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Person-Centered Dementia Care and Sleep in Assisted Living Residents With Dementia: A Pilot Study

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Abstract

The sleep of people with dementia living in long-term care is known to be disturbed. This pre–post controlled pilot study examined the effects of a person-centered dementia care intervention on sleep in assisted living residents with dementia. The three-month intervention included in-class staff training plus supervision and support in practice. The sleep-wake patterns were measured using actigraphy for three consecutive days at baseline and postintervention. Sixteen residents from the intervention and six from the control groups completed the study. The intervention group had significantly more nighttime sleep at posttest. After adjusting for baseline, the intervention group exhibited significantly less daytime sleep and more nighttime sleep. Person-centered dementia care may be effective for improving sleep of residents with dementia.

The sleep of people with dementia living in long-term care facilities is known to be disturbed and severely fragmented (Ancoli-Israel & Ayalon, 2006; Lorenz, 2011; Martin & Ancoli-Israel, 2008). Residents with dementia experience excessive daytime sleepiness, and at night, difficulty falling asleep, increased duration and frequency of awakenings, and disrupted sleep-wake rhythms (Rose & Lorenz, 2010; Song, Dowling, Wallhagen, Lee, & Strawbridge, 2010). Ancoli-Israel et al. (1989) have shown that residents with dementia were not totally awake or fully asleep in a single hour during a 24-hr period, and these residents with dementia, on average, fell asleep 22 times for a total of 2 hr during the

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daytime (Ancoli-Israel, Parker, Sinaee, Fell, & Kripke, 1989). Furthermore, for people with dementia residing in long-term care facilities, poor sleep has been found to be associated with negative health outcomes, including risk of falls, greater depression, poor concentration and memory, decreased physical performance and quality of life, and elevated mortality risk (Martin & Ancoli-Israel, 2008; Martin, Fiorentino, Jouldjian, Josephson, & Alessi, 2010).

Multiple factors are associated with sleep problems in residents with dementia in long-term care settings (Ancoli-Israel, Ayalon, & Salzman, 2008; Lorenz, 2011). Increasing age and dementia contribute to the increased frequency of awakenings, decreased percentage of slow-wave sleep, excessive daytime sleep, and abnormal day-night sleep patterns (Rose & Lorenz, 2010; Vitiello & Borson, 2001). Increased physical and psychological health problems and multiple medication use may have negative impact on the ability to sleep and the quality of sleep in elders with dementia (Ancoli-Israel et al., 2008; Cole & Richards, 2007; Foley, Ancoli-Israel, Britz, & Walsh, 2004; Gaugler, Yu, Krichbaum, & Wyman, 2009; Roehrs & Roth, 2005; Zwakhalen, Hamers, Abu-Saad, & Berger, 2006). In addition to these factors, inactivity, the lack of social activities, and the environment contribute to the prevalence of sleep disturbances in long-term care settings (Martin & Ancoli-Israel, 2008; Naylor et al., 2000; Rose et al., 2010).

Managing sleep problems in residents with dementia living in long-term care is challenging to clinicians. Medications such as sedative-hypnotics and antipsychotics are often used, but the many reported side effects seem to result in the exacerbation of insomnia and symptoms of dementia (Lorenz, 2011). Lack of physical and social activity during the day is documented in the literature as a major cause of excessively unintentional daytime sleep, which disturbs nighttime sleep in long-term care residents with dementia (Richards, Beck, O’Sullivan, & Shue, 2005). In addition to the inactive lifestyle in this environment, the ability to remain awake and become engaged in daytime activities is weaker in people with dementia than in older adults without cognitive impairment. Therefore, interventions to consolidate the normal sleep-wake patterns of residents with dementia need to provide meaningful physical and social activity and to facilitate the engagement of these older adults in activities and thus promoting greater alertness.

Person-centered dementia care (PCDC) is an approach used in this study to improve sleep in residents with dementia. It is a humanistic care model for people with dementia that was developed from Tom Kitwood’s work (Kitwood, 1997). PCDC sees the person first rather than his or her dementia, and it discovers and enables the potential for greatest capacity in people with dementia by involving them in relationships and care, regardless of their level of cognitive and physical impairment (Brooker, 2007; Kitwood, 1997). Kitwood identifies five psychosocial needs (comfort, attachment, inclusion, identity, and occupation) above and beyond the physical needs. He describes how a “malignant social environment” is created for residents with dementia in the long-term care settings through routinized task-oriented care with a focus on physical care and how to resolve this issue with “positive person work.” Positive person work provides a practical guideline for long-term care providers for engaging these older adults through interactions during care practice (Brooker, 2007; Brooker & Surr, 2005; Kitwood, 1997).

