



Research Article

MEASURING STRESS AMONG PHYSICIANS' WORKING ON-DUTY AT KING FAHAD GENERAL HOSPITAL IN JEDDAH, 2013

Dr. Faisal Ahmad Aljuhani, Dr. Alaa Abdulkareem Shaheen,
Dr. Omar Abdulkarim Alkathiri and Dr. Yahya Makhdom*

Consultant Community and Family Medicine the Joint Program of Family and Community Medicine, Jeddah

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ABSTRACT

Background: Physicians are exposed to many stressors, such as the burden imposed by expectations of a high degree of professionalism, responsibility for patient well-being and maintenance of relationships with patients and health workers, as well as concerns about medical errors and malpractice litigation.

Objectives: To determine association of 24-hours hospital On-Duty with stress among physicians as well as to compare the level of stress between physicians who work 24-hours hospital On-Duty to those who do not in King Fahad General Hospital in Jeddah at 2013.

Subjects and Methods: A descriptive cross sectional study was carried out in May 2013 including physicians in King Fahad General Hospital in Jeddah city who were available at the time of study conduction. Data were collected by self-administered questionnaire included information about socio-demographic data of physicians. In addition, the Perceived Stress Scale (PSS) was utilized to measure the degree to which situations in one's life are appraised as stressful among them.

Results: The study included 173 physicians with a response rate of 68.4%. Their age ranged between 24 and 59 years with a mean of 35.69 years and standard deviation of 7.6 years. Most of them (76.9%) were males and Saudis. Almost two-thirds (65.3%) of physicians reported a history of 24-hours hospital on duty. The perceived stress scale score (PSS) ranged between 11 and 32 with a mean of 22.71, median of 24 and standard deviation of 4.12. (Extremes were 0-40). PSS score was significantly higher among Saudi physicians compared to non-Saudi physicians (mean ranks were 92.56 versus 68.50), $p=0.007$. PSS score was significantly higher among physicians who had 24-hours hospital duty compared to those who had no 24-hours hospital duty (mean ranks were 100.06 versus 62.40), $p<0.001$. PSS score was also significantly high among residents (mean rank=101.21), $p=0.003$. Diabetic physicians expressed higher significant PSS score compared to non-diabetics (mean rank were 130.46 and 83.76, respectively, $p=0.002$). PSS score was highest among orthopedic surgeons (mean rank= 108.84) and general surgeons (mean rank=108.03) followed by ER physicians (mean rank=101.47) whereas it was lowest among dermatologists (mean rank=30.13). The difference was statistically significant, $p<0.001$.

Conclusions: This study identified that physicians at King Fahad general hospital in Jeddah do face considerable amount of stress at work place. Saudi, surgeons, emergency physicians, residents, those who had 24-hours hospital duty and those with diabetic history expressed significant higher perceived stress score than others.

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INTRODUCTION

Physicians in residency training programs are required to work for prolonged periods under conditions of sleep deprivation. That is, "on-call" nights.⁽ⁱ⁾

On 1 July 2003, The Accreditation Council for Graduate Medical Education in USA approved regulations that would prohibit residents from working more than 80 hours per week and more than 24 hours at a stretch.

*Corresponding author: Dr. Faisal Ahmad Aljuhani
Consultant Community and Family Medicine the Joint Program of Family and Community Medicine, Jeddah

⁽ⁱⁱ⁾On 1 July 2011 The Accreditation Council for Graduate Medical Education further restricting the duty hours of the residents, the maximum continuous duty period for Post Graduate Year 1 (PGY1s) has been reduced to 16 hours per stretch. Post Graduate Year 2 (PGY2s) and above may work 24 continuous hours, with an additional 4 hours permitted for hand-offs, but "strategic napping" is suggested.⁽ⁱⁱⁱ⁾

The Saudi Council for Health Specialties mandate an average of 6-8 On-calls duty per month for most of the specialty that require 24 hours care of the patients.^(iv) According to Baum (1990), "stress can be defined as a

negative emotional experience accompanied by predictable biochemical, physiological and behavioral changes that are directed toward adaptation either by manipulating the situation to alter the stressor or by accommodating its effects."^(v)

Lazarus and Folkman (1984) provided the following definition: "Psychological stress involves a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being".^(vi)

Physicians are exposed to many stressors, such as the burden imposed by expectations of a high degree of professionalism, responsibility for patient well-being and maintenance of relationships with patients and health workers, as well as concerns about medical errors and malpractice litigation.^(vii)

It has been shown that health workers are highly susceptible to stress at work and experience more negative outcomes of stress than other professions. Work stress in physicians is associated with an array of other negative outcomes such as adverse psychological well-being, job burnout, significantly larger number of suicide attempts, and other psychosocial problems. Stress in physicians affects not only their private lives and health but also the quality of medical care that they provide, patient's satisfaction with the physician, and patient's adherence to treatment.^(viii)

The stress produced by acute sleep deprivation and prolonged fatigue among physicians leads to reduced alertness and concentration, which, in turn, leads to prolonged and suboptimal decision-making and impaired judgment, both of which impair physician performance and jeopardize patient and physician safety.^(ix)

Many studies proven that lack of sleep, sleeping less than 7 hours or circadian phase misalignment can result in performance decrements, health deterioration and increase in obesity rate in the community. In addition, many studies and analyses done in the US have demonstrated that after a period of sleep deprivation, such as being on an overnight call, doctors have worse language and numeric skills, less retention of information and impaired short-term memory and concentration. Additionally, sleepiness has a significant negative effect on mood, with individuals demonstrating increased anger and anxiety. There are several examples of self-reported data linking the fatigue of health care personnel to medical errors.^(x,xi)

Long working hours, high frequency of on-call/overnight works, lack of rest due to sleep deprivation, and insomnia were associated with an increased risk of significant medical errors, adverse events and fatalities, which in turn can increase stress.^(xii)

Very few local studies were conducted in this area.^(ix,xiii)

Operational Definitions

Stress: Will be defined according to a definition by Lazarus and Folkman (1984),^(vi) as a condition or feeling experienced when a person perceives that "demands exceed the personal and social resources the individual is able to mobilize." Lazarus developed psychological stress theory, which views stress as a relationship, or transaction, between individuals and their environment. Self-reported perceived stress will be measured by the Perceived Stress Scale.

24-Hours On-Duty (On-Call): Defined as the continuous 24-hours or more in which the physicians are obligated to stay in the hospital and provide continuous care for the patients.

Rationale

Self-experience of symptoms of stress, fatigue, sleep deprivation, and lack of concentration while and after attending long hospital On-Duty, created the desire of finding out similar problem among other colleagues and its effect on their life and quality of patients care.

Up to the researcher knowledge no previous study was carried out to investigate the inter correlation between long hospital On-Duty and stress among physicians in King Fahad General Hospital.

