Providence

Differences in nutritional profile by chronotype among 12-hour day shift and night shift nurses

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Providence Inland Northwest Washington (PINWA)

Mission & Core Values

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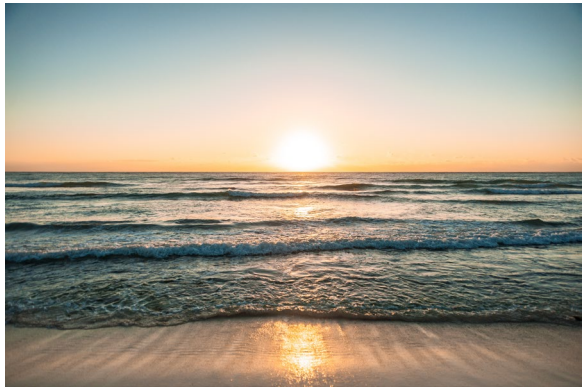
Objectives

1. Define chronotype
2. Describe how chronotype might influence dietary intake choices in acute care nurses

Background/ Literature Review

- Nurses work in high stress situations 24-7
- Night shift nurses more likely to have poor health
- The risk for negative health outcomes among nurses may be further compounded when assigned a shift conflicting with their chronotype.
- Few studies examine the nutritional patterns of 12-hour shift nurses stratified by preferred chronotype or chronotype mismatch to assigned shift.



Purpose/Aims

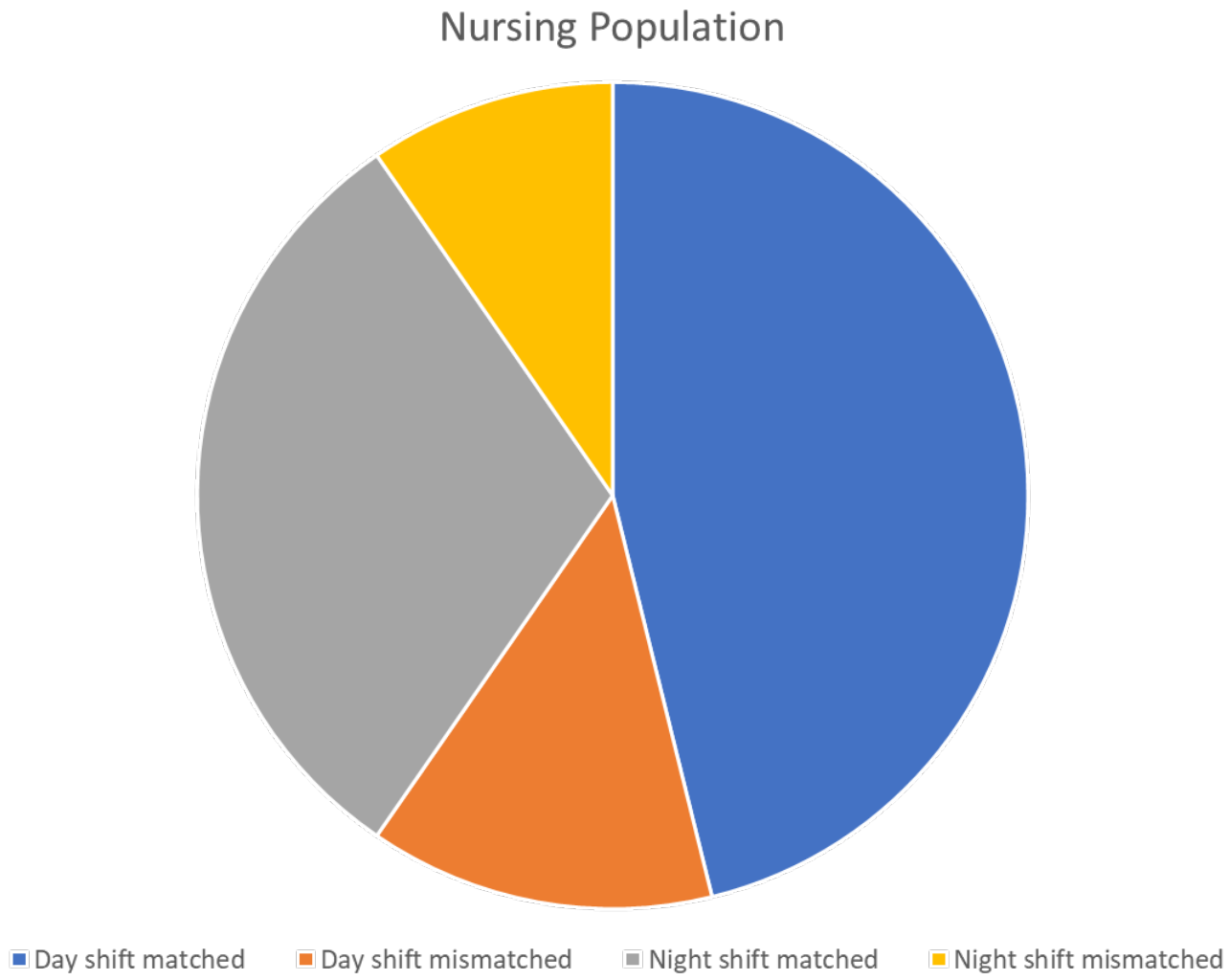
- To analyze differences in dietary intake among day shift and night shift nurses across a typical workweek, stratified by preferred chronotype.
- To determine whether differences in dietary intake exist between nurses with a shift-chronotype mismatch and those without a mismatch.