In addition to Kitwood's work, PCDC takes place in a system that requires a person-centered physical environment and a supportive organizational environment (Li & Porock, 2014). It challenges staff in particular to reflect on their philosophy of care and care practices and to learn creative ways to interact using nonverbal as well as verbal communication. Learning to be person-centered is not simply a matter of changing a protocol and making sure everyone knows what to do. It is a process of total and holistic change, building respect, dignity, collaboration, and team feeling among care providers. It is also highly skills and action orientated. An intervention like PCDC needs to start with direct care staff training and then be carried out by the staff.

There are three reasons why PCDC may improve sleep in long-term care residents with dementia. First, PCDC may decrease daytime sleep opportunity by providing and engaging residents with meaningful and purposeful daytime activities, which potentially enhances the homeostatic sleep drive and consolidates nighttime sleep. Second, the social stimuli and physical activities provided by PCDC may serve as external cues for residents to establish normal circadian rhythms. Third, the positive staff–resident interactions of PCDC may provide a more positive psychosocial environment and improve subjective well-being, which may improve sleep.

The purpose of the pilot study reported here was to test the effects of a PCDC intervention on sleep in residents with dementia residing in assisted living facilities. Specifically, we hypothesized that the PCDC intervention will decrease daytime sleep and then consolidate nighttime sleep by training direct care staff with the skills to provide meaningful and purposeful daytime activities and interact with the residents with dementia during activities of daily living.

METHODS

Design

This pre–post controlled trial was nested within a larger study examining the impact of PCDC on multiple resident, staff, and family outcomes (Porock, Li, & Chang, 2014). This study was reviewed and approved by the Social and Behavioral Sciences Institutional Review Board, University at Buffalo.

Setting

Secure dementia care units at two different assisted living facilities in suburban Buffalo were selected for the study. Both facilities provided person-centered care to residents in general, but had not been previously trained specifically on PCDC. Older adults living in the two study units had cognitive impairment and required assistance in activities of daily living, such as preparing meals or bathing, but could eat and walk (with or without walking device) independently. The two dementia units included one with 30 beds and the other with 18 beds, and were randomly assigned to be the intervention or control group. The staff-to-resident ratios in the intervention group and control group were 1:7 and 1:6 respectively. To be eligible for the study, the resident must have had a formal diagnosis of dementia; the score of Brief Interview for Mental Status must be equal to or less than 7, indicating severe cognitive impairment; the resident must be 65 years of age or older, and have had at least 60 days' residency to allow the resident time to have adjusted to the unit. Exclusion criteria applied to residents' included diagnosis of Parkinson's disease or obstructive sleep apnea, acute illness, being completely bed-bound, or expected to move or require hospice care within the five-month study period.

The research team worked with the unit managers to ensure there was no coercion during recruitment of the study. Potentially eligible residents in each unit were first identified by the unit managers. The unit manager informed these potential residents as well as their designated representatives about the study, distributed letters of introduction to their designated representatives, and elicited their permission for a member of the research team to visit both the residents and their representatives to provide information about the study. After verbal agreement and arranging to meet, a member of the research team explained the study, answered questions, and obtained oral consent from the residents and written informed consent from their designated representative for participation. We recruited 18 residents from intervention units and 10 from control units.

Measures

Actiwatch Spectrum (Philips Respironics, Andover, MA) is a small watch-like device worn on the nondominant wrist to provide an objective estimate of sleep and the 24-hour sleep-wake rhythm and can detect circadian rhythm disturbances. It functions by measuring physical movement using motion sensors (Ancoli-Israel, Cole, Alessi,Chambers, Moorcroft, & Pollak, 2003; Buysse, Ancoli-Israel, Edinger, Lichstein, & Morin, 2006; Chesson, Coleman, Lee-Chiong, & Pancer, 2007). It also has a light sensor to capture the participant's light exposure. In this study, participants wore this device for three consecutive days at baseline and postintervention to assess 24-hour sleep-wake patterns and light exposure.

The following variables were extracted from participants' actigraphy by Respironics Actiware 5.5 computer algorithms: daytime sleep, percent of daytime on sleep, nighttime sleep, percent of night on sleep, number of awakenings, daytime physical activity, and daylight exposure. The sensitivity for wakefulness on Actiware 5.5 was set at low, which is 20 counts/min. The arousal index was calculated from the number of awakenings and nighttime sleep. Sleep latency and sleep efficiency are not the points of interest of this study, because residents' exact bedtime and rise time are unknown. Sleep-wake patterns in older adults with dementia are very complicated, with many awakenings and little consolidation (Rose et al., 2010). For that reason, we examined total sleep across the 24-hour period, coded as day or night sleep. Based on the common sleep schedule of residents living in the two units, 8:00 a.m. to 8:00 p.m. is defined as daytime, and 8:00 p.m. to 8:00 a.m. as nighttime. Minutes of daytime sleep and minutes of nighttime sleep were identified as the primary sleep outcome variables in this study. Daytime physical activity is represented by daytime activity counts from Actigraphy.

