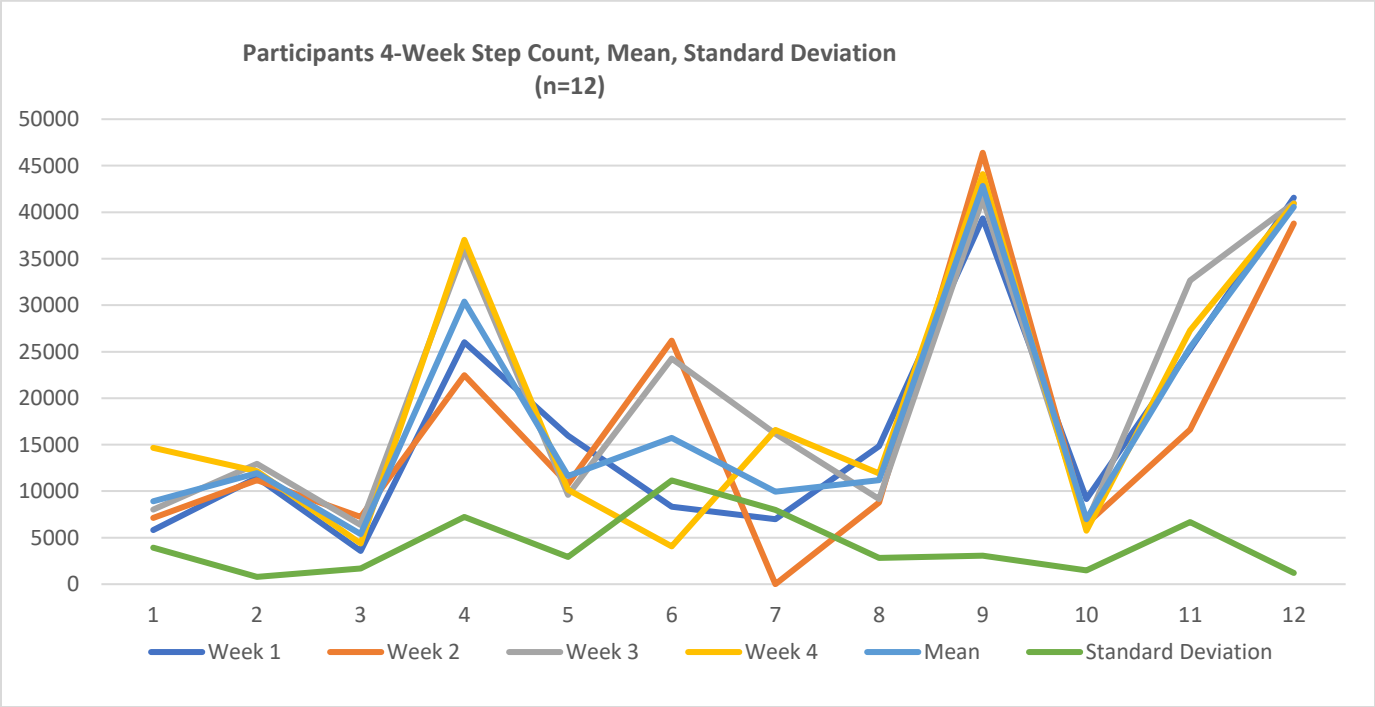
	Participants (n=12)											
Week#	1	2	3	4	5	6	7	8	9	10	11	12
Week 1	5812	11448	3574	26024	15964	8343	6972	14840	39348	9160	25277	41562
Week 2	7124	11184	7234	22487	10781	26196	0	8776	46392	6487	16619	38800
Week 3	7124	12941	6362	36017	9602	24275	16189	9171	41452	6569	32665	41000
Week 4	14651	12135	4358	37024	10148	4065	16592	11925	44098	5734	27291	40900



Appendix I

Comparison of Participants weekly total step count, mean, and Standard deviation

Figure I1. Run Chart: Comparison of Participants weekly total step count, mean, and Standard deviation



Appendix J

Description of key Features of the Plan–Do–Study–Act (PDSA) Cycle Method

Plan Phase

- Develop project SMART goals & objectives in collaboration with of Dr. August-Marcucio, Kassandra & Faculty Project Advisor to drive the pilot
- Submit Oral presentation for approval by SHU
- Prepare DNP project proposal for IRB review at the VA hospital and SHU
- Identify pilot team, recruit of the night shift workers, and obtain participants' consent.
- Getting approval from appropriate sources to utilize the ESS tool.

