Heath Equity: Training Diabetes Educators to Promote Sleep Health in Mexico

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Introduction: Rates of diabetes throughout Mexico contribute to increases in morbidity, mortality and health care costs.

Objective: To describe a Spanish-language sleep disorders/sleep health promotion program for certified diabetes educators at a large university in central Mexico.

Methods: Health providers voluntarily completed 10-item True-False pre/post-test surveys following 2-hours of sleep training during each of six consecutive semesters. Curriculum included sleep disorders, causative factors and misconceptions, and sleep promotion strategies. Higher scores (range 0-10) indicated improved learning. Data were analyzed using frequencies, paired *t*-tests, pre/post item analysis and standard deviations with SPSS (V22). Significance was set at $p<0.05$. Qualitative comments derived from a post-test open-ended question regarding learning ("What was most beneficial to you?") were transcribed verbatim, coded, and categorized into themes. Study approvals were obtained from U.S. and Mexican institutions.

Results: Participant (N=146; 65% women) means with standard deviations showed significant learning from pre- (8.4±1.3) to post-testing (9.5±0.71, $p<0.001$). Item analysis revealed greatest learning areas were misconception about daytime napping and adult sleep needs, sleep as a risk factor for chronic illness, and sleep being as important as diet and exercise. Four themes emerged: Clinical care (53%), Greater knowledge of sleep (25%), Importance of sleep (13%), and Sleep self/family care (9%).

Conclusions: Health providers trained as certified diabetes educators could become leaders toward fostering healthy sleep in diabetes care across the lifespan that supports health equity and evidence-based policy by reducing sleep-associated comorbidities and health care costs. Notably, application to clinical practice was the leading theme to emerge from training.

Key words: Mexico; Sleep Wake Disorders; Diabetes Mellitus; Education; Health Promotion; Health Personnel; Health Equity; Evidence-Based Policy

INTRODUCTION

The local to global advance of chronic diseases across the lifespan, including obesity, type 2 diabetes, cardiovascular disease (CVD), and mood disorders are attributed, in large part, to lifestyle factors, particularly when a country's economy develops, and populations become more urbanized.[1] Traditionally, however, poor sleep behavior rarely, if ever, garners the same attention as the unhealthy lifestyle behaviors of poor diet, physical inactivity, smoking, alcohol or other drug use, and yet sleep is inextricably entwined with these behaviors. Impediments to controlling this local to global growth of chronic diseases involve nursing, medical, allied and community health programs that have yet to address chronic disease prevention and health promotion, a failure to provide current evidence on disease burden to key policy makers, limited health care access to underserved populations in developing and developed countries (health inequality), including the United States, and lack of an emphasis on health promotion, risk reduction, and prevention strategies.[1] The World Health Organization (2013)[2] stressed the growing shortage of providers, particularly nurses, further increasing health inequality and stressing the critical need for trained lay health workers, particularly for underserved, marginalized persons residing in low- and middle-income countries (LMICs).

To emphasize the need for sleep health education and interventions, twenty years of evidence support associations between sleep disorders, including obstructive sleep apnea (OSA), insomnia, restless legs syndrome (RLS), short sleep duration (less than six hours per night) and insufficient sleep with increased rates of obesity, diabetes, CVD, poorer mental health, reduced quality of life and well-being, and greater work, home, and traffic-related accidents due to fatigue, as well as disability and death.[3-7] A study of 313 older adults in Monterrey, Mexico found 52% of the participants snore, a risk factor for the metabolic syndrome,[6] 24% reported insomnia symptoms, 24% had RLS symptoms, 44% reported inferior quality sleep, and 62% indicated symptoms of depression.[8] In the EQUINOX descriptive primary care sub-study of 3,021 Mexican outpatients identified as having insomnia, 82% reported difficulty falling asleep, 80% difficulty staying asleep, and 71% with early morning awakening, with an overall frequency of 63% with insomnia; an additional 83% of this population reported non-restorative sleep, and 83% indicated that their social, emotional and work lives were affected, 25% severely so.[9] Notably, there was an increase in the prevalence of diabetes in Mexico from 9 to 13% between 2014 and 2016 with a concomitant 26% increase in economic burden.[3] The epidemic of diabetes has resulted in nearly 14% of all deaths in Mexico; however, the epidemic was attributed to poor diet and physical inactivity leading to obesity.[10] No mention was made of sleep as an essential lifestyle factor despite global dissemination of research linking sleep disorders to obesity and chronic disease.

