The Association between Stress, Fatigue and Cortisol in Acute Care Nurses & Nurse Leaders

Mona Cockerham, MSN, RN, PhDc, Duck-Hee Kang, PhD, FAAN, Robin Howe, MSN, RN RNC-OB & Susan Weimer, MSN RN
Department of Nursing in collaboration with University of Texas School of Nursing, Houston, Texas

Abstract

Health care reform introduced many changes to patient care delivery in hospitals. Nurses are faced with challenges related to length of stay limits and decreases in patient care reimbursement, while maintaining quality outcomes. Long work hours, stress and fatigue can compromise performance and patient safety.

Purpose: Use a biobehavioral approach to assess the effect of stress on cortisol and fatigue.

Methods: In an observational within-subject fatigue over two consecutive 12-hour day shifts in an acute care setting: 1) Assess the effect of stress on fatigue; 2) Examine the effect of stress on cortisol; 3) Compare the levels of stress, fatigue, and cortisol; 4) Compare the responses of stress, fatigue and cortisol between acute care, day shift staff nurses and nurse leaders. Data is collected before and after two consecutive shifts.

Results: Stress, fatigue and cortisol in a paired t-test significantly increased from baseline to Day 2 (p= 0.001, 0.004; 0.010, respectively). In comparing nurses and nurse leaders in an independent t-test, stress and fatigue at baseline were significantly higher in acute care nurses, than nurse leaders (p=>0.00, 0.05, respectively). At the end of two consecutive shifts, cortisol was significantly higher in staff nurses, than nurse leaders (p=0.001).

Methods

Design: A non-experimental, observational study with a within - subject repeated measures design. Convenience samples of acute care nurses and nurse leaders on the day shift who meet inclusion criteria, complete a consent to enroll in the study. Data is collected before and after a 12-hour shift for two consecutive shift.

Sample and Setting:
Medical/Surgical nurses and Nurse Leaders (Directors/Managers) recruited from 250-bed acute care hospital (oncology, stroke, and surgical, observational units and per diem nurses).

Demographics & Descriptive Statistics

Table 1.
Mean and SD of Nurse Leader and Staff Nurse Demographics and Scores

Demographic	Nurse Leader Mean (SD)		Staff Nurse Mean (SD)	
Age	44	(11.44)	35	(10.9)
Education*	3.50	(0.610)*	2.9	(0.52)*
Years of Experience	20.89	(10.15)	12.8	(7.98)
Hours Worked per Week	50.28	(6.53)	42.9	(5.63)
Hours Worked per Day	12.33	(0.767)	12.75	(1.16)
Hours Sleep per Night	6.44	(1.09)	6.20	(1.11)
MFI Scores	45.73	(12.73)	43.79	(13.64)
RN Stress Scores	54.29	(20.13)	81.26	(48.04)
PSS Scores	16.33	(5.40)	15.62	(6.57)
VAS-S Baseline	3.50	(2.74)	5.03	(2.44)

*2 = ADN; 3 = *BSN; 4=MSN*

The mean age of nurses in this study is 39.5 years. This study represents experienced nurses with a mean of 16.8 years of experience. Hours worked per day and fatigue scores are similar between groups, whereas, RN stress scores are higher in staff nurses than nurse leaders. Overall stress scores (PSS) are higher in nurse leaders though not statistically significantly.

Table 2
Instrument Descriptive Statistics

Time point	Variable	N	Range	Mean	(SD)
Day 1 AM	VAS-Stress	57	(0-10)	3.13	(2.39)
	VAS-Fatigue	57	(0-10)	3.40	(2.81)
	Cortisol	58	(0.0257-0.9696)	0.3101	(0.2223)
	MFI	58	(21-78)	44.48	(13.3)
	VAS-10	51	(0-10)	4.75	(2.54)
	PSS	59	(1-30)	5.78	(6.31)
	RNSS	59	(15-326)	14.95	(44.9)
Day 1 PM	Stress	58	(0-10)	4.68	(2.70)
	Fatigue	58	(0-10)	3.76	(2.70)
	Cortisol	57	(0000-.4713)	0.0860	(0.0968)
Day 2 AM	Stress	56	(0-10)	3.25	(2.50)
	Fatigue	58	(0-10)	3.76	(2.66)
	Cortisol	57	(0000-.8007)	0.2055	(0.1535)
Day 2 PM	Stress	59	(0-10)	4.82	(2.70)
	Fatigue	58	(0-10)	4.79	(2.57)
	Cortisol	57	(0000-.1939)	0.0058	(0.0443)

Baseline stress, as measured by PSS, RNSS, LISRES and VAS-Stress are not significant univariate or multivariate predictors of fatigue at Day 2. Stress and fatigue continue to increase from Day 1 to Day 2.