Aim

This study aims at providing information for designing coping with stress programs among physicians.

Objective

To correlate the 24-hours hospital On-Duty with stress among physicians in King Fahad General Hospital in Jeddah at 2013.

To compare the level of stress between physicians who work 24-hours hospital On-Duty to those who do not in King Fahad General Hospital in Jeddah at 2013.

Literature Review

Circadian and Homeostatic Sleep-Wake Regulation

Sleep is a dynamic process that adjusts to the body's needs every day. What time you fall asleep, how long you sleep, and how well you sleep, all result from the combined effects of two forces: the homeostatic debt and the phase of your circadian rhythm.^(xiv)

The two-process model of sleep regulation has been applied successfully to describe, predict, and understand sleep-wake regulation in a variety of experimental protocols such as sleep deprivation and forced de-synchrony. The model consists of a homeostatic process termed 'process S' and a circadian process termed 'process C'. Process S represents a putative drive for sleep that increases progressively during wakefulness, and decreases progressively during (non-REM) sleep. Process C represents a (nearly) 24-h oscillatory variation in the propensity for sleep. These two processes were demonstrated to predict the timing and duration of sleep and the intensity of non-REM sleep. The interaction between the homeostatic and circadian processes of sleep-wake regulation was investigated using neurobehavioral performance data from a laboratory experiment involving total sleep deprivation. The results provided evidence of an actual non-linear interaction between the homeostatic and circadian processes of sleep-wake regulation for the prediction of waking neurobehavioral performance.^(xv)

Medical Profession and the Sleep/Wake Regulation

Working long shifts, fragmented sleep due to actual^(xvi) or threatened^(xvii) interruptions, moonlighting, concurrent primary sleep disorders, and insufficient recovery sleep contribute to acute and chronic sleep deprivation in physicians, particularly those in training. Night shifts force physicians to work at the circadian acme of sleep propensity, which may jeopardize waking function, and rotating work shifts disrupt circadian

alignment and sleep consolidation. Naps may be an effective countermeasure, but when accomplished in the setting of sleep deprivation and/or increased circadian sleep propensity, sleep inertia may impair performance on awakening.^(xviii)

In 2010, a longitudinal field study conducted to find the relation between Sleep and recovery in physicians on night call. Sleep, monitored by actigraphy and Karolinska Sleep Diary/Sleepiness Scale on one night after daytime work, one night call, the following first and second nights post-call, and a Saturday night, was compared between 15 anesthesiologists and 17 pediatricians and ear, nose, and throat surgeons. Results showed that recovery patterns over the days after night call did not differ between groups, but between days. Mean night sleep for all physicians was 3 hours when on call, 7 hours both nights post-call and Saturday, and 6 hours after daytime work ($p < 0.001$). Scores for mental fatigue and feeling well rested were poorer post-call, but returned to Sunday morning levels after two nights' sleep. The conclusion was that these 16-hour night duties were compatible with a short-term recovery in both physician groups, but the limited sleep duration in general still implies a long-term health concern.^(xix)

Lockley and his group studied the effects of health care provider work hours and sleep deprivation on safety and performance. Physicians in training working traditional > 24-hour on-call shifts are at greatly increased risk of experiencing an occupational sharp injury or a motor vehicle crash on the drive home from work and of making a serious or even fatal medical error. Residents who work 24-hours or more shifts have twice as many attentional failures and commit 36% more serious medical errors in comparison to those who work 16-hours shifts. They also report making 300% more fatigue-related medical errors that lead to a patient's death.^(xx)

Physicians and Stress

In 2011 a study done by Wang and his group to assess the levels and association of occupational stress and depression rate among physicians, and to compare physicians' occupational stress with that of Taiwanese employees in other occupations. Results revealed that the depression rate (13.3%) was higher than that found in the general population (3.7%) of Taiwan. The mean scores of the Job Content Questionnaire (JCQ) dimensions "work demands" and "job control" were both much higher than those in most occupations in Taiwan. The study suggests that job stress plays an important role in depression in physicians; it is necessary to pay attention to physicians at high risk of depression, as well as their work environments, for early detection and intervention.^(xxi)

In 2011 a study done by Tomioka and his group to investigate the cross-sectional association between working hours, occupational stresses and depression among physicians. A self-administered questionnaire was mailed to 1902 alumni of a medical school. The questionnaire evaluated working hours in the previous week, occupational stresses assessed by the effort-reward imbalance model, social support and depression evaluated by the Center for Epidemiologic Studies Depression scale. The associations between these occupational factors and depression were analyzed using multiple logistic regression analysis. This study indicates that the management of occupational stresses is needed as a countermeasure against depression among physicians.^(xxii)

A study done by Poantă and his group to determine the connection between professional stress evaluated with Job

Content Questionnaire, in a group of physicians, and some biomoral markers, including cortisol, and to analyze gender differences. There were included 118 presumed healthy physicians from Cluj county, aged between 30 and 60 years, with medical specialties. In conclusion professional stress is connected with inflammation and this could be a pathway through cardiovascular disease. There are some gender differences in stress perception which should be taken into account.^(xxiii)

In a prospective study, a cohort of Swiss medical school graduates was followed up, beginning in 2001. In their fourth and eighth year after graduation, 443 physicians assessed their workplace conditions, the experienced effort-reward imbalance, the received professional and emotional support as well as their personal characteristics. The chronic stress experience was measured by the Trier Inventory for the Assessment of Chronic Stress-Screening Subscale of Chronic Stress (TICS-SCSS), 7 years after graduation. The model of influencing factors on chronic stress experience was tested with a hierarchical regression analysis. Young physicians report to feel chronically stressed early in their professional career. Actions have to be taken to reduce the stress level mainly in regard to re-establish reciprocity between perceived effort invested and rewards received, in the form of esteem, monetary gain and career opportunities including job security.^(xxiv)

A study done by Gallery and his group to determine the level of stress and depression among emergency physicians and whether these variables were related to the emergency physician's decision to leave the specialty. The study involved a random sample of 1,350 emergency physicians who received a questionnaire containing scales on depression and occupational stress as well as questions about their future plans for remaining in the specialty. In conclusion, while the vast majority of emergency physicians reported normal levels of stress, a disproportionate number reported high levels of stress and depression and plan on leaving the specialty of emergency medicine. The number of individuals planning to leave appeared to be greater than the number that will be replaced through residency training.^(xxv)

In a study that examine the differences in work stress between nurses and physicians, and relationships between work stress, work activity patterns, and sleep. A total of 185 physicians and 119 nurses (206 women, 98 men) working in four teaching hospitals participated in an observational study of work stress. Participants completed more than 9,500 random interval surveys during the study (an average of 30.8 surveys per person-week). Emotional stress scores among physicians were nearly 50% higher than those of nurses. Higher work stress and lower sleep quality were also associated with poorer memory performance.^(xxvi)