Taken together, sleep as a lifestyle factor is still overlooked, undervalued, and under-diagnosed. In response to this oversight, the objective of this study is to provide quantitative and qualitative outcomes from a brief sleep training session for health providers enrolled in a diabetes educator certificate program at a large university located in central Mexico to support health equity and generate evidence-based policy.

I. METHODS

A. Type of Study

This is a mixed-method (quantitative and qualitative) descriptive study to examine learning of educational sleep concepts using a pretest and post-test design.

B. Participants and Recruitment Methods

Participants were providers (nurses, physicians, social workers, nutritionists, psychologists and exercise physiologists) enrolled in a semester-long diabetes educator certificate program for six consecutive semesters (2013-2015) at a university in central Mexico. Participants voluntarily completed a 10-item True-False pre- and post-test questionnaire. Inclusion criteria were enrollment in the class and willingness to complete the questionnaire. Survey questionnaires contained subject numbers, and semester and year of the course, and box to voluntarily indicate sex. There was no additional identifying information collected to maintain full confidentiality. Participants completed the pretest just prior to the training, and the post-test immediately after the 2-hour training. Class members were fully informed of their right to participate or not in the consenting process. Human subject's approvals were obtained from both the United States and Mexican universities.

C. Sleep training materials

Sleep training materials were adapted from a community health educator manual.[11] Curriculum included leading sleep disorders across the lifespan (OSA, snoring, insomnia, RLS, short sleep duration, and insufficient sleep), causative factors contributing to sleep disorders and chronic disease, misconceptions about sleep, and sleep hygiene/stimulus control methods for sleep health promotion presented in PowerPoint format. The training was based on the English to Spanish translation, back-translation and validation of the Sleep Heart Health Study (SHHS) Sleep Habits Questionnaire.[12] The framework for training drew from the 'Ramirez Family' used the National Institutes of Health National Heart, Lung, and Blood Institute (NIH NHLBI) promotora training manual, *Su Corazón/Su Vida*, now the updated Pan American Health Organization/World Health Organization (PAHO/WHO) training manual for promotoras,[13] to illustrate sleep disorders across the lifespan.

D. Data Collection and Analysis

Data were derived from the 10-item True-False pretest/post-test questionnaire regarding the training materials covered in the 2-hour training session. Higher scores (items correct prior to and after training) indicated improved learning of concepts (range 0-10). Item analysis for each of the True/False questions provided insight into the greatest areas of learning. Qualitative data were derived from a post-training open-ended question regarding areas of greatest learning ("What was most beneficial to you?"). Data were analyzed with frequencies, paired t-tests and standard deviations, and pre- to post-test item analysis using SPSS (V22) software. Significance was set at $p<0.05$. Qualitative statements were transcribed verbatim from Spanish to English, then back-translated to Spanish, coded, and then categorized into themes until saturation was achieved. Qualitative exploration also included percentage of mentions for themes that emerged.

II. RESULTS

Of the 168 participants enrolled in the certified diabetes educator certificate program over the six consecutive semesters, 146 (65% women; 30% men; 5% missing) completed the pre- and post-test questionnaires for an 86.9% response rate. As displayed in Table 1, participants showed significant learning from pre- to post-testing (p<0,001).

Table 1 Participant pre/post-test learning outcomes.

Participants (N=146)	Pre-test	Post-test
	8,4 ± 1,3	9,5 ± 0,71*
*p<0,001		

Item analysis, displayed in Table 2 along with the True and False pre-and post-test statements, suggested that the areas of greatest learning focus on misconceptions about sleep (#2), sleep in clinical practice (#4), and the importance of sleep (#5 and #6). Learning for these items improved significantly from pre- to post-testing (all p<0,01).

Table 2 Pre- and post-test item analysis for sleep disorders training (N=146).

T/F		Items	Statements
1.	T	F	Loud snoring means a person is sleeping deep and well.
2.	T	F*	People who don't sleep well at night and are tired during the day should sleep at least an hour in the afternoon.
3.	T	F	Insomnia is more common in women than in men.
4.	T	F*	Adults only need 5 or 6 hours of sleep every night for their health and well-being.
5.	T	F*	Sleep disorders are risk factors for obesity, high blood pressure, diabetes, and depression.
6.	T	F*	Sleep is not as important as a healthy diet and exercise for health and well-being.
7.	T	F	Children and teenagers need at least 9 hours of sleep every night.
8.	T	F	Mrs. Ramirez is 40 years old and is at a healthy weight. She has had problems falling asleep for more than nine years and, with time, has felt more depressed. It is very likely that Mrs. Ramirez has a sleep disorder called insomnia.
9.	T	F	Mr. Ramirez is 50-years-old, obese, and falls asleep during the day. His wife says that he snores and sometimes stops breathing during his sleep. Mr Ramirez probably has obstructive sleep apnea.
10.	T	F	Crawling, restless discomfort in the legs is the same as cramps in the legs.
*p<0,01			Starred items indicate major areas of learning following sleep training.