Results

Table 3
Paired T-test between Day 1 AM and Day 2 PM

Variable 1	Variable 2	N	Mean Difference	*p=*
Day 2 PM_Stress	Day 1AM_Stress	54	3.46	.001
Day 2 PM_Fatigue	Day 1AM_Fatigue	53	3.54	.004
Day 2 PM_Cortisol	Day 1AM_Cortisol	52	0.238	.000*
Day 2 AM_Cortisol	Day 1AM_Cortisol	54	-0.109	.001
Day 2 PM_Cortisol	Day 1PM_Cortisol	53	-0.038	.010

*Less than .001.
Stress and fatigue paired mean difference were statistically significant from Day 2 PM.

Stress and fatigue increase from the beginning of a work schedule to the end of two consecutive 12-hour shifts. Cortisol significantly increase from Day 1 AM to Day 2 PM*, however this is expected because of the natural circadian rhythm of cortisol. However, the increase in cortisol from Day 1 AM to Day 2 AM AND Day 1 PM to Day 2 PM is statistically and clinically significant.

Stress, fatigue and cortisol samples are collected between 6:30am/pm-7:30am/pm. The limited sample size are due to the ability to collect salivary samples due to emergencies at change of shift. If one collection was missed in a day, the results could not be used for statistical analysis.

Table 4
Independent Sample T-test over four-time points between Day 1 AM and Day 2 PM for Nurse Leaders and Staff Nurses

Time point	Variable	Nurse Leaders N=16 Mean (SD)	Staff Nurses N=43 Mean (SD)	Mean Difference	*p=*
Day 1 AM	Stress	1.2 (1.03)	3.3 (2.01)	2.060	.000
	Fatigue	2.1 (1.95)	4 (2.77)	1.571	.050
	Cortisol	0.3394 (0.2305)	0.3180 (.2241)	-0.0214	.779
Day 1 PM	Stress	4.3 (2.84)	5.0 (2.95)	0.7555	.418
	Fatigue	4.3 (2.91)	5 (2.68)	0.5557	.550
	Cortisol	0.1018(0.1460)	0.0736 (0.0514)	-0.0282	.507
Day 2 AM	Stress	2.6 (2.60)	4.5 (2.35)	0.8475	.310
	Fatigue	3.6 (2.99)	3.8 (2.63)	0.2333	.805
	Cortisol	14 (.2186)	41(0.2041)	-0.0144	.769
Day 2 PM	Stress	4.5 (2.65)	5(2.78)	0.4239	.613
	Fatigue	4 (2.03)	5 (2.76)	0.9571	.175
	Cortisol l	0.0224 (.0275)	0.0590 (0.0446)	0.0365	.001

Stress and fatigue are significantly higher in staff nurses than nurse leaders starting a work schedule, however cortisol is not significantly different between the two groups. Stress and fatigue quickly increase in nurse leaders to match those of staff nurses. The cortisol mean difference between staff nurses and leaders are not significantly different, until the end of the second shift.

Future studies should focus on the effects of stress, fatigue and cortisol over more than two-consecutive shifts. The differences in these concepts between day and night shift nurse will provide a baseline to evaluate the effectiveness of unit-based fatigue counter measure program interventions.

Theoretical Framework

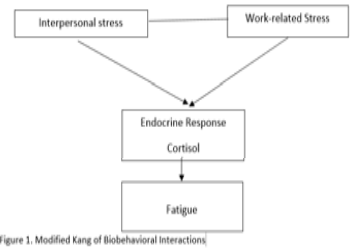

Figure 1. Modified Kang of Biobehavioral Interactions

Stress leads to a interaction in the endocrine system, causing a fight or flight response, and a increase in cortisol production, and if not resolved leads to a fatigue.

Recommendations

- ❑ Nurses are aware of practice attitudes and practices to maintain a healthy work environment but fail at self-care.
- ❑ Make healthy choices.
- ❑ Stay hydrated, keep water close at hand.
- ❑ Eat healthy foods, high in protein, low in fat and sugar.
- ❑ Take a lunch break.
- ❑ Use coffee and other caffeinated beverages wisely.
- ❑ Sleep at least 6 hours between shifts.
- ❑ Reduce consecutive shifts and overtime when possible.
- ❑ Nursing leaders support work breaks and meal breaks, and reduce overtime.
- ❑ Be knowledgeable of fatigue and its effect on patient care and recognize the signs of fatigue.
- ❑ Recognize ineffective coping, passive behavior, and negative communication as a possible result of fatigue.
- ❑ Be familiar with hospital employee assistance programs.

Contact Information

Mona Cockerham mona.c.cockerham@uth.tmc.edu
Duck-Hee Kang duck-hee.kang@uth.tmc.edu
Robin Howe rhowe@houstonmethodist.org
Susan Weimer skweimer@houstonmethodist.org