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Teresa Bigand

Providence St. Joseph Health, teresa.bigand@providence.org

Panshak P. Dakup

Devon Hansen

Marian Wilson

Benjamin Thomas

See next page for additional authors

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Authors

Teresa Bigand, Panshak P. Dakup, Devon Hansen, Marian Wilson, Benjamin Thomas, Steven James, Lois James, and Shobhan Gaddameedhi

Relationships between Cortisol, Sleep, Stress, and Mood among Night Shift Nurses

Teresa Bigand^{a,c}, Panshak P. Dakup^b, Devon Hansen^c, Marian Wilson^d, Benjamin Thomas^{d,e}, Steven James^{c,d}, Lois James^{c,d}, Shobhan Gaddameedhi^b

^aNursing Department, Providence Health Care, Spokane; WA; ^bDepartment of Biological Sciences and Toxicology Program, North Carolina State University, Raleigh, NC; ^cSleep and Performance Research Center, Elson Floyd College of Medicine, Washington State University, Spokane, WA; ^dCollege of Nursing, Washington State University, Spokane, WA; ^eDepartment of Biology, Eastern Washington University, Cheney, WA, USA.

BACKGROUND

- Night shift poses adverse mood, stress, sleep, and cardiovascular health risks.
- Cortisol is a hormone that is clinically regarded as a stress indicator
- Cortisol levels follow a circadian rhythm in humans and naturally peak in the morning and drop in the evening.
- The impact of consecutive night shifts on cortisol levels remain unclear.

METHODS

- Nurses working 12-hour night shift were recruited from two urban hospitals in the Pacific Northwest (N=44).
- Nurses were tested in the morning after 3 consecutive 12-hour shifts and again after 3 consecutive days of rest.
- Nurses wore sleep actigraphs for 72 hours prior to both test sessions; they provided salivary cortisol samples and completed self-report questionnaires on mood, stress, and sleepiness.
- Salivary cortisol levels were determined using a Cortisol Enzyme Immunoassay Kit (Salimetrics, Cat #:1-3002).
- T-tests and regression models were conducted in SPSS v 26.

RESULTS

- Central tendencies on each variable of interest are displayed by working condition in Table 1 below.
- There was no statistical difference in measured saliva cortisol levels between off- and on-duty collections (Figure 1).
- After a third consecutive 12-hour shift, nurses were significantly more likely to have a normal cortisol level as sleep quality ($p<0.01$) and efficiency ($p<0.01$) increased (Table 2).
- Relationships between cortisol and stress, mood, and sleep (positive) were stronger when nurses tested after the third consecutive day of work versus after the third consecutive day of rest (data not shown).

FIG 1: SALIVARY CORTISOL LEVELS IN NIGHT SHIFT NURSES

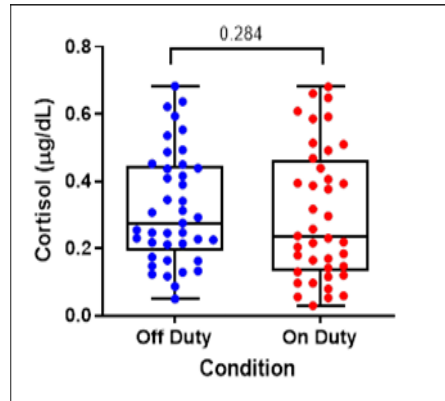


TABLE 1: MEDIAN MEASURES WHEN ON AND OFF-DUTY

Variable	Median±SD "on-duty"	Median±SD "off-duty"
Positive Mood (PANAS-Pos)	18.8±4.6*	19.5±4.6
Sleepiness (KSS)	5.0±1.8*	3.0±1.5
Perceived stress (PSS-4)	4.0±2.7	4.5±2.5
Sleep efficiency	90.0±6.9	87.4±5.7
Cortisol	0.23±0.19	0.28±0.17

* $p<0.05$

TABLE 2: MULTIVARIABLE RELATIONSHIPS WITH CORTISOL

	Beta	t	Significance
Sleepiness	-0.46	-3.15	0.01
Positive mood	0.16	0.85	0.23
Sleep efficiency	-0.01	-3.18	0.00
Perceived stress	-0.2	-1.18	0.25

CONCLUSIONS AND IMPLICATIONS

- We provide preliminary evidence that improving sleep hygiene for nurses may reduce negative health effects associated with working night shifts.
- Nurses may be able to recover from the stress of night shift work after three consecutive days of rest.
- Additional timepoints are needed to examine changes in cortisol levels.
- Further research should uncover novel strategies to support positive health outcomes in clinicians.

HIGHLIGHT

Nurses may recover from stress of working 3 consecutive night shifts after 3 consecutive days of rest.