Themes, examples, and rankings by percent of mentions for each theme are displayed in Table 3. Of the 146 participants who completed the pre- and post-test questionnaires, 138 provided comments to the qualitative question, "What was most beneficial to you?" for a 94.5% response rate. The leading theme was germane to application of sleep learning within clinical practice and the promotion of healthy sleep. More than half of the respondents (53%) made comments relevant to this first theme. The second theme to emerge was that of enhanced knowledge of sleep disorders; 25% of the participants provided comments applicable to the causes, consequences, treatments, epidemiology and biol-

ogy of sleep problems. The third theme was the importance of sleep and 13% of participants reported this as significant learning for them. The fourth and final theme to arise was that of self and family sleep health with 9% of participants reporting this as personally relevant to material contained in the 2-hour training session.

Table 3 Themes, examples, and rankings by percent of mentions

Themes and Examples	**%**
1). Clinical care and sleep health promotion:	53%
--"Excellent information to identify symptoms that we can treat in patients, and often are considered as normal when they are not."	
--"To identify the clinical data and lifestyle factor modifications."	
2). Greater knowledge of sleep disorders:	25%
--"The influence of sleep deprivation on serotonin, melatonin, ghrelin and leptin."	
--"I learned more about the different sleep disorders, their causes and consequences, as well as their treatments."	
3). Importance of sleep:	13%
--"Question my patients more and give greater importance to sleep disorders."	
--"Understood the importance of sleep and its relationship as a risk factor in diabetes and henceforth will give more importance."	
4). Self/family sleep health promotion:	9%
--"Very important since I learned that my family and I are not getting the required hours of sleep for health."	
--"It gave me tips [stet] to organize my routines and improve my quality of sleep."	

III. CONCLUSIONS

Findings from this study indicate that health providers enrolled in the university-based diabetes educator program in central Mexico show significant learning regarding sleep disorders and sleep health promotion strategies. Pre-to-post item analysis suggested significant learning relevant to the misconception that daytime sleep can make up for poor nighttime sleep, sleep needs for adults, sleep as a risk factor for chronic disease, and sleep being as important a lifestyle factor as diet and physical activity. Consistency in item errors across the six consecutive semesters provide guidelines for reinforcing the learning of concepts that can be applied in clinical practice. The themes identified in the qualitative component of the study can serve as heuristic strategies for adding to and revising the sleep curriculum. The comments also imply that this academic platform is grounded in information that educates, informs and, importantly, leads health providers to incorporate sleep assessment and sleep health promotion into their clinical practice making sleep as compelling a lifestyle factor as diet and physical activity.

Notably, quantitative results and item analysis are consistent with a study done using the English version of the 2-hour sleep training among Doctor of Nursing Practice (DNP) students (N=51) at a large

public university in the southwestern United States.[14] The DNP students completed the English version of the same pre- and post-test measure. In like manner, item analysis for these DNP students showed similar misconceptions to those of the Mexican health providers, particularly regarding daytime napping as an approach to compensate for poor nighttime sleep, as well as sleep needs of adults. The uniformity of findings between these two groups receiving the same sleep training and pre to post-testing in two different languages suggests that the training is generalizable to other Spanish- and English-speaking health providers that holds promise for promoting sleep health equity to two language groups.

A limitation to these findings is the small number of participants, particularly the DNP students, that have taken part in these studies. Future studies employing this same training program need to be implemented with larger groups of health providers with both language versions to confirm these learning outcomes. Nevertheless, these preliminary outcomes for both Spanish and English versions are promising. Specific sleep health education and training strategies are needed to increase awareness and enhance clinical care delivery among health professionals whether they speak Spanish or English. The results of this study and the findings from the DNP study show potential for this sleep training program to become an evidence-based practice program in Mexico and the United States.[15] These programs emphasize outcomes based on rigorous evaluations of interventions designed for individuals, families, schools and communities that have proven successful.

In summary, this brief sleep training is a salient, cost-effective adjunct to education and practice. Given the high prevalence of type 2 diabetes in Mexico, health providers with certification as diabetes educators could become leaders in assessing and promoting sleep health equity across the lifespan, thereby reducing sleep-associated comorbidities and concomitant health care costs. The sleep training program for health providers also includes tangible teaching/learning tools that can promote public health with early identification of sleep disorders, engender culturally responsive healthy sleep behaviors, and inform evidence-based health policy than can affect and effect further community-based care.