Do Phase •

- Distribute ESS surveys prior to initiation of physical activity intervention
- Educate participants on the use of pedometers and how to log in step count.
- Begin the 4-week walking intervention after reception of the VA IRB
- Weekly reminders to participants on logging step count on Excel spreadsheets
- Administer ESS surveys post physical intervention to all participants

Study Phase

- Collect participants weekly step count and pre/post ESS surveys
- Track changes **to** weekly step count and **ESS scores**
- Identify barriers to decreased ESS scores or increased weekly step count

Act Phase

- Communicate results to the project team and the organization's leadership.
- Based on project data results, the leadership will decide to either adopt, adapt, or reject the use of physical intervention to improve excessive daytime sleepiness among night shift healthcare workers at the VA hospital.

Evaluation Phase

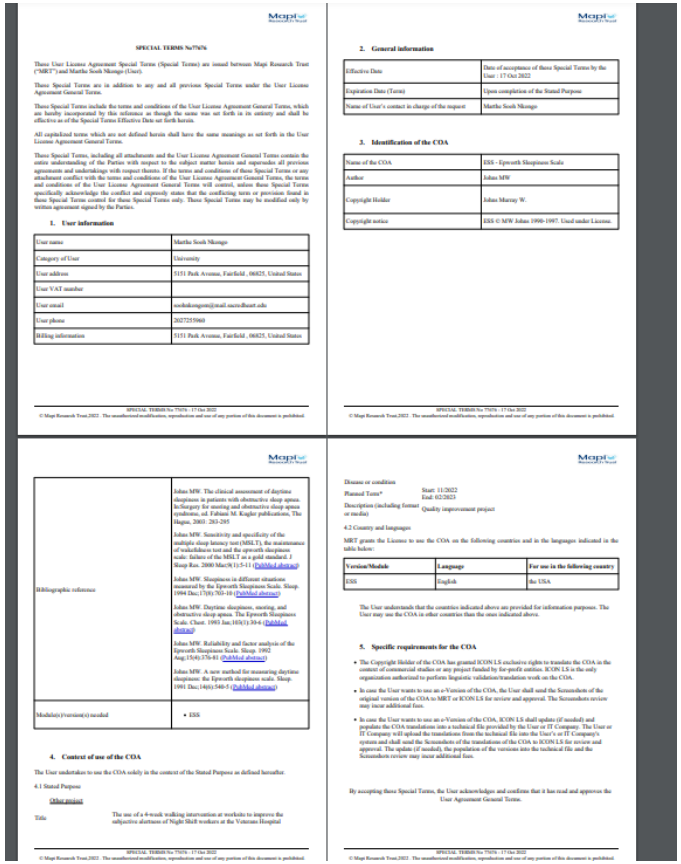
The project evaluation will include some strategies to decrease daytime sleepiness and improve physical activity during shift hours, tracking nursing staff ESS scores improvement with pre/ post –interventional surveys questionnaires.

Dissemination Phase

- Adoption of an educational intervention on worksite physical activity during night shift as a yearly employee's training.
- Receive input from participants about how to sustain the changes in worksite physical activity associated with night shift schedule.
- Have posters on each ward with sleep hygiene tips or strategies to stay active during night shift schedules
- Hold open discussion with participants regarding input about strategies to mitigate sleepiness or fatigue after a night shift once a month or once every 3 months.
- Executive summary to the Director of Nursing services and the educational department at the VA hospital.
- Electronic poster (DNP program)
- Podium presentation at the Ground meeting at the VA hospital.
- Final project write up in manuscript.

Appendix K

Approval for Usage of the Epworth Sleepiness Scale



SPECIAL TERMS No77676

These User License Agreement Special Terms (Special Terms) are issued between Mapi Research Trust ("MRT") and Martha Sooh Nkonge (User).

These Special Terms are in addition to any and all previous Special Terms under the User License Agreement General Terms.

These Special Terms include the terms and conditions of the User License Agreement General Terms, which are hereby incorporated by this reference as though the same was set forth in its entirety and shall be effective as of the Special Terms Effective Date set forth herein.

All capitalized terms which are not defined herein shall have the same meanings as set forth in the User License Agreement General Terms.

These Special Terms, including all attachments and the User License Agreement General Terms contain the entire understanding of the Parties with respect to the subject matter herein and supersedes all previous agreements and undertakings with respect thereto. If the terms and conditions of these Special Terms or any attachment conflict with the terms and conditions of the User License Agreement General Terms, the terms and conditions of the User License Agreement General Terms will control, unless these Special Terms specifically acknowledge the conflict and expressly states that the conflicting term or provision found in these Special Terms control for these Special Terms only. These Special Terms may be modified only by written agreement signed by the Parties.