Participants' level of social engagement was measured by Dementia Care Mapping (DCM). DCM is a highly structured observation system that quantifies the behaviors, mood, and engagement of the residents with dementia in long-term residential care settings. It was developed by Kitwood in the late 1990s and has been further refined by the Dementia Group at the University of Bradford, UK (Brooker, 2007). In its latest version there are 23 behavioral category codes, each with a mood and engagement score that is recorded every 5 min for several hours by a pair of certified dementia care mappers and producing an overall score of well-being versus ill-being. The 23 behavioral category codes, named alphabetically to aid recall during observations, include “Articulation” (interacting with others verbally or otherwise), “Borderline” (being passively involved), “Cool” (disengaged), “Doing for self” (self-care), “Expressive” (expressive or creative activities), “Food” (eating or drinking), “Going back”(reminiscence), “Intellectual” (prioritizing the use of intellectual abilities), “ Joints” (exercise), “Kum and Go” (walking about), “Leisure” (leisure, fun and recreational activities), “Medication,” “Nod Land Of” (sleeping, napping), “Objects” (displaying attachment to inanimate objects), Physical care (receiving care), “Religion” (engaging in a religious activity), “Sex” (sexual expression), “Timalation” (direct engagement of the senses, e.g., aromatherapy), “Unresponded to” (communicating without receiving a response), “Vocational” (engaging in work or work-like activities), “Withstanding” (repetitive self-stimulation, e.g., rocking, calling out), “Excretion” (Episodes related to excretion), “Yourself” (interaction in the absence of any observable other), and Zero option (when the behavior does not fit any other category). The eight mappers, including the PI in this study from UB Institute for Person-Centered Care, were all trained and certified by the University of Bradford’s Dementia Group. All participants were observed for 12 hours by three shifts of paired mappers (8:00 a.m.–8:00 p.m.) at both baseline and postintervention. Level of social engagement (Social Activity) is an aggregate score of frequency of behavior codes that are related to social interaction and capture interactions between staff and resident, resident and resident, and resident and family, including “Articulation,” “Expression,” “Going back,” “Intellectual,” “Leisure,” and “Religion.” In addition to being an outcome measure, participants’ baseline DCM was used to tailor the training of staff in the PCDC intervention. The interrater agreement of DCM behavioral codes from the paired mappers in this study was 92%.

Cognitive impairment was assessed using Brief Interview for Mental Status (BIMS) which is a scale embedded in the Minimum Data Set version 3.0 (MDS 3.0). Saliba et al. tested reliability and validity of the new score against the gold standard Modified Mini Mental State Exam (Lee Teng & Chang Hui, 1987) and the previously used MDS-embedded Cognitive Performance Scale (CPS; Saliba et al., 2012). Scores range from 0 (no response) to 15 (no impairment). Scores from 8 to12 indicate moderate impairment and scores from 0 to7 indicate severe impairment. “For identifying any impairment, a BIMS score of 12 had sensitivity = 0.83 and specificity = 0.91; for severe impairment, a BIMS score of 7 had sensitivity = 0.83 and specificity = 0.92” (Saliba et al., 2012).

The participant’s comorbidity was assessed by using the Cumulative Illness Rating Score for Geriatrics (CIRS-G), which was developed from the Cumulative Illness Rating Score (CIRS) and is a comprehensive recording of all comorbid diseases of older adults (Miller & Towers, 1991). CIRS-G has been validated and commonly used in the geriatric residential population (Parmelee, Thuras, Katz, & Lawton, 1995). It has established good intrarater and interrater reliability (intraclass correlation coefficients of 0.83 and 0.81, respectively) in the literature (Salvi et al., 2008). Participants’ comorbidity is represented by CIRS-G total score and the number of categories endorsed. The research team also used a standard data collection form to collect participants' demographic information, diagnosis, and medication use.

Intervention

The PCDC intervention in this study was guided by Kitwood's work on PCDC. The major strategies of this PCDC intervention and also the mechanism of PCDC on improving sleep in this study were to provide and engage residents with dementia with meaningful physical and social activities and to include residents with dementia in meaningful social interaction as much as possible. Staff training was provided by faculty from the UB Institute for Person-Centered Care over a three-month period, which comprised staff training, mid-intervention feedback, and staff practice. Staff training included three modules of in-class training plus in-service sessions. Direct care staff (registered nurses, certified nursing assistants, personal care assistants, and activity staff) from the intervention unit were allocated to small groups and received a total of 8 hr training in three modules during the working day (or night) to initiate the process of change. Each training module involved didactic teaching integrated with active learning exercises and role play. The demonstration of sleep characteristics in residents with dementia, factors associated with poor sleep, and strategies to improve sleep in residents with dementia were introduced in the three modules.

Active learning exercises and role playing were used to help staff members to understand and develop the new skills. Examples were drawn from the many difficult situations on the unit observed during the baseline data collection, which made the training more relevant to staff's work experience and built on their existing knowledge of the residents. The aim was to train all direct care staff working on the intervention unit. However, it was very difficult to get every staff member to complete all three modules. We concluded our training modules with 82.6% staff (19 of 23) completing all three modules by the end of our fourth week of the intervention. Following the in-class sessions, the trainers also worked with staff on the unit on the job by role modeling techniques and by helping staff to think on their feet as they learned and tried to see the world from the perspective of the residents with dementia.