Hargreave and his group studied gender differences in stress among physicians. A questionnaire was sent out in 2001 to a total of 1414 physicians; 707 males and 707 females. Using SPSS, the answers were reviewed by gender differences in relation to selected stressors in daily life, working life and health. Finally, a logistic regression was run where the correlation between gender and stress was controlled for all significant stressors. Female physicians had more than twice the risk of being stressed on a daily basis compared to their

male colleagues, in spite of control for stressors in relation to daily life, working life and health.^(xxvii)

Mira and his group conducted a study to determine the level of job satisfaction and job stress among general practitioners of National Health Service, and the most common sources of stress of their job. The setting was the primary care centers of the Valencian Health Service. 216 general practitioners were questioned. Of these 127 answered on time (102 male; age 39-55 years; response rate of 58.80%). Moderate job stress has been observed among general practitioners. The most important sources of stress were interruptions of family life and other conditions which disturb intimacy.^(xxviii)

Al-Omar conducted a study to determine the sources of work-stress among the MOH hospital staff working in Riyadh City, Saudi Arabia, to examine the relationship between the socio-demographic variables and the level of work stress, and to studies the relationship between work-stress and the anticipated outcomes. The conclusion was that the level of work-stress among the MOH hospital staff seems to be high. This was due to insufficient technical facilities, absence of appreciation, long working hours, and short breaks. In addition, the older the employee and the more experience he/she has the less work-stress is experienced.^(xiii)

On-calls (On-Duties) and Stress

In July 2012, a systematic review of a literature showed that extended work hours, interrupted sleep, and shift work are integral parts of medical training among all specialties. The need for 24-hour patient care coverage and economic factors have resulted in prolonged work hours for resident physicians.^(xxix)

In a prospective observational study of the fellowship training, workload, fatigue and physical stress. The workload and the level of fatigue and physical stress of 11 senior fellows during 35 shifts in the critical care unit at the Hospital for Sick Children in Toronto were measured. The numbers of rostered hours were within Ontario guidelines. The mean shift duration was 25.5 hours (range 24-27 hours). The fellows worked on average 69 hours (range 55-106) per week. In conclusion established Canadian and proposed American guidelines expose trainees to significant on-call workload, physical stress and sleep deprivation.^(xxx)

In a study for Intern call schedules and their relationship to sleep, operating room participation, stress, and satisfaction, interns taking call every other night reported the greatest amount of fatigue and stress, the lowest satisfaction, and the fewest operative cases compared with interns taking call every third or fourth night.^(xxxi)

In 2006, Lindfors and his group investigated on-call stress and its consequences among anaesthetists. A questionnaire was sent to all working Finnish anaesthetists (n = 550), with a response rate of 60%. Four categories of on-call workload and a sum variable of stress symptoms were formed. In this sample, 68% felt stressed during the study. The most important causes of stress were work and combining work with family. The study showed a positive correlation between stress symptoms and on-call workload (p = 0.009).^(xxxii)

In 2005, Tendulkar hypothesized that surgical resident stress involves both psychological and physiologic components that manifest as changes in heart rate (HR) and circulating white blood cell (WBC) count. HR was continuously documented by

Holter monitor for 24 hours "on call" in interns (n = 6), junior residents (n = 5), and senior residents (n = 5). Interns (n = 4), junior residents (n = 4), and senior residents (n = 4) during periods devoid of clinical responsibilities served as controls. WBC counts were obtained from residents "off" and "on call" for interns (n = 5) and junior residents (n = 5). Mean HR "on call" increased in all resident groups as compared with controls. When heart rate is used as an indicator of combined physiologic and psychological stress, surgical residents achieve stress levels of tachycardia "on call". Surgical residents also exhibit an increase in circulating WBC count "on call".^(xxxiii)

From May 2009 to April 2010 Wali and his group conducted a study for the effect of on-call-related sleep deprivation on physicians' mood and alertness. Eighty-eight junior physicians working in the university hospital in Jeddah completed a questionnaire, before and after completion of a shift. They conclude that acute sleep loss due to working long on-call shifts significantly decreases daytime alertness and negatively affects the mood state of junior physicians.^(ix)

METHODOLOGY

Study Area

This study was carried out in Jeddah city, which is a Saudi city located in the middle of the eastern coast of the red sea known as the 'Bride of the Red Sea' and is considered the economic and tourism capital of the country. Its population is estimated around 3.4 million, area inhabited is more than 1,500 km and it is the second largest city after Riyadh.

The Ministry of Health (MOH) is responsible for the supervision of healthcare and hospitals in both the public and private sectors. The healthcare system has two tiers. One is a network of primary healthcare centers and clinics that provide preventive, prenatal, emergency, and basic services, as well as mobile clinics for remote rural areas. The second tier is represented by the hospitals and specialized treatment facilities located in urban areas. There are 9 MOH hospitals in Jeddah.^(xxxiv)

This study was carried out in King Fahad General Hospital which was opened in 1400H, it has a total of 612 bed capacity, it has a number of specialized medical centers such as heart center, ears and nose and throat, kidney center, dental center, Prince Sultan bin Abdulaziz center for laparoscopic surgery in addition to 24-hours emergency, internal medicine, surgery, ICU and orthopedic departments.^(xxxv) This hospital was chosen because it has departments that don't require physicians to work 24h hospital On-Duties.

Study Period

This study was conducted during May 2013.

Study Design

This study was a descriptive cross sectional study.

Study Population

All physicians who were available at the study period in King Fahad General Hospital in Jeddah city were eligible to be included in the study.

Sampling / Sampling Size

Out of 253 physicians available at the time of the study, 173 responded by filling in completed study questionnaire.

Data Collection

Data Collection tool

Self-administered questionnaire that included information about socio-demographic data as name (optional), age, gender, marital status, nationality, department, on-duties and educational level.

The Perceived Stress Scale (PSS): is the most widely used psychological instrument for measuring the perception of stress. It is a measure of the degree to which situations in one's life are appraised as stressful. Items were designed to tap how unpredictable, uncontrollable, and overloaded respondents find their lives. The scale also includes a number of direct queries about current levels of experienced stress. Moreover, the questions are of a general nature and hence are relatively free of content specific to any subpopulation group. The questions in the PSS ask about feelings and thoughts during the last month. In each case, respondents are asked how often they felt a certain way. PSS scores are obtained by reversing responses (e.g., 0 = 4, 1 = 3, 2 = 2, 3 = 1 & 4 = 0) to the four positively stated items (items 4, 5, 7, & 8) and then summing across all scale items. The PSS-10 has a possible range of scores from 0 to 40. Higher scores represent high stress levels. There is an abundant literature reporting reliability and validity of Perceived Stress Scale.^(xxxvi,xxxvii)

The PSS is not a diagnostic instrument, so there are no cut-offs. There are only comparisons between people in a given sample.^(xxxviii)

Data collection technique

During the data collection month, the researcher visited King Fahad General Hospital. The researcher specified one day for each department and distribute the questionnaire among the physicians who are included in the study immediately after the morning meeting. The questionnaires were collected after been filled by the physicians in the same day.