1. User information

User name	Martha Sooh Nkonge
Category of User	University
User address	5151 Park Avenue, Fairfield , 06825, United States
User VAT number	
User email	sookenkonge@mail.sacredheart.edu
User phone	2027215960
Billing information	5151 Park Avenue, Fairfield , 06825, United States

SPECIAL TERMS No 77676 - 17 Oct 2022

2. General information

Effective Date	Date of acceptance of these Special Terms by the User : 17 Oct 2022
Expiration Date (Term)	Upon completion of the Stated Purpose
Name of User's contact in charge of the request	Martha Sooh Nkonge

3. Identification of the COA

Name of the COA	ESS - Epworth Sleepiness Scale
Author	Johns MW
Copyright Holder	Johns Murray W.
Copyright notice	ESS © MW Johns 1990-1997. Used under License.

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Bibliographic reference	Johns MW. The clinical assessment of daytime sleepiness in patients with obstructive sleep apnea. In:Surgery for snoring and obstructive sleep apnea syndromes, ed. Fabiani M. Kugler publications, The Hague, 2003: 283-295 Johns MW. Sensitivity and specificity of the multiple sleep latency test (MSLT), the maintenance of wakefulness test and the epworth sleepiness scale: failures of the MSLT as a gold standard. J Sleep Res. 2000 Mar;9(1):5-11 (PubMed abstract) Johns MW. Sleepiness in different situations measured by the Epworth Sleepiness Scale. Sleep. 1994 Dec;17(8):703-10 (PubMed abstract) Johns MW. Daytime sleepiness, snoring, and obstructive sleep apnea. The Epworth Sleepiness Scale. Chest. 1993 Jan;103(1):30-6 (PubMed abstract) Johns MW. Reliability and factor analysis of the Epworth Sleepiness Scale. Sleep. 1992 Aug;15(4):376-81 (PubMed abstract) Johns MW. A new method for measuring daytime sleepiness: the Epworth sleepiness scale. Sleep. 1991 Dec;14(6):540-5 (PubMed abstract)
Module(s)/version(s) needed	• ESS

4. Context of use of the COA

The User undertakes to use the COA solely in the context of the Stated Purpose as defined hereafter.

4.1 Stated Purpose

Other project

Title: The use of a 4-week walking intervention at worksites to improve the subjective alertness of Night Shift workers at the Veterans Hospital

SPECIAL TERMS No 77676 - 17 Oct 2022

Disease or condition

Planned Term* Start: 11/2022
End: 02/2023

Description (including format or media): Quality improvement project

4.2 Country and languages

MRT grants the License to use the COA on the following countries and in the languages indicated in the table below:

Version/Module	Language	For use in the following country
ESS	English	the USA

The User understands that the countries indicated above are provided for information purposes. The User may use the COA in other countries than the ones indicated above.

5. Specific requirements for the COA

- The Copyright Holder of the COA has granted ICON LS exclusive rights to translate the COA in the context of commercial studies or any project funded by for-profit entities. ICON LS is the only organization authorized to perform linguistic validation/translation work on the COA.
- In case the User wants to use an e-Version of the COA, the User shall send the Screenshots of the original version of the COA to MRT or ICON LS for review and approval. The Screenshots review may incur additional fees.
- In case the User wants to use an e-Version of the COA, ICON LS shall update (if needed) and populate the COA translations into a technical file provided by the User or IT Company. The User or IT Company will upload the translations from the technical file into the User's or IT Company's system and shall send the Screenshots of the translations of the COA to ICON LS for review and approval. The update (if needed), the population of the versions into the technical file and the Screenshots review may incur additional fees.

By accepting these Special Terms, the User acknowledges and confirms that it has read and approves the User Agreement General Terms.

SPECIAL TERMS No 77676 - 17 Oct 2022

Appendix L

SHU IRB Approval

From: "Taber, Prof. Christopher B." <taberc@sacredheart.edu>
Date: Thursday, June 2, 2022 at 1:34 PM
To: "Glenn, Prof. Constance H." <glennc@sacredheart.edu>
Cc: "Alp, Feride F. 'Funda'" <alpf1@sacredheart.edu>, "Yolen, Nina" <yolenn@sacredheart.edu>, "Londo, Madeline C." <londom@mail.sacredheart.edu>
Subject: IRB#220602B - Exempt Status Request

Dear Applicant,
Thank you for your submission to the IRB requesting exempt review. Based on the application submitted, the IRB is pleased to approve your submission and we wish you great success in your research.