After the training modules and in-service sessions, we allowed two weeks for the staff to settle into the new practices with access to the trainers for consultation as necessary. At that time point, the trainers conducted a second dementia care mapping session on six randomly selected residents for 4 hr. Insights from this mapping session were used as feedback to the staff to reinforce positive behaviors and identify negative or less desirable behaviors, so that information could be used to further develop and hone their skills. Then staff practiced the skills with access to trainers for consultation for six weeks. The details of intervention are summarized in Table 1.

Procedure

Data were collected during a five-month period, which included a one-month baseline data collection (July 2013–August 2013), three months' intervention (August 2013–November 2013), and one month of postintervention data collection (November 2013–December 2013). Thus, the data related to the measurement of light was potentially confounded by seasonal variations in the day length, weather, and types of clothing worn during baseline and posttest data collection. Procedures for data collection at baseline and postintervention were the same. In both the intervention and control groups, we grouped six residents as a data collection unit. Each unit of data collection took five days. On the first day, the principal investigator (PI) collected data on a standard data collection sheet and CIRS-G by reviewing the participants' medical and social records. The PI and another research team member assessed the participants for cognitive status (BIMS). On the next morning, the PI assisted the participants to put on the Actiwatch Spectrum before 8:00 a.m., asked them to wear it for three consecutive days and nights, and took off the Actiwatch Spectrum after 8:00 a.m. on the fifth day of data collection. Actigraphy data recording started at 8:00 a.m. on the first Actiwatch day. DCMs with residents were conducted on one of the Actiwatch days for 12 hr (8:00 a.m.–8:00 p.m.) by three pairs of certified mappers.

In our baseline data collection, two residents in the control unit refused to wear the Actiwatch on the second Actiwatch day and were excluded from the postintervention data collection. Both of the two residents had frequent episodes of paranoid behavior (as reported by the registered nurse in the control unit) that were exacerbated by wearing the Actiwatch. Thus, all 18 residents from the intervention unit and 8 of 10 residents from the control unit completed the baseline data collection. The three-month PCDC intervention started after the baseline data collection. During the intervention period, we lost two residents from the intervention group (one moved to a skilled nursing facility and one died) and two from the control group (one moved to a skilled nursing facility and one moved back home). Therefore, 16 residents in the intervention unit and 6 residents in the control group completed this study. Thus, the different attrition rates in the two study units were not related to the intervention or the variability between facilities. The three training modules were made available to staff members in the control group after concluding the postintervention data collection and completed by 11 of the 15 (73.3%) staff in the control unit.

Description of data analysis

The three-day actigraphy data from both baseline and postintervention were averaged. Statistical analyses were conducted with IBM SPSS statistics 21. Descriptive statistics (frequencies, percentages, range, means, and standard deviations) were used to describe participants' demographic and baseline characteristics. An independent *t*-test and a chi-square statistic test were used to examine the differences in participants' demographic, comorbidity, medication use, and sleep variables between two groups at baseline. Descriptive statistics and a paired *t*-test were used to detect the change between baseline and postintervention within each group. Analyses of covariance using the variable baseline values as covariates were conducted to evaluate the intervention effects between the groups. At last, numbers of participants who had better outcomes (simply the direction of change) at posttest between two groups was compared by using a chisquare statistic test. All statistical analyses were two-tailed tests at $p = .05$ level of significance.

RESULTS

Baseline Characteristics of Residents

In total, $n = 22$ residents, including $n = 16$ in the intervention and $n = 6$ in the control group, completed both baseline and postintervention data collection. Baseline demographic and clinical characteristics of residents in the intervention and control groups are summarized in Table 2. Overall, all participated residents were white, nearly all (86.4%) were female, and all had severe dementia. Mean age was over 86 years, with mean number of comorbidities of five, and on a mean of six categories of medication. About 50% of residents were on psychotropic medications, including antianxiety agents, antidepressants, mood stabilizers, and antipsychotics. There were no significant differences in residents' demographic characteristics (age, gender, and race), baseline cognitive status, comorbidity, and number of medications used between intervention and control groups (Table 2).

Baseline sleep characteristics are presented in Table 3. Participants spent a mean of 35% of their day on sleep (246 min); they slept 73% of nighttime and woke up 13 times per hour during nighttime sleep. They were involved in some form of social activity for a mean of 160 (32 x 5) minutes during a 12-hr daytime period and were exposed to light over 1,000 Lux for only 22 min. Four residents did not have any daytime bright-light exposure (less than 1 min of bright light or did not get any light exposure over 1,000 Lux). There were no significant differences on most outcome variables at baseline. Residents in the control group had significantly more minutes of daylight exposure over 1,000 Lux ($p = .04$) than those in the intervention group at baseline.