Methods/Approach

- Full-time nurses were recruited from 10 hospitals from October 2020 to October 2021.
- Participants recorded diet intake over a typical work week.
- Participants completed the revised morningness-eveningness questionnaire and reported their shift type. This was later coded as match/mismatch.
- Nutrients were analyzed and compared by preferred chronotype and when chronotype was mismatched to assigned shift.
- Statistical analysis software was SPSS; a p-value of 0.05 was considered significant.

Table 1. Characteristics of Participants by Chronotype

	M-type (N=19)	E-type (N=15)	N-type (N=23)	*P*
	n(%)	*n(%)*	*n(%)*	
Shift				
Day	13 (68)	7 (47)	14 (61)	0.65
Gender				
Female	15 (88)	11 (73)	21 (91)	0.18
Ethnicity				
Hispanic	4 (21)	3 (13)	2 (9)	0.93
Highest Education				
Associates or less	3 (16)	4 (27)	2 (9)	0.38
Age Range				
Less than 30Y	6 (32)	2 (13)	10 (43)	0.40
31-40Y	7 (37)	8 (53)	10 (43)	
41Y+	6 (31)	5 (34)	3 (14)	
Diet Quality since COVID				
Worse	6 (32)	9 (53)	9 (40)	0.23
	Mean (SD)	*Mean (SD)*	*Mean (SD)*	
Experience on Shift (Y)	4.4 (3.7)	6.3 (8.2)	2.6 (3.1)	0.12
BMI	26.0 (5.5)	29.2 (7.7)*	24.4 (3.7)*	0.04
Waist Circumference (in)	33.8 (6.0)	36.8 (7.2)*	31.6 (4.5)*	0.04



52 nurses (n=21 night shift and n=31 day shift) completed diet logs available for analysis.

Results

•Eveningness nurses consumed on average more calories than morningness or neither-type nurses.

•Mismatched day and night nurses consumed significantly more calories and carbohydrates per day across the work week than matched day or night nurses.

•Mismatched night nurses consumed more protein, sodium and fiber on average per day than other groups

•Mismatched day nurses consumed the most cholesterol.

Dietary Differences by Chronotype

	M-type (n=17)	E-type (n=14)	N-type (n=21)
	Mean (SD)	Mean (SD)	Mean (SD)
Calories per Day (kcal)	1804.8 (553.6)*	1814.9 (676.6)*	1531.2 (527.9)*
Carbohydrates per Day (g)	209.0 (75.2)*	192.7 (87.8)*	158.5 (87.2)*
Sugar per Day (g)	66.2 (34.8)*	64.8 (44.0)	54.2 (40.1)*
Fiber per Day (g)	22.2 (12.1)*	15.3 (9.7)*	13.8 (9.0)*
Total Fat per Day (g)	78.4 (43.3)*	72.8 (35.5)	64.4 (31.8)*
Saturated Fat per Day (g)	21.8 (11.3)	22.7 (14.8)	20.8 (13.1)
Cholesterol per Day (mg)	222.7 (190.3)	244.6 (218.8)	279.6 (249.5)
Protein per Day (g)	80.0 (36.4)	76.5 (37.7)	70.3 (30.6)
Sodium per Day (g)	2.3 (1.4)	2.1 (1.3)	2.1 (1.1)
*Groups differing significantly per post-hoc Tukey test			