Principle Variables

Dependent variables: Stress level.
Independent variable: On-Duty, gender, age and educational level.

Data Entry and Analysis

Data were analyzed using IBM SPSS Statistics version 22. Continuous variables were presented as mean and standard deviation (SD) for normally distributed variables (age) while they were presented as median and interquartile range (IQR) for abnormally distributed variables (PSS). Categorical variables were presented as frequency and percentage. Since PSS was abnormally distributed as evidenced by significant Kolomongrove-Smironove test (K-S), non-parametric statistical tests were performed. Mann Whitney statistical test was utilized for comparison of two groups whereas Kruskal-Wallis test was applied for comparison of more than two groups. Differences were considered as statistically significant when the p-value was less than 0.05.

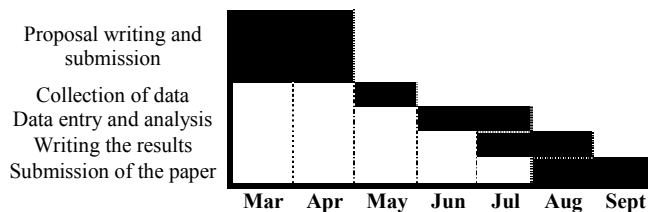
Pilot Study

After getting approval for the research, a pilot study was done to test the applicability of the questionnaire and the time needed to fill it. The questionnaire was clear, easily understandable. Time needed to fill it was approximately 10 minutes. It was done on a sample from King Abdulaziz General Hospital in Jeddah and it was not be included in the main study.

Ethical Considerations

1. This study was done after achieving ethical approval from the research ethics committee.
2. Approval for this study was taken from the hospitals administration.
3. It was written on the front page of the questionnaire that answering this questionnaire considered as agreement of participation in the study.
4. Confidentiality of the participants' information's was ascertained.
5. It was benefit and caused no harm to the participants and society.

Work Plan



Budget

Self-funded

RESULTS

Response rate

Out of 253 physicians available at the time of the study, 173 responded by filling in completed study questionnaire. Thus, overall response rate of 68.4% was obtained. The highest response rate was reported among ER physicians (85.7%) while the lowest rate was reported among surgeons and dermatologists (60.6%). Table 1

Table 1 Response rate of physicians at King Fahad General Hospital, Jeddah city to participate in the study

	Number of physicians	Responded physicians	Response rate
Medicine	61	41	67.2
Surgery	66	40	60.6
Dermatology	33	20	60.6
ER	21	18	85.7
Orthopedics	38	28	73.7
ENT	34	26	76.5
Total	253	173	68.4

Socio-Demographic Characteristics of the Respondents

The study included 173 physicians. Their socio-demographic characteristics are presented in table 1. Their age ranged between 24 and 59 years with a mean of 35.69 years and standard deviation of 7.6 years. Most of them (76.9%) were males and Saudis. One hundred and eight physicians (62.4%) were married. Almost a quarter of them were recruited from either medical (23.7%) or surgical (23.1%) departments. Seventy-four of them (42.8%) were residents while 49 (28.3%) and 50 (28.9%) were specialists and consultants, respectively.

Table 2 Socio-demographic characteristics of physicians, King Fahad general hospital, Jeddah

	Categories	Frequency	Percentage
Age (years)	≤30	57	32.9
	31-45	94	54.3
	>45	22	12.7
Gender	Male	133	76.9
	Female	40	23.1
Nationality	Saudi	133	76.9
	Non-Saudi	40	23.1
Marital status	Single	61	35.3
	Married	108	62.4
	Divorced	4	2.3
Department	Medicine	41	23.7
	Surgery	40	23.1
	Dermatology	20	11.6
	ER	18	10.4
	Orthopedics	28	16.2
	ENT	26	15.0
Position	Resident	74	42.8
	Specialist	49	28.3
	Consultant	50	28.9

24-hour hospital on duty

As evident from Figure 1, almost two-thirds (65.3%) of physicians reported a history of 24-hours hospital on duty.

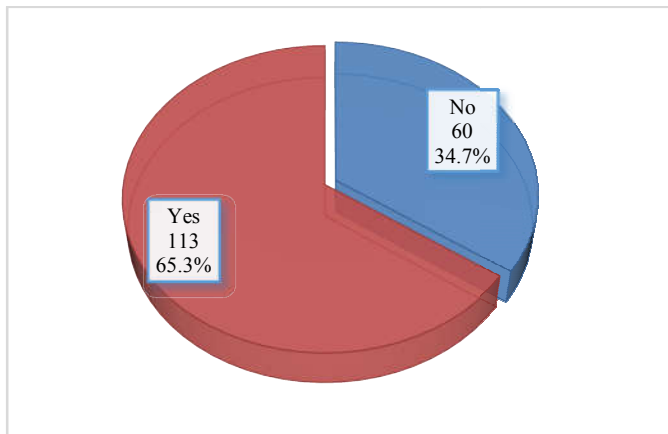


Figure 1 Distribution of the physicians according to 24-hour hospital on duty.

Medical History

Figure 2 illustrates that 6.9% of physicians had history of diabetes mellitus whereas Figure 3 demonstrates that the prevalence of hypertension among physicians was 2.9%.

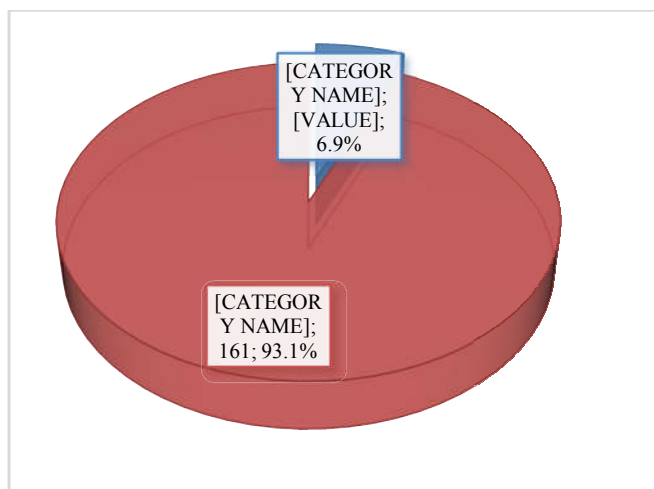


Figure 2 Prevalence of diabetes mellitus among physicians, King Fahad general hospital, Jeddah.