Postintervention Effects on Sleep

The comparisons of baseline to postintervention outcomes within each group and between the two groups are summarized in Tables 4 and 5.

Within-group comparisons

The percentages of residents with improved outcomes (simply the direction of change) of daytime sleep, nighttime sleep, arousal index, physical activity, and social activity at the posttest for both groups were reported in Table 4. In at least half of participants in the intervention group, nighttime sleep increased, and social activity increased. Changes were seen in at least 40% of the group for decreased daytime sleep and increased physical activity. This is in contrast to the control group, which saw minimal improvements, if any. Regarding continuous measures, Table 5 shows that the intervention group increased nighttime sleep and decreased mean light exposure over the course of the study, whereas no significant changes in measures were seen in the control group.

Between-group comparisons

Table 5 shows that the intervention group had significantly less daytime sleep ($p = .01$) and more nighttime sleep ($p = .03$) than the control group, after controlling for baseline values. These results are partially reflected in Table 4, which shows that the percent of participants meeting threshold values for nighttime sleep was greater in the intervention group, and trends were seen for daytime sleep and physical activity ($p = 0.05$).

DISCUSSION

The present study evaluated the effects of a PCDC intervention on sleep in assisted living residents with dementia. Overall, the results support our hypothesis that PCDC improves residents' sleep in terms of decreasing daytime sleep and increasing nighttime sleep.

Distinguishable from traditional medical care, PCDC is a care approach that not only meets the person's physical needs, but goes beyond physical needs to meet psychosocial needs. PCDC endeavors to maintain the personhood of the individual with dementia by facilitating social relationships, and making their day meaningful and enjoyable through personal engagement. The meaningful activities and social interactions in PCDC aim to keep the residents with dementia from unintentional daytime sleep with the potential then to consolidate nighttime sleep. The intervention in this study was delivered by direct care staff, who are trained with knowledge and skills of PCDC provided in the training modules and reinforced with role modeling on the job.

Our findings support the conclusion that person-centered dementia care significantly increased participants' minutes of nighttime sleep (between and within groups) and decreased daytime sleep (between groups). Other variables failed to reach statistical significance, but since these analyses were underpowered to detect these differences, some findings may still have some clinical significance upon replication in a larger sample. For example, social activity and physical activity increased from baseline to postintervention in 62.5% and 43.8% of participants in the intervention group compared with 16.7% and 0% participants in the control group. These statistically and clinically significant findings suggest that the PCDC intervention had stimulated staff to interact more often with residents and helped residents with dementia in the intervention group to stay awake during the day.

There are only three studies that have examined the effect of person-centered care on sleep in long-term care residents, and in each of these sleep was a secondary outcome (Chang, Li, & Porock, 2013; Fossey et al., 2006; Matthews, Farrell, & Blackmore, 1996). Daytime and night-time sleep was measured through staff reports (Fossey et al., 2006), questionnaire items (Matthews et al., 1996), and Minimum Data Set 2.0 chart review (Chang et al., 2013). No objective measures for sleep were used in these studies. However, aligned with results in our study, two of three studies found person-centered care decreased residents' daytime sleep (Chang et al., 2013; Matthews et al., 1996). Matthews et al. found that residents' daytime sleepiness was significantly decreased at 6–8 weeks of the intervention (Matthews et al., 1996). Chang et al. used the minimum data set (MDS) 2.0 to measure the effects of person-centered care on outcomes of residents (both with and without cognitive impairment) living in long-term care settings (Chang et al., 2013). Sleep quality was measured by variables representing elders' daytime sleepiness in MDS 2.0. The daytime sleep of residents in PCC units significantly decreased compared with that of residents in traditional care units (Chang et al., 2013). However, no significant difference between the intervention group and the control group in terms of daytime sleep was found in Fossey et al.'s study (Fossey et al., 2006).

Previous research also reports that increased daytime physical and social activities are associated with decreased daytime sleep, increased nighttime sleep, decreased sleep fragmentation, and normal sleep-wake cycles (Alessi et al., 2005; Chen et al., 2010; Fetveit & Bjorvatn, 2005; Ouslander et al., 2006; Richards et al., 2005; Richards et al., 2011). Richards and colleagues conducted a series of studies to improve sleep in residents with dementia through individualized physical activity, social activity, or both, and resulted in improvement in both daytime and nighttime sleep. Most other interventions provide structured activities in a certain time frame of the residents' day. Interventions without adequate consideration for the person's individuality and preference, which are extremely important for people with cognitive impairment, are more likely to be ineffective or problematic (Kitwood, 1997). For example, the time for structured activity, especially for group activity, is usually scheduled at a time convenient for activity staff and facility routine, rather than considering a time of each individual's preference in the group. Or it is very possible that the resident with dementia may not be interested in that particular activity and attends only because he or she is brought to the activity. As a result, the resident does not engage positively in the activity nor is engaged in an activity of choice. These kinds of structured activities may not be meaningful to the residents, even though sometime favorable physical outcomes can be achieved, at least while the activity is in progress. A PCDC intervention may be more beneficial that is embedded into the daily care of residents with dementia, with the aim of engaging the residents in physical and social activity at any possible moment of their day, making life in long-term care generally more enjoyable. These features make PCDC a healthy way to facilitate sleep for residents with dementia.