Table 3. Differences in Average Daily Macronutrient Intake by Chronotype

Dietary Difference by Shift Match or Mismatch Chronotype

	Day Mismatched (n=7)	Night Mismatched (n=5)	Day Matched (n=24)	Night Matched (n=16)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Calories/d (kcal)	1935.1 (758.0)*	1976.9 (508.4)*	1648.9 (509.3)*	1561.0 (653.5)*
Carbohydrates/d (g)	194.2 (93.5)*	213.6 (61.9)*	179.3 (84.3)*	176.7 (91.2)*
Sugar/d (g)	63.2 (42.1)	59.5 (30.4)	61.2 (37.0)	59.6 (45.9)
Fiber/d (g)	12.8 (9.2)*	21.5 (13.2)*	19.6 (10.8)*	13.2 (9.3)*
Total Fat/d (g)	74.8 (41.0)	76.9 (29.6)	74.1 (40.2)	62.9 (31.5)
Saturated Fat/d (g)	22.8 (17.0)	25.2 (12.3)	21.8 (12.5)	19.8 (11.7)
Cholesterol/d (mg)	294.3 (261.2)*	245.6 (181.7)	275.0 (248.3)	198.0 (163.0)*
Protein/d (g)	82.6 (44.5)	94.0 (43.1)*	75.6 (29.7)*	64.6 (30.3)*
Sodium/d (g)	2.14 (1.51)	2.74 (1.52)*	2.11 (1.20)*	2.11 (1.23)*

Table 4. Differences in Average Daily Macronutrient Intake by Chronotype Match/Mismatch

*Groups differing significantly per post-hoc Tukey test

Conclusion

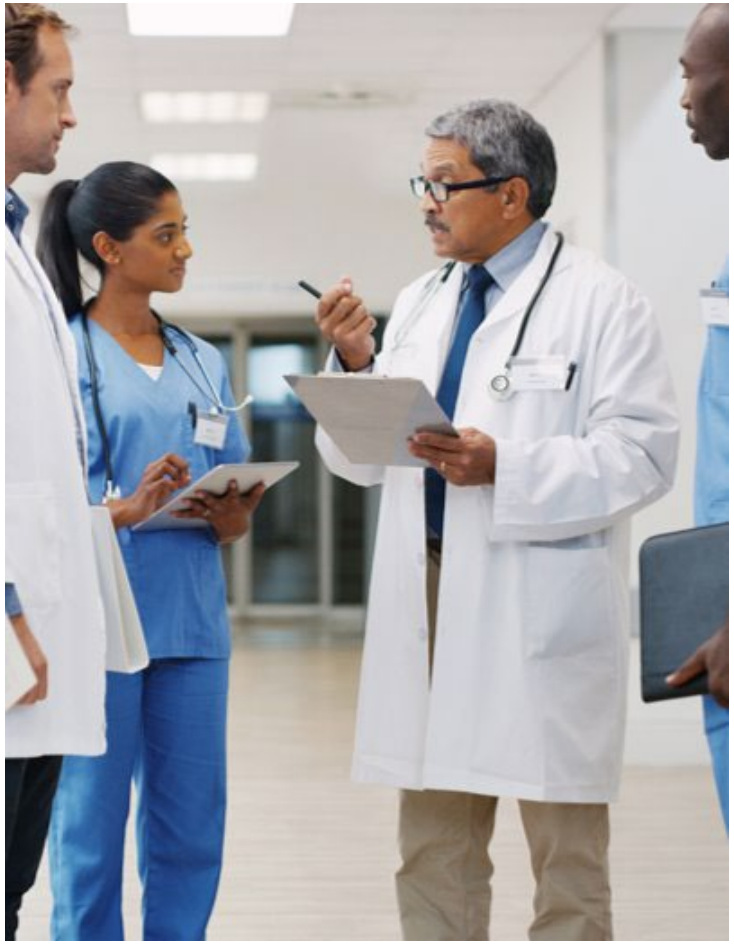
•Eveningness nurses consumed more calories and carbohydrates than other chronotypes.

•>1/5 of nurses were mismatched to shift (n=12, 23%).