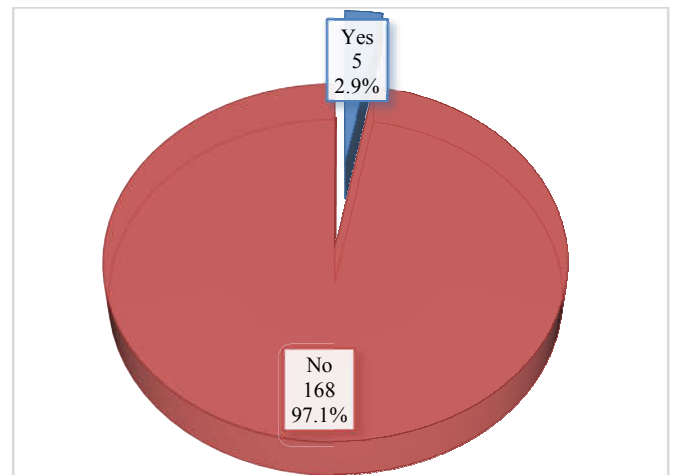


Figure 3 Prevalence of hypertension among physicians, King Fahad general hospital, Jeddah.

The Perceived Stress Scale (PSS)

Figure 4 presents the distribution of PSS score among participants. It ranged between 11 and 32 with a mean of 22.71 and standard deviation of 4.12. Its median value was 24 (IQR 20-25).

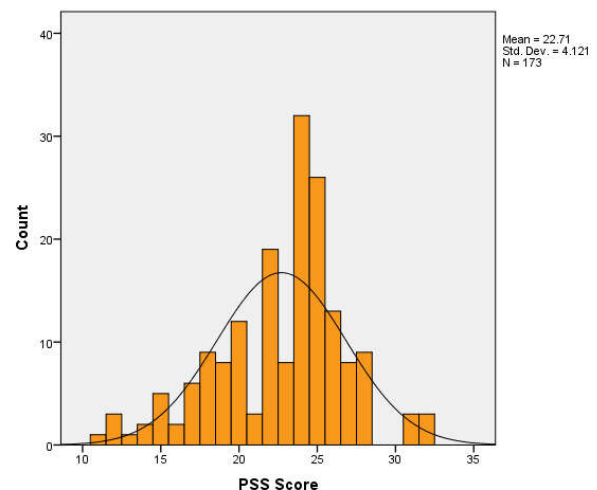


Figure 4 Distribution of perceived stress scale score among physicians, King Fahad general hospital, Jeddah.

Association between PSS and physicians' characteristics

Physician's age

As shown in table 3, there was no statistically significant difference between different categories of physician's age regarding PSS score, p=0.253.

Table 3 Distribution of perceived stress score according to physician's age.

Age (years)	Median	IQR	Mean rank
≤30	24	20-25	91.81
31-45	24	20-25	87.77
>45	22	19-24	71.27
p-value		0.253	

IQR: Inter-quartile range

Physician's gender

As shown in table 4, there was no statistically significant difference between male and female physicians regarding PSS

score (mean ranks were 88.88 and 80.75 for males and females, respectively).

Table 4 Distribution of perceived stress score according to physician's gender.

Gender	Median	IQR	Mean rank
Male	24	20-25	88.88
Female	24	18-25	80.75
p-value		0.365	

IQR: Inter-quartile range

Physician's Nationality: As presented in table 5, PSS score was significantly higher among Saudi physicians compared to non-Saudi physicians (mean ranks were 92.56 versus 68.5), $p=0.007$.

Table 5 Distribution of perceived stress score according to physician's nationality

Nationality	Median	IQR	Mean rank
Non-Saudi	22	20-24	68.5
Saudi	24	20-26	92.56
p-value		0.007	

IQR: Inter-quartile range

Physician's Marital Status

Table 6, shows that there was no statistically significant difference between single and ever married physicians regarding PSS score, $p=0.139$.

Table 6 Distribution of perceived stress score according to physician's marital status

Marital status	Median	IQR	Mean rank
Single	25	20-25.5	94.59
Ever married	23.5	20-25	82.87
p-value		0.139	

IQR: Inter-quartile range

On 24 Hourshospital Duty

As demonstrated in table 7, PSS score was significantly higher among physicians who had 24-hours hospital duty compared to those who had no 24-hours hospital duty (mean ranks were 100.06 versus 62.40), $p<0.001$.

Table 7 Distribution of perceived stress score according to physician's on 24 hours hospital duty.

24 hours hospital duty	Median	IQR	Mean rank
No	20.5	17.25-24	62.40
Yes	24	22-26	100.06
p-value		<0.001	

IQR: Inter-quartile range

Position

As shown in table 8, PSS score was highest among residents (mean rank= 101.21) whereas it was lowest among consultants (mean rank =71.98). The difference between was statistically significant, $p=0.003$.

Table 8 Distribution of perceived stress score according to physician's position.

Position	Median	IQR	Mean rank
Consultant	22	19-24	71.98
Resident	25	20-26.25	101.21
Specialist	23	21-25	80.87
p-value		0.003	

IQR: Inter-quartile range

Physician's Department

Table 9 shows that PSS score was highest among orthopedic surgeons (mean rank= 108.84) and general surgeons (mean rank=108.03) followed by ER physicians (mean rank=101.47) whereas it was lowest among dermatologists (mean rank=30.13). The difference was statistically significant, $p<0.001$.

Table 9 Distribution of perceived stress score according to physician's department.

Department	Median	IQR	Mean rank
Dermatology	16.5	13.5-21	30.13
ER	24.5	20-26.25	101.47
Medicine	22	19.5-27	84.62
Orthopedics	25	24-26	108.84
Surgery	24.5	24-25.75	108.03
ENT	23	19-24	68.62
p-value		<0.001	

IQR: Inter-quartile range

History of Diabetes Mellitus

As presented in table 10, diabetic physicians expressed higher significant PSS score compared to non-diabetics (mean rank were 130.46 and 83.76, respectively), $p=0.002$.

Table 10: Distribution of perceived stress score according to physician's history of diabetes mellitus.

History of diabetes mellitus	Median	IQR	Mean rank
No	24	20-25	83.76
Yes	27	23-28	130.46
p-value	0.002		

IQR: Inter-quartile range

History of hypertension

As demonstrated in table 11, Hypertensive physicians expressed higher PSS score compared to normotensive physicians (mean ranks were 87.97 and 54.40, respectively). However, this difference was not statistically significant, $p=0.137$.

Table 11 Distribution of perceived stress score according to physician's history of hypertension.