Daytime exposure to light is necessary for good sleep and for increased alertness (Ancoli-Israel, Martin, Kripke, Marler, & Klauber, 2002; Neikrug & Ancoli-Israel, 2010). However, residents in long-term care are routinely exposed to significantly lower levels of daylight during the day and high levels of light throughout the night in terms of intensity, duration, and spectrum, compared to people living in the community (Ancoli-Israel et al., 1997; Noell-Waggoner, 2006; Shochat, Martin, Marler, & Ancoli-Israel, 2000). Ancoli-Israel and colleagues reported that 4% of nursing home residents with dementia were not exposed to any bright light at all, and 47% were never exposed to light greater than 1,000 Lux. In our study, about 17.4% participants at baseline and 47.8% at posttest were not exposed to light over 1,000 Lux (Ancoli-Israel et al., 1997). At baseline, residents in the control group had significantly more minutes of daylight exposure over 1,000 Lux than those in the intervention group. Visible differences in physical features of the two study units that could contribute to this difference were not observed, such as windows or sunlight in residents' bedrooms, in the dining rooms, or in activity areas. However, there were more outdoor social activities observed in the control group than in the intervention group, which may lead to the difference in daylight exposure at baseline. In the didactic teaching of staff training in this study, daylight exposure was emphasized as an important element to consolidate normal sleep circadian rhythm in residents with dementia. However, daylight exposure in both groups dropped significantly from baseline to postintervention, and the intervention group dropped less than the control group.

Two possible reasons may contribute to the significant decrease in daylight exposure at posttest. First, our data collection for baseline was from early July to August and for postintervention was from November to December. Therefore, the significant decrease in daylight exposure may be attributable to the variation of natural light exposure in different seasons. Second, the Actiwatch Spectrum was placed underneath the clothes of many participants while data recording to reduce rejection of the equipment. The light sensor may not have accurately captured the daylight through the clothes, especially as the clothes got heavier as the seasons changed.

Actigraphy is commonly used as an objective sleep measure in sleep research in older adults with dementia; however, the validity and reliability of actigraphy in this population are rarely reported. Actigraphy is considered an indirect sleep measure because the data is derived from movement rather than directly from brain physiology (David et al., 2010). Due to the decreased movement and physical activity, actigraphy may overestimate sleep in older adults. One previous study reported that various modes of actigraphy systematically overestimated sleep in a population of community-dwelling older women compared to polysomnography (Blackwell et al., 2008). Some studies set up the nocturnal period in the software using caregiver-recorded bedtime and rise time of older adults with dementia (Martin, Marler, Harker, Josephson, & Alessi, 2007; Richards et al., 2005). This method is more accurate than the software’s automatic scoring of sleep and wake time (David et al., 2010). In this study, we did not have records of participants’ bedtimes and rise times. Nighttime was defined from 8:00 p.m. to 8:00 a.m. and daytime from 8:00 a.m. to 8:00 p.m. The sleep and wake scores were then extracted from participants’ actigraphy by computer algorithms.

This pilot study had some limitations, most of which are due to the larger study being conducted for feasibility and development of the intervention and not being powered for efficacy. The nesting of treatment group within facilities increased the risk for type I error. The small sample size exaggerates the deviation scores, decreases statistical power, and yields a greater potential for type II error. The unbalanced sample size magnifies the potential differences between two groups. Increased sample size would reinforce the findings and provide stronger evidence for the benefits of PCDC on sleep in long-term residents with dementia and encourage long-term care clinicians to provide PCDC. Second is the intervention fidelity. The intervention was extremely time-intensive, requiring the commitment and engagement of the staff. However, changing practice is not easy to achieve. The whole unit culture and approach must change in order to prevent or minimize the likelihood of a return to conventional behaviors over time. This intervention was delivered by the unit direct care staff after PCDC training and it is very likely that there would be some variation among staff members in terms of the magnitude of mastering the knowledge and applying the knowledge in clinical practice. In addition, dementia care mapping was used to tailor the intervention; therefore, the mappers in this study were not blinded to the group assignment. As a result, the level of social engagement measured from dementia care mapping in this study might be susceptible to bias. Finally, actigraphy may have a low specificity in detecting wakefulness (Sadeh, 2011); therefore, the sleep time reported in this study might be overestimated and reflect participants’ inactivity. Also, to fit within the limitations of a larger study in which this study was nested, actigraphy data were collected for three consecutive days, which may not accurately capture the day-to-day variability of sleep. Extending length of actigraphy data collection and trying to keep a record of participants' bed schedule will ease these issues.