•Mismatched nurses consumed significantly more of certain macronutrients

Implication for practice

- Chronotype may influence eating patterns.
- Organizational resources should be implemented to support healthy diet patterns for nurses working all shifts, such as consideration of preferred chronotype when assigning shift schedules.
- Educating nurses on importance of chronotype alignment to shift will allow them to be more proactive about their health.



References

Adan, A., & Almirall, H. (1991). Horne & Östberg morningness-eveningness questionnaire: A reduced scale. Personality and Individual Differences, 12(3), 241–253. https://doi.org/10.1016/0191-8869(91)90110-W

An R, Shi Y, Clarke C, Zhang S. 2019. Night-time eating and body weight status among US adults, 2007–2016. J Hum Nutr Diet. 32:754– 764 https://doi.org/10.1111/jhn.12671

Baron, K. G., & Reid, K. J. (2014). Circadian misalignment and health. International review of psychiatry (Abingdon, England), 26(2), 139–154. https://doi.org/10.3109/09540261.2014.911149

Cayanan EA, Eyre NAB, Lao V, Comas M, Hoyos CM, Marshall NS, Phillips CL, Shiao JSC, Guo YLL, Gordon CJ. 2019. Is 24-hour energy intake greater during night shift compared to non-night shift patterns? A systematic review. Chronobiology International. 36(12), 1599-1612. DOI 10.1080/07420528.2019.1666865.

Cheng, S. Y., Lin, P. C., Chang, Y. K., Lin, Y. K., Lee, P. H., & Chen, S. R. (2019). Sleep quality mediates the relationship between work-family conflicts and the self-perceived health status among hospital nurses. *Journal of nursing management*, *27*(2), 381–387. https://doi.org/10.1111/jonm.12694

Davis R, Bonham MP, Nguo K, Huggins CE. 2020. Glycaemic response at night is improved after eating a high protein meal compared with a standard meal: A cross-over study. Clinical nutrition (Edinburgh, Scotland), 39(5):1510–1516. https://doi.org/10.1016/j.clnu.2019.06.014

Evenepoel, C., Clevers, E., Deroover, L., Loo, W. V., Matthys, C., & Verbeke, K. (2020). Accuracy of Nutrient Calculations Using the Consumer-Focused Online App MyFitnessPal: Validation Study. Journal of Medical Internet Research, 22(10), e18237. https://doi.org/10.2196/18237

Gallego-Gómez, J. I., González-Moro, M. T. R., González-Moro, J. M. R., Vera-Catalán, T., Balanza, S., Simonelli-Muñoz, A. J., & Rivera-Caravaca, J. M. (2021). Relationship between sleep habits and academic performance in university Nursing students. BMC Nursing, 20(1), 100. https://doi.org/10.1186/s12912-021-00635-x

Gangwar A, Tiwari S, Rawat A, Verma A, Singh K, Kant S, Garg RK, Singh PK. Circadian preference, sleep quality, and health-impairing lifestyles among undergraduates of medical university. *Cureus.* 2018;10(6):e2856.

References

Harfmann, B. D., Swalve, N., Mitrzyk, J., & Montoye, A. H. K. (2020). Effect of Chronotype on Sleep Quality in a Laboratory Setting. *International journal of exercise science*, *13*(3), 1283–1294.

Hittle, B. M., & Gillespie, G. L. (2018). Identifying shift worker chronotype: implications for health. Industrial Health, 56(6), 512-523. https://doi.org/10.2486/indhealth.2018-0018

Kemper, K. J., Mo, X., & Khayat, R. (2015). Are Mindfulness and Self-Compassion Associated with Sleep and Resilience in Health Professionals? Journal of Alternative and Complementary Medicine (New York, N.Y.), 21(8), 496–503. https://doi.org/10.1089/acm.2014.0281

Khubchandani, J., Kandiah, J., & Saiki, D. (2020). The COVID-19 pandemic, stress, and eating practices in the United States. European Journal of Investigation in Health, Psychology and Education, 10(4), 950-956.