History of hypertension	Median	IQR	Mean rank
No	24	20-25	87.97
Yes	15	14-25	54.40
p-value	0.137		

IQR: Inter-quartile range

DISCUSSION

Physicians are subject to stress and frustration; it is a global problem. Physicians' frustration and dissatisfaction are not with the core concepts of the discipline, or solely with complaints about low reimbursement, or even with hassles related to managed care.^(xxxix) Physicians initially work hard to pay their medical school fees. Afterwards, they have to manage the increasing cost of medical practice. They have to maintain a hard work schedule to afford the rather expensive life style they have created as compensation for family members for their continued absences. Finally, physicians are burdened by the responsibility of supporting their children in having a less burdened professional career. Our profession might be considered neither among the best jobs, nor the most stressful jobs of the 21st century.^(xxxix)

In agreement with others,^(xiii,xxxii,xl,xli) the current study confirmed the association between 24 hours hospital on duty and perceived stress among physicians. Mansukhani et al^(xxix) reported that the extended work hours, shift work, and interrupted sleep are integral parts of medical training among all specialties. The need for 24-hour patient care coverage and economic factors have resulted in prolonged work hours for physicians, particularly residents. In agreement with this, the highest perceived stress score was recorded among residents in the present study. These long and erratic work hours lead to acute and chronic sleep deprivation and poor sleep quality, resulting in numerous adverse consequences. Impairments may occur in several domains, including attention, cognition, motor skills, and mood.^(xlii)

A year-long, prospective, observational study of first-year residents in a surgery training program was performed with use of intern sleep/operative logs and questionnaires, and faculty questionnaires. In results compared with interns taking call every third or fourth night, interns taking call every other night reported the greatest amount of fatigue and stress, the lowest satisfaction, and the fewest operative cases.^(xxxix)

Lindfors and his colleagues investigated on-call stress and its consequences among anaesthetists. In that study, the prevalence of stress was 68%. The most important causes of stress were work and combining work with family. The study showed a positive correlation between stress symptoms and on-call workload.^(xxxii)

In the present study, the highest perceived stress score was reported among surgeons (orthopedics and general). Training for and practicing surgery are stressful endeavors.^(xliii,xliv) Studies^(xlv,xlvi,xlvii,xlviii) involving national samples of surgeons from surgical subspecialty societies and graduates of surgical training programs suggest that burnout rates among surgeons range from 30% to 38%. These statistics indicate that a substantial number of surgeons are struggling with personal and professional distress at a level that should be of concern to all surgeons. Surgeons work hard, work long hours, deal regularly with life-and-death situations with their patients, and make substantial personal sacrifices to practice in their field. These attributes of surgical practice, along with the rigors and length of training for this profession, attract individuals of a particular character and determination. These individuals share an unwritten but understood code of rules, norms, and expectations. This code includes coming in early and staying late, working nights and weekends, performing a high volume of procedures, meeting multiple simultaneous deadlines, never complaining, and keeping emotions or personal problems from interfering with work.^(xlix)

Emergency physicians in our study reported one of the highest score of perceives stress. Circadian disruption (CD) is important to emergency physicians because of its ill effects on well-being: specifically, sleep pattern disruption, health, and psychological mood. For most people, working overnight shifts and alternating day and night shifts results in CD. This disruption has a negative physiologic impact on most every body systems with both short and long-term consequences. Short-term consequences include sleep disturbances (the most frequent side effect) resulting in increased sleepiness when awake and insomnia.^(l,li) Decreased alertness and performance, a sense of "not feeling well",^(lii) gastrointestinal disturbances,^(liii) and fertility issues,^(liv,lv) can also occur. Long-

term effects include increased rates of hypertension, chronic heart disease, diabetes mellitus, obesity, and some forms of cancer.^(l,vi) There are things that can be done to assist in coping with short-term effects of CD but there are no known methods to prevent long-term side effects.

Emphasis on maintaining a healthy body, exercising regularly, rotating shift schedules in a clockwise direction, scheduling consecutive night shifts, maintaining close family and social ties, and continuing to have a positive attitude toward the practice of emergency medicine have been suggested as methods of coping with the distress caused by rotating shifts and working night shifts.^(lvii,lviii)

In agreement with others,^(lix,lx,lxi) in our sample, diabetes was significantly associated with perceived stress among physicians. Diabetes management is a constant process; for many, it is an ongoing challenge that may be complicated by the impact of stress. Excessive stress is a major barrier to effective glucose control and a danger to one's general health.^(lxi)

Interestingly, Saudi physicians in the current study expressed significant higher perceived stress score than non-Saudi physicians. The same has been reported in Kuwait, where Kuwaiti physicians tended to have higher stress, although not significant, than non-Kuwaiti.^(lxii) This could be attributed to the fact that they were more exposed to administrative responsibilities, career demands and outside-hospital business responsibilities.

Among strengths of the current study is its unique nature in our society as well as the relatively acceptable response rate (68.4%). A response rate of less than 50% reported among different studies conducted among physicians.^(lxiii,lxiv,lv,lvii)

Among important limitations of the present study. First, it is based on self-report, where responses regarding perceived stress may be understated or overstated. However, we used a valid, reliable tool and have been used in many studies. Second, our sample was recruited from one hospital in Jeddah which limits the generalizability of the study to all physicians in different regions of the kingdom or even in Jeddah. Finally, these data are cross-sectional and limit our ability to make causal inference among personal and work-related characteristics of physicians. Despite these limitations, we consider that our study provides important information on the multiple personal and health risks related to stress in physicians.

CONCLUSION

This study identified that physicians at King Fahad general hospital in Jeddah do face considerable amount of stress at work place. Saudi, surgeons (Orthopedic or general), residents, emergency physicians, those who had 24-hours hospital duty and those with diabetic history expressed significant higher perceived stress score than others.

Recommendations

1. Human resources should arrange workshops and sessions on how to deal with stress for physicians and taught them different stress management techniques to improve their ability to cope with their problems.
2. Department directors should raise staff satisfaction by frequent satisfaction survey and frequent meeting to discuss staff needs.

3. Training program directors should reconsider the continuous 24 hours On-duty and limit it to a maximum of 16 hours as done in other countries.
4. Senior physicians and directors should improve communication with residents, as they appeared to be under more stress.
5. Further studies are recommended to reveal the exact impact of work stress on the performance of physicians and the quality of health care administered to the patients.
6. It is also recommended to repeat this study to include physicians representing different sectors of health care system in Jeddah and other cities in KSA.
7. If a physician with diabetes is experiencing severe stress, referral to a mental health professional may be the most effective approach.
8. Administrators need to recognize the need for doctors to participate in decisions affecting their working lives.