Sincerely,
Christopher Taber
Chair, IRB

Christopher B. Taber, PhD, CSCS, USAW2, EP-C, PES
Director, Exercise and Sport Science M.S. Program
Associate Professor
College of Health Professions
Sacred Heart University
(203) 396-6342

Appendix M

VHA QI Determination Letter

DEPARTMENT OF VETERANS AFFAIRS
VA Connecticut Healthcare System Research Office

Date: **September 27, 2022**

To: **Marthe Sooh, RN**
From: **VACHS Research Office**

Protocol Title: **[1715797-1] Use of a Walking Intervention to Improve Subjective Alertness Among Night Shift Healthcare Workers at the Veterans Affairs Healthcare System West Haven, Connecticut**

Review Type: **Administrative Review**

Action: **NOT RESEARCH**

Determination Date: **September 27, 2022**

The objective of the project is to examine the impact of a 4-week walking intervention on subjective sleepiness among night shift workers. Additional objectives include 1) improve night shift workers' concentration and focus; 2) improve shift workers' sleep hygiene and well-being; and 3) improve Veterans' quality of care and safety. Participants will complete the Epworth Sleepiness Scale (ESS) questionnaire and be asked to wear pedometers to measure their baseline activity while at work. This will be followed by a 4-week walking intervention with a target of 2,000 steps per workday. Participants will be encouraged to increase their steps at work gradually by utilizing their 15-minute breaks to walk around their unit or around the hospital. After completing the walking intervention, participants will again complete the ESS questionnaires. Results from this project will be used to determine if a 4-week walking intervention made a positive impact among night shift healthcare workers.

It appears that the project is designed to support the delivery of healthcare rather than to contribute to generalizable knowledge. It is not designed to expand the knowledge base of a scientific discipline or other scholarly field of study. The data collected will be used for quality improvement purposes rather than to test a hypothesis or answer a specific research question. It is not funded as a research study.

In view of these characteristics, the Research Office has made the determination that this project is not research. It does not require review by the VACHS IRB or R&D Committee. Publication or presentation describing the study is permitted.

Mehmet Sofuoglu 177719 Digitally signed by Mehmet Sofuoglu 177719 Date: 2022.09.28 09:04:29 -04'00'

Mehmet Sofuoglu, M.D., Ph.D. (Acting ACOS/R)

This electronically generated document serves as official notice to sponsors and others of approval, disapproval or other VA Connecticut Healthcare System Research Office decisions. Only those individuals who have been granted authority by the institution to create letters on behalf of the VA Connecticut Healthcare System Research Office are able to do so. A copy of this document has been retained within VA Connecticut Healthcare System Research Office IRBNet records. The IRBNet System is fully compliant with the technology requirements for Electronic Records per CFR 21, Part 11, Section 11.10 - Controls for Closed Systems, and the technology requirements for Electronic Signatures per CFR 21, Part 11 Subpart C - Electronic Signatures.

- 1 -

Appendix N

Executive Summary

Executive Summary

An estimated 20 percent of American workers in the United States are engaged in night shift schedules to conform to shiftwork schedules and other non-traditional working time arrangements. The healthcare industry employs many nursing professionals working the night shift. Nurses report health effects of working night shift including weight gain, increased appetite, limited exercise, and daytime sleepiness. This quality improvement (QI) project aimed to implement and evaluate a pedometer-based walking intervention to improve the subjective daytime sleepiness of the night shift nurses over three months.

A pedometer-based walking intervention was implemented in a teaching hospital using a pre-post design. Night shift registered nurses and nursing assistants participated in the project. During the preintervention (baseline) period, nursing staff received pedometers. After the baseline period, a 4-week pedometer-based walking exercise was implemented. Daytime sleepiness was evaluated before and after the walking intervention using the Epworth Sleepiness Scale (ESS) surveys. The pedometers measured the step count of the night shift nurses at work.

Shift nurses' data were collected and analyzed. Of the twelve nursing shift workers selected for analysis, 33% self-reported an ESS score > 10 at the beginning of the walking initiative, while 16% self-reported an ESS score >10 post- walking initiative. The pre-implementation data (surveys and step count) indicated that 8 out of 12 nursing shift workers had an ESS score

between 0 and 10, while four out of 12 had an ESS score above 10. The post-implementation data revealed that two out of 12 shift nurses had an ESS score of 10 or above. The use of a 4-week pedometer-based worksite walking exercise did not significantly alter the night-shift nurses' ESS scores. However, this QI project changed the culture of night-shift nurses. Another finding of this QI was that the weekly step count of the nurses working the night shift improved. Overall, further research is required to determine the appropriateness of physical activity to improve shift workers' daytime sleepiness.

Appendix O

DNP Poster