CONCLUSION

Sleep is important for health and well-being and this is no different for someone living in long-term care. Older adults, and particularly those with dementia, often experience disrupted sleep, including difficulty reaching deep sleep. Poor sleep has been associated with an increase in distressing behaviors, such as pacing, agitation, aggression, and depression. The findings of this pilot study suggest that PCDC may be beneficial for sleep in residents with dementia in terms of decreasing daytime sleep through providing individualized care, engaging them personally through communication, and providing meaningful physical and social activities. PCDC may provide the caregivers in long-term care a way to manage sleep disturbance in residents with dementia and may potentially decrease behavioral disturbance. More rigorous research with larger samples in multiple long-term care settings is needed to further test the hypothesis that person-centered dementia care improves sleep for the resident with dementia.

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Table 1

Summary of Person-Centered Dementia Care Intervention

Phase one: Comprised staff training (4 weeks) Developed from Tom-Kitwood's Enriched Model of Dementia and Framework for Person Centered Care

	Learning objectives	Didactic teaching	Learning exercises and role play
Module 1 (2 hr)			
Understanding Dementia: The Person and the Disease	(1) Define dementia (2) Identify the types and symptoms of dementia (3) Differentiate between signs of dementia and other physical conditions that cause forgetfulness/ confusion (4) Identifying empathetic ways to interact with a person with dementia	Enriched Model of Dementia: Neurological impairment & health and physical fitness (1) What is dementia (2) Types of dementia and symptoms; what conditions are not dementia (3) Understanding cognitive impaired individuals (4) How dementia causes changes in the perception of the world and with communication (5) Work from the perspective of empathy in caring for people with dementia	(1) Video watching: Remember who I am; Living with dementia (2) Standing in the shoes exercise aimed to make the staff members better understand the cognitive issues and mental stress that people with dementia experience every day. In this exercise, staff were asked to perform Stroop color and word test, use nonverbal cues to express themselves and communicate with other participants. (3) Open discussion.
Module 2 (3 hr)			
Being with the person who has dementia	(1) Understand concepts of Person-Centered Dementia Care; (2) Identify how the biography and personality of an individual affects behaviors; (3) Understand the importance of nonverbal communication, body language, inflection and tone with people with dementia; (4) Describe characteristics of sleep in people with dementia; (5) Understand importance of quality sleep in people with dementia	Enriched Model of Dementia: Biography & Personality (1) Principles and Values of Person-Centered Care; (2) VIPS frameworks for Person-Centered Dementia Care; (3) Biography and personality in relations behaviors; (4) Meaning of underlying behaviors & triggers of distress responses; (5) Sleep issues and sundowning; (6) Dealing with behaviors; (7) Communicating with individuals with dementia	(1) Video watching: Dementia and behaviors; Understanding needs-driven behaviors. (2) Role Playing: Practice interpreting and responding to some distressed responses of persons with dementia (3) Open discussion.
Module 3 (3 hr)			
Making a Difference in the Life of the Cognitively Impaired	(1) Understand the importance of creating an environment that creates a supportive social psychology/ relationships; (2) Identify ways to individualized care planning and practice. (3) Understand and review ways to engage the person in interactions and activities. (4) Understand importance and approaches to improve sleep.	Enriched Model of Dementia: Social psychology (1) Five psychological needs of people with dementia; (2) Identifying the person's unmet needs and making individualized care plan; (3) Individualized care in practice; (4) Engaging the person in human interactions: personal detractors and personal enhancers; (5) Engaging the person in daily activities; (6) Strategies to improve sleep.	(1) Video watching: Activities for people with dementia; Ideas to Engage, Socialize, and Interact with Dementia Patients (2. Role playing: Scripts developed from observed negative cases of staff–resident interactions at baseline were used in role playing. The staff were assigned to different roles in the script. After each scenario of role playing, staff were encouraged to share their feeling and identify issues in the scenario. The trainers will discuss PCDC care strategies of the individual residents in the scenario.
In-service sessions	The two trainers went to the unit and practiced together with staff member during phase 1. Twice a week for four weeks(16hours in total)		
Phase 2: Mid-intervention feedback (2 weeks)			
Two weeks for staff to settle in PCDC practice with access to the trainers for consultation as necessary			
Dementia care mapping session in unit on a randomly selected six residents for 4 hours			
Feedback to staff			

Phase one: Comprised staff training (4 weeks) Developed from Tom-Kitwood's Enriched Model of Dementia and Framework for Person Centered Care			
	Learning objectives	**Didactic teaching**	**Learning exercises and role play**
Phase 3: Staff practice (6 weeks)			
Staff practiced PCDC for 6 weeks with access to the trainers consultation as necessary			

Note. Person-centered dementia care is a humanistic care model for people with dementia. It not only meets the person's physical needs but goes beyond physical needs to meet psychosocial needs. PCDC endeavors to maintain the personhood of the individual with dementia by facilitating social relationships, and making their day meaningful and enjoyable through personal engagement (Li & Porock, 2014).