Koufakis, T., Maltese, G., Popovic, D. S., & Kotsa, K. (2022). The importance of sleep quality, quantity, and chronotype in the management of diabetes: Is it time to wake up?. *Journal of diabetes*, *14*(9), 633–634. https://doi.org/10.1111/1753-0407.13313

Kyle, R. G., Wills, J., Mahoney, C., Hoyle, L., Kelly, M., & Atherton, I. M. (2017). Obesity prevalence among healthcare professionals in England: a cross-sectional study using the Health Survey for England. BMJ open, 7(12), e018498. https://doi.org/10.1136/bmjopen-2017-018498

Maukonen M, Kanerva N, Partonen T, Männistö S. 2019. Chronotype and energy intake timing in relation to changes in anthropometrics: a 7-year follow-up study in adults. *Chronobiology international, 36(*1):27–41. https://doi.org/10.1080/07420528.2018.1515772

Millen BE, Abrams S, Adams-Campbell L, Anderson CA, Brenna JT, Campbell WW, Clinton, S, Hu F, Nelson M, Neuhouser ML, Perez-Escamilla R, Siega-Riz AM, Story M, Lichtenstein AH. 2016. The 2015 Dietary Guidelines Advisory Committee Scientific Report: Development and Major Conclusions. Advances in nutrition (Bethesda, Md.), 7(3), 438–444. https://doi.org/10.3945/an.116.012120

~~Peplonska~~, B., Kaluzny, P., & Trafalska, E. (2019). Rotating night shift work and nutrition of nurses and midwives. Chronobiology International, 36(7), 945 – 954.

Rangel, T. L., Saul, T., Bindler, R., Roney, J. K., Penders, R. A., Faulkner, R., Miller, L., Sperry, M., James, L., & Wilson, M. L. (2023). Exercise, diet, and sleep habits of nurses working full-time during the COVID-19 pandemic: An observational study. Applied Nursing Research : ANR, 69, 151665. https://doi.org/10.1016/j.apnr.2022.151665

References

Rathore HH, Shukla KK, Singh SS, Tiwari GG. Shift work—problems and its impact on female nurses in Udaipur, Rajasthan India. Work. 2012;41:4302–4314.

-Saklayen M. G. (2018). The Global Epidemic of the Metabolic Syndrome. Current hypertension reports, 20(2), 12. https://doi.org/10.1007/s11906-018-0812-z

Spaeth, AM, Dinges, DF, & Goel, N. (2013, Jul). Effects of experimental sleep restriction on weight gain, caloric intake, and meal timing in healthy adults. Sleep (Basel), 36(7), 981-90, https://doi.org/10.5665/sleep.2792.

Sun J, Chen M, Cai W, Wang Z, Wu S, Sun X, Liu H. Chronotype: Implications for sleep quality in medical students. *Chronobiol Int.* 2019;36(8):1115–1123.

Teixeira, G. P., Guimarães, K. C., Soares, A. G. N., Marqueze, E. C., Moreno, C. R., Mota, M. C., & Crispim, C. A. (2022). Role of chronotype in dietary intake, meal timing, and obesity: a systematic review. Nutrition Reviews. 81(1), 79-90. https://doi.org/10.1093/nutrit/nuac044

Teixeira, V., Voci, S. M., Mendes-Netto, R. S., & da Silva, D. G. (2018). The relative validity of a food record using the smartphone application MyFitnessPal. Nutrition & Dietetics: The Journal of the Dietitians Association of Australia, 75(2), 219–225. https://doi.org/10.1111/1747-0080.12401

U.S Department of Agriculture and U.S Department of Health and Human Services. Dietary guidelines for Americans, 2020-2025. 9th Edition. December 2020. Available at DietaryGuidelines.gov.

van der Merwe C, Münch M, & Kruger, R. 2022. Chronotype differences in body composition, dietary intake and eating behavior outcomes: a scoping systematic review. Advances in nutrition (Bethesda, Md.), 13(6), 2357–2405. https://doi.org/10.1093/advances/nmac093

~~Yu, L.,~~ Buysse, D. J., Germain, A.,Moul, D. E.,Stover, A., Dodds, N. E., JohnstonK. L., & Pilkonis, P. A. (2012). Development of Short Forms From the PROMIS™ Sleep Disturbance and Sleep-Related Impairment Item Banks. Behavioral Sleep Medicine, 10(1), 6-24. https://doi.org/10.1080/15402002.2012.636266

Zhao I, Bogossian F, Turner C. A cross-sectional analysis of the association between night-only or rotating shift work and overweight/obesity among female nurses and midwives. J Occup Environ Med. 2012;54(7):834–840.

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Questions?

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