REFERENCES

1. Baldwin, C. M., Cuervo, L. G., & Hancock, C. (in press). Considerations in conducting interventions in specialized settings: Interventions across global settings. In B. M. Melnyk and D. Morrison-Beedy (Eds.), *Designing, conducting, analyzing and funding intervention research: A practical guide for success, (2nd Ed*). New York, NY: Springer Publishing Company.

2. World Health Organization (2013). *Global health workforce shortage to reach 12.9 million in coming decades.* Retrieved May 10, 2018 from http://www.who.int/mediacentre/news/releases/2013/health-workforce-shortage/en/.

3. Arredondo, A., Azar, A., & Recamán, A.L. (2017). Diabetes, a global public health challenge with a high epidemiological and economic burden on health systems in Latin America. *Global Public Health, 27*, 1-8. doi: 10.1080/17441692.2017.1316414.

4. Baldwin, C. M., Reynaga Ornelas, L., Russell, M., Batool Anwar, S., & Quan, S. F. (2014). Quality of life and sleep disorders in special populations. In S. Garbarino, L. Nobili, & G. Costa (Eds.),

Sleepiness and human impact assessment (pp. 73-79). London: Springer Publishing Company.

5. Caruso, C. C., Baldwin, C. M., Berger, A., Chasens, E. R., Landis, C., Redeker, N. S., Scott, L. D., & Trinkoff, A. (2017). Position statement: Reducing fatigue associated with sleep deficiency and work hours in nurses. *Nursing Outlook, 65*(6), 766-768. doi: 10.1016/j.outlook.2017.10.011.

6. Quan, S. F., Baldwin, C. M., & Reynaga-Ornelas, L. (2016). El sueño y su relación con el metabolismo. In *Apnea obstructiva del sueño: Guía práctica para el médico general, el paciente y sus familiares* (pp. 38-50). Mexico City, Mexico: Trillas.

7. Durgin, T., Witt, E. A., & Fishman, J. (2015). The humanistic and economic burden of restless legs syndrome. *PLoS ONE*, *10*(10), e0140632. http://doi.org/10.1371/journal.pone.0140632

8. Tellez, A., Juarez Garcia, D. M., Jaime Bernal L., & Garcia Cadena, C. (2016). Prevalencia de trastornos de sueño en relación con factores sociodemográficos y depresión en adultos mayores de Monterrey, México. *Revista Colombiana de Psicologia, 25*(1), 95-106.

9. Marquez Romero, J. M., & Chiquete, E. (2013). Frecuencia de insomnio y sus consecuencias diurnas en pacientes mexicanos: Subanálisis del estudio EQUINOX. *Revista Mexicana de Neurosciencias, 14*(6), 314-320.

10. Barquera, S., Campos Nonato, I., Aguilar Salinas, C., Lopez Ridaura, R., Arredondo, A., & Rivera Dommarco, J. (2013). Diabetes in Mexico: Cost and management of diabetes and its complications and challenges for health policy. *Globalization and Health*, *9*, 3. http://doi.org/10.1186/1744-8603-9-3

11. Baldwin, C. M. (2014). Sesión 13. Los trastornos del sueño y la promoción del sueño saludable. In *Camino a la salud (Su Corazón/Su Vida) manual para promotoras y promotores*. PAHO/WHO, Washington, D. C.

12. Baldwin, C. M., Choi, M., McClain, D. B., Celaya, A., & Quan, S. F. (2012). Spanish translation and cross-language validation of a Sleep Habits Questionnaire for use in clinical and research settings. *Journal of Clinical Sleep Medicine: JCSM: Official Publication of the American Academy of Sleep Medicine*, *8(2)*, 137–146. http://doi.org/10.5664/jcsm.1764

13. Pan American Health Organization/World Health Organization. (2014). *Camino a la salud (Su Corazón/Su Vida) manual para promotoras y promotores*. PAHO/WHO, Washington, D. C. Retrieved May 9, 2018 from http://iris.paho.org/xmlui/handle/123456789/4313.

14. Baldwin, C. M., Kenny, K., Saewert, K. J., & Quan, S. F. (2015). Implementation and evaluation of sleep education in a Doctor of Nursing Practice program. [Abstract]. *Sleep Abstract Supplement, 38*, A441.

15. Baldwin, C. M., Schultz, A. A., & Barrere, C. (2016). Evidence-based practice. In B. M. Dossey & L. Keegan (Eds.), *Holistic nursing: A handbook for practice* (7th Ed.) (pp. 637-659). Boston, MA: Jones & Bartlett.