Table 2

Comparison of Demographic and Baseline Clinical Characteristics (Independent *t*-Test and Chi-Squared Test)

		Total (n = 22)	PCDC (n = 16)	Control (n = 6)	p value
Age		86.45(6.90)	85.67(5.16	88.66 (5.16)	.37
Race	White	22 (100%)	17 (100%)	5 (100%)	
Gender	Male	3 (13.6%)	2 (12.5%)	1 (16.7%)	.80
	Female	19 (86.4%)	14 (87.5%)	5 (83.3%)	
BIMS		2.59 (2.48)	2.63 (.66)	1.50 (1.76)	.22
CIRS-G	Total score	9.45 (3.11)	9.06 (3.26)	10.50 (2.66)	.35
	Number of systems	5.41(1.74)	5.65 (1.69)	5.17 (2.14)	.70
Total number of medication use		5.86 (2.98)	6.31 (2.95)	4.67 (2.88)	.26
Psychotropic medication use	No	11 (50%)	6 (37.5%)	5 (50.0%)	.06
	Yes	11 (50%)	10 (62.5%)	1 (50.0%)	

Note. BIMS represents Brief Interview for Mental Status; CIRS-G represents Cumulative Illness Rating Score for Geriatrics.

Table 3

Comparison of Sleep Characteristics at Baseline Between Two Groups (Independent t-Test)

	Variables		**Total (n = 22) Mean (SD)**	**PCDC (n = 16) Mean(SD)**	**Control (n = 6) Mean(SD)**	**p value**
Sleep variables	Daytime sleep (mins)		245.67 (93.90)	241.35 (96.97)	257.19 (92.75)	.73
	% daytime on sleep (%)		34.80 (13.25)	34.40 (13.80)	35.87 (12.81)	.82
	Nighttime sleep (mins)		524.62 (67.72)	518.46 (71.56)	541.04 (58.78)	.50
	% nighttime sleep (%)		73.05 (9.56)	72.07 (10.06)	75.67 (8.33)	.45
	Arousal Index		12.75 (7.94)	13.88 (8.87)	3.75 (1.53)	.29
Variables associated withsleep	Physical activity (counts/ min)		103.98 (40.93)	108.00 (43.02)	93.25 (35.97)	.47
	Social activity (5mins/unit)		32.00 (13.90)	29.25 (13.26)	39.33 (13.95)	.13
	Daylight exposure	Mins over 1,000 Lux	21.73 (26.54)	15.85 (20.45)	45.34 (25.82)	.04
		Lux/min	276.75 (368.88)	191.50 (259.03)	504.08(533.79)	.08

Note. Social activity was measured by Dementia Care Mapping; other outcome variables were extracted from actigraphy.

Table 4

Comparison of Residents With Improved Outcome at Posttest Between Groups (Chi-Squared Test)

Variables	PCDC (%) (n = 16)	Control (%) (n = 6)	p value
Daytime sleep (mins)	7 (43.8)	0 (.0)	.05
% daytime on sleep (%)	7 (43.8)	0 (.0)	.05
Nighttime sleep	12 (75.0)	2 (33.3)	.07
% nighttime sleep	12 (75.0)	1 (16.7)	.01
Arousal index	8 (50.0)	1 (16.7)	.16
Physical activity	7 (43.8)	0 (.0)	.05
Social activity	10 (62.5)	1 (16.7)	.06

Note. Social activity was measured by Dementia Care Mapping; other outcome variables were extracted from actigraphy.

Table 5

Comparisons of Outcomes Within and Between Groups at Postintervention

				Within-group (Paired t-test)		Between-group (ANCOVA)	
				p value			
		PCDC (n = 16)	**Control (n = 6)**	**PCDC**	**Control**	**p value**	**Partial eta-squared**
Sleep variables	Daytime sleep (mins)	241.48 (82.16)	341.82 (99.35)	.99	.07	.01	.31
	% daytime on sleep (%)	34.17 (11.52)	47.68 (13.92)	.92	.07	.01	.30
	Nighttime sleep (mins)	548.87 (57.64)	525.65 (58.27)	< .001	.53	.03	.22
	% nighttime sleep (%)	76.81 (7.84)	73.53 (7.96)	.07	.86	.03	.23
	Arousal Index	35.11 (15.20)	24.03 (8.09)	.22	.20	.23	.08
Variables associated with sleep	Physical activity (counts/min)	104.89 (44.56)	79.33 (44.56)	.68	.16	.35	.05
	Social activity (5mins/unit)	32.94 (15.00)	34.67 (18.77)	.21	.61	.49	.03
	Daylight exposure Mins over 1000 Lux	38.05 (33.10)	74.35 (91.49)	.05	.09	.08	.16
	Lux/min	2.81 (4.82)	8.65 (14.40)	.03	.13	.13	.12

Note. Social activity was measured by DCM; other outcome variables were extracted from actigraphy.