Reference

- ⁱ Robbins J, Gottlieb F. Sleep deprivation and cognitive testing in internal medicine house staff. *The Western journal of medicine*. 1990;152(1):82-6.
- ⁱⁱ Lowenstein J. Where have all the giants gone? Reconciling medical education and the traditions of patient care with limitations on resident work hours. *Perspectives in biology and medicine*. 2003;46(2):273-82.
- ⁱⁱⁱ Accreditation Council for Graduate Medical Education. ACGME Duty Hours. [homepage on the Internet]. 2011 [cited 2013 Mar 14]. Available from: <http://www.acgme.org/acgmeweb/tabid/271/GraduateMedicalEducation/DutyHours.aspx>
- ^{iv} The Saudi Commission for Health Specialties. [homepage on the Internet]. 2013 [cited 2013 Mar 14]. Available from: <http://english.scfhs.org.sa/en/pages/index.html>
- ^v Baum A. Stress, intrusive imagery, and chronic distress. *Health psychology : official journal of the Division of Health Psychology, American Psychological Association*. 1990;9(6):653-75.
- ^{vi} Lazarus R.S. & Folkman S. *Stress, Appraisal and Coping*. New York: Springer; 1984.
- ^{vii} Firth-Cozens J. Interventions to improve physicians' well-being and patient care. *Social science & medicine*. 2001;52(2):215-22.
- ^{viii} Gregov L, Kovacevic A, Sliskovic A. Stress among Croatian physicians: comparison between physicians working in emergency medical service and health centers: pilot study. *Croatian medical journal*. 2011;52(1):8-15.
- ^{ix} Wali SO, Qutah K, Abushanab L, Basamh R, Abushanab J, Krayem A. Effect of on-call-related sleep deprivation on physicians' mood and alertness. *Annals of thoracic medicine*. 2013;8(1):22-7.
- ^x Hanlon EC, Van Cauter E. Quantification of sleep behavior and of its impact on the cross-talk between the brain and peripheral metabolism. *Proceedings of the National Academy of Sciences of the United States of America*. 2011;108 Suppl 3:15609-16.
- ^{xi} Mavanji V, Billington CJ, Kotz CM, Teske JA. Sleep and obesity: a focus on animal models. *Neuroscience and biobehavioral reviews*. 2012;36(3):1015-29.
- ^{xii} Kaneita Y, Ohida T. Association of current work and sleep situations with excessive daytime sleepiness and medical incidents among Japanese physicians.
- ^{xiii} Al-Omar BA. Sources of work-stress among hospital-staff at the Saudi MOH. *JKAU, Econo & Adm* 2003; 17(1): 3 - 16.
- ^{xiv} Schmidt C, Peigneux P, Cajochen C. Age-related changes in sleep and circadian rhythms: impact on cognitive performance and underlying neuroanatomical networks. *Frontiers in neurology*. 2012;3:118.
- ^{xv} Van Dongen HP, Dinges DF. Investigating the interaction between the homeostatic and circadian processes of sleep-wake regulation for the prediction of waking neurobehavioural performance. *Journal of sleep research*. 2003;12(3):181-7.
- ^{xvi} Akerstedt T, Arnetz BB, Anderzen I. Physicians during and following night call duty--41 hour ambulatory recording of sleep. *Electroencephalography and clinical neurophysiology*. 1990;76(2):193-6.
- ^{xvii} Torsvall L, Akerstedt T. Disturbed sleep while being on-call: an EEG study of ships' engineers. *Sleep*. 1988;11(1):35-8.
- ^{xviii} Olson EJ, Drage LA, Auger RR. Sleep deprivation, physician performance, and patient safety. *Chest*. 2009;136(5):1389-96.
- ^{xix} Malmberg B, Kecklund G, Karlson B, Persson R, Flisberg P, Orbaek P. Sleep and recovery in physicians on night call: a longitudinal field study. *BMC health services research*. 2010;10:239.
- ^{xx} Lockley SW, Barger LK, Ayas NT, Rothschild JM, Czeisler CA, Landrigan CP, et al. Effects of health care provider work hours and sleep deprivation on safety and performance. *Joint Commission journal on quality and patient safety / Joint Commission Resources*. 2007;33(11 Suppl):7-18.
- ^{xxi} Wang LJ, Chen CK, Hsu SC, Lee SY, Wang CS, Yeh WY. Active job, healthy job? Occupational stress and depression among hospital physicians in Taiwan. *Industrial health*. 2011;49(2):173-84.
- ^{xxii} Tomioka K, Morita N, Saeki K, Okamoto N, Kurumatani N. Working hours, occupational stress and depression among physicians. *Occupational medicine*. 2011;61(3):163-70.
- ^{xxiii} Poanta L, Craciun A, Dumitrascu DL. Professional stress and inflammatory markers in physicians. *Romanian journal of internal medicine = Revue roumaine de medecine interne*. 2010;48(1):57-63.
- ^{xxiv} Buddeberg-Fischer B, Stamm M, Buddeberg C, Klaghofer R. Chronic stress experience in young physicians: impact of person- and workplace-related factors. *International archives of occupational and environmental health*. 2010;83(4):373-9.
- ^{xxv} Gallery ME, Whitley TW, Klonis LK, Anzinger RK, Revicki DA. A study of occupational stress and depression among emergency physicians. *Annals of emergency medicine*. 1992;21(1):58-64.
- ^{xxvi} Rutledge T, Stucky E, Dollarhide A, Shively M, Jain S, Wolfson T, et al. A real-time assessment of work

stress in physicians and nurses. *Health psychology* : official journal of the Division of Health Psychology, American Psychological Association. 2009;28(2):194-200.

^{xxvii}Hargreave M, Petersson BH, Kastrop MC. [Gender differences in stress among physicians]. *Ugeskrift for laeger*. 2007;169(25):2418-22.

^{xxviii}Mira JJ, Vitaller J, Buil JA, Aranaz J, Rodriguez-Marin J. [Job satisfaction and stress among general physicians in the public health system]. *Atencion primaria / Sociedad Espanola de Medicina de Familia y Comunitaria*. 1994;14(10):1135-40.

^{xxix}Mansukhani MP, Kolla BP, Surani S, Varon J, Ramar K. Sleep deprivation in resident physicians, work hour limitations, and related outcomes: a systematic review of the literature. *Postgraduate medicine*. 2012;124(4):241-9.

^{xxx}Parshuram CS, Dhanani S, Kirsh JA, Cox PN. Fellowship training, workload, fatigue and physical stress: a prospective observational study. *CMAJ* : Canadian Medical Association journal = journal de l'Association medicale canadienne. 2004;170(6):965-70.

^{xxxi}Sawyer RG, Tribble CG, Newberg DS, Pruett TL, Minasi JS. Intern call schedules and their relationship to sleep, operating room participation, stress, and satisfaction. *Surgery*. 1999;126(2):337-42.

^{xxxii}Lindfors PM, Nurmi KE, Meretoja OA, Luukkonen RA, Viljanen AM, Leino TJ, et al. On-call stress among Finnish anaesthetists. *Anaesthesia*. 2006;61(9):856-66.

^{xxxiii}Tendulkar AP, Victorino GP, Chong TJ, Bullard MK, Liu TH, Harken AH. Quantification of surgical resident stress "on call". *Journal of the American College of Surgeons*. 2005;201(4):560-4.

^{xxxiv}Saudi Arabia Ministry of Health. [homepage on the Internet]. 2013 [cited 2013 Mar 14]. Available from: <http://www.moh.gov.sa/en/Pages/Default.aspx>

^{xxxv}King Fahad Hospital Jeddah. [homepage on the Internet]. 2013 [cited 2013 Mar 14]. Available from: <http://www.kfhj.med.sa>

^{xxxvi}Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *Journal of health and social behavior*. 1983;24(4):385-96.

^{xxxvii}Al kalaldehy MT, Abu Shosha GM. Application of the perceived stress scale in health care studies. An analysis of literature. *International Journal of Academic Research Part B* 2012; 4(4), 45 -50.

^{xxxviii}Cohen S. Perceived stress in a probability sample of the United States. In Spacapan, Shirlynn (Ed); Oskamp, Stuart (Ed). (1988). *The social psychology of health*. (pp. 31-67). 251 pp. Thousand Oaks, CA, US: Sage Publications, Inc.

^{xxxix}Sarru E. Physicians and stress – highlights and preventions. *Middle East Journal of Family Medicine* 2004;3(3):1-5

^{xl}Rauchenzauner M1, Ernst F, Hintringer F, Ulmer H, Ebenbichler CF, Kasseroler MT, et al. Arrhythmias and increased neuro-endocrine stress response during physicians' night shifts: a randomized cross-over trial. *Eur Heart J*. 2009 Nov;30(21):2606-13.

^{xli}Weinberg A1, Creed F. Stress and psychiatric disorder in healthcare professionals and hospital staff. *Lancet*. 2000 Feb 12;355(9203):533-7.

^{xlii}Eddy R. Sleep deprivation among physicians. *BCM J* 2005;47(4):176-180

^{xliii}Dyrbye LN, Shanafelt TD. Protecting and promoting the well-being of surgeons. In: Timbros J, Timbros-Kemper TCM, eds. *Basics of Surgery*. Maarssen, Germany: Elsevier Gezondheidszorg; 2007:177-184.

^{xliv}Shanafelt T. A career in surgical oncology: finding meaning, balance, and personal satisfaction. *Ann Surg Oncol*. 2008;15(2):400-406.

^{xlv}Harms BA, Heise CP, Gould JC, Starling JR. A 25-year single institution analysis of health, practice, and fate of general surgeons. *Ann Surg*. 2005;242(4):520-529.

^{xlvi}Kuerer HM, Eberlein TJ, Pollock RE, et al. Career satisfaction, practice patterns and burnout among surgical oncologists: report on the quality of life of members of the Society of Surgical Oncology. *Ann Surg Oncol*. 2007;14(11):3043-3053.

^{xlvii}Benson S, Trussett PG, Findlay B. The relationship between burnout and emotional intelligence in Australian surgeons and surgical trainees. *ANZ J Surg*. 2007; 77(suppl 1):A79.

^{xlviii}Sharma A, Sharp DM, Walker LG, et al. Stress and burnout in colorectal and vascular surgical consultants working in the UK National Health Service. *Psychooncology*. 2008;17(6):570-576.

^{xlix}Balch CM, Freischlag JA, Shanafelt TD. Stress and burnout among surgeons understanding and managing the syndrome and avoiding the adverse consequences *Arch Surg* 2009 Apr; 144(4): 371-376

^lRutenfranz J, Knauth P, Colquhoun WP. Hours of work and shiftwork. *Ergonomics*. 1976;19:331-40.

^{li}Smith-Coggins , R Rosekind MR, Hurd S, Buccino KR. Relationship of day versus night sleep to physician performance and mood. *Ann Emerg Med*. 1994;24:928-34.

^{lii}Ruger M, Scheer FA. Effects of circadian disruption on the cardiometabolic system. *Rev Endocr Metab Disord*. 2009;10:245-60.

^{liii}Vener KJ, Szabo S, Moore JG. The effect of shift work on gastrointestinal (GI) function: A review. *Chronobiologia*. 1989;16:421-39.

^{liv}Infante-Rivard C, David M, Gauthier R, Rivard GE. Pregnancy loss and work schedule during pregnancy. *Epidemiology*. 1993;4:73-5.

^{lv}Mamelle N, Laumon B, Lazar P. Prematurity and occupational activity during pregnancy. *Am J Epidemiol*. 1984;119:309-22.

^{lvi}Erren TC, Reiter RJ. Defining chronodisruption. *J Pineal Res*. 2009;46:245-7.

^{lvii}Whitehead , DC , Thomas HC, Slapper DC. A rational approach to shift work in emergency medicine. *Ann Emerg Med*. 1992;21:1250-8.

^{lviii}Houry D, Shockley L, Markovchick V. Wellness issues and the emergency medicine resident. *Ann Emerg Med*. 2000;35:394-7.

^{lix} Surwit RS, Schneider MS, Feinglos MN. Stress and diabetes mellitus. *Diabetes Care*. 1992 Oct;15(10):1413-22.

^{lx} Surwit RS, Schneider MS. Role of stress in the etiology and treatment of diabetes mellitus. *Psychosom Med*. 1993 Jul-Aug;55(4):380-93.

^{lxi} Lloyd C, Smith J, Weinger K. Stress and diabetes: A review of the links *Diabetes Spectrum* 2005; 18(2):121-127

^{lxii} Makames RA, Alkoot EM, Al-Mazidi MB, El-Shazly MK, Kamel MI. Sources and expressions of stress among physicians in a general hospital. *Alexandria Journal of Medicine*. 2012 Dec;48(4): 361–366

^{lxiii} Bazargan M, Makar M, Bazargan-Hejazi S, Ani C, Wolf KE. Preventive, lifestyle, and personal health behaviors among physicians. *Academic Psychiatry* 2009 July-Aug;33(4.):289- 295

^{lxiv} Livaudais JC, Kaplan CP, Haas JS, Pérez-Stable EJ, Stewart S, Jarlais GD. Lifestyle behavior counseling for women patients among a sample of California physicians. *J Womens Health (Larchmt)*. 2005 Jul-Aug; 14(6):485-95.

^{lxv} Frank E, Bhat Schelbert K, Elon L. Exercise counseling and personal exercise habits of US women physicians. *J Am Med Womens Assoc*. 2003 Summer; 58(3):178-84.

^{lxvi} Hull SK, DiLalla LF, Dorsey JK. Prevalence of health-related behaviors among physicians and medical trainees. *Acad Psychiatry* 2008; 32:31–38