Original article

Work related fatigue and sleepiness at work among intern house officers of four hospitals in Sri Lanka

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Abstract

Introduction: Intern house officers (IHOs) are expected to work long duration shifts with frequent on-calls. Lack of adequate sleep due to prolonged duty hours leads to increase in medical errors. United States and European countries have imposed guidelines to restrict duty hours of IHOs, however no such restrictions are implemented in Sri Lanka.

Objectives: The aim of this study was to evaluate fatigability and sleepiness at work among IHOs of four main hospitals in Sri Lanka.

Method: IHOs of Colombo South Teaching Hospital, National Hospital Sri Lanka, Lady Ridgway Children's Hospital and De Soysa Maternity Hospital were recruited. Duty rosters were analysed for the length of duty shifts and night on-calls. Questionnaires were used to record fatiguability, sleepiness at work, medical errors, risk at work and daytime sleepiness.

Results: Out of 94 IHOs, 73% worked more than 100 hours and 32% worked more than 125 hours a week. Notably, 38% did three night on-calls per week and 31% did more than three. Subjective fatigue level at work was reported as "most of the time" and "always" by more than 80% of IHOs, 32% had severe day time sleepiness. Fatigue risk assessment score indicated that 97% IHOs were in the high-risk group. Female IHOs were found to be more fatigued. One third of doctors reported medical errors due to fatigue and sleepiness which was significantly high in medicine rotation.

Conclusions: IHOs were found to be over working. Majority were fatigued and sleepy at work. Self reported medical errors during internship were found to be high.

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Introduction

Intern house officers (IHOs) are the junior most doctors starting work after having qualified and are compelled to work long hours with no proper breaks in between. Their work pattern affects their sleep adversely[1,2,3]. In Sri Lanka, IHOs work seven-day weeks and are required to be the first on call. Day time work is from 8 am to 4 pm and then they are on call to their respective units. The wards are usually overcrowded and can have more than 50 new patients for a night and even up to hundred on an admission day. It is well known that these interns don't get the opportunity to have adequate hours of sleep and even proper breaks to have their meals. Work performance after on-calls is adversely affected by lack of adequate sleep[3,4,5]. It had been shown that lack of adequate sleep due to prolonged duty hours and night shifts increase sleepiness at work[6], medical errors[3,7,8], risk of depression[8] and reduce professional judgement[6]. These findings first came to light in 1984 after the death of Libby Zion, an 18-year-old woman, as a result of inappropriate treatment by a sleep deprived resident doctor[9,10]. This incident drew global attention to this hidden, unreported important issue. As a result of that, to minimize the fatigue, sleepiness at work and related medical errors, medical authorities in Europe[1,4] and United States[4,11] have imposed guidelines to restrict duty hours of all doctors including IHOs. In India, there is an agreement to restrict the duty hours of doctors, however this had not been practiced[12]. Sri Lankan IHOs, during their one-year internship period work in medicine, surgery, paediatrics or obstetrics and gynaecology units, comprising six months each in two of these specialties. Medical emergencies are directly admitted to wards and IHOs manage those patients first, especially after normal duty hours. Therefore, their work performance is a key determinant of the treatment success and outcomes of these critically ill patients. In Sri Lanka, duty hours IHOs are not regulated. Usually

there is no time-off after a night on-call for doctors. A study from Sri Lanka on sleep quality and its effects on IHOs revealed that, more than 70% reported sleep deprivation[13]. The objectives of this study were to evaluate and risk stratify the duty hours, fatiguability and sleepiness of IHOs working in four main hospitals in Colombo, Sri Lanka.

Method

We recruited all the IHOs who have completed atleast 3 months of their current rotation, working at Colombo South Teaching Hospital (CSTH), National Hospital Sri Lanka (NHSL), De Soysa Maternity Hospital (DMH) and Lady Ridgeway Children's Hospital (LRH) in mid 2016. Informed consent was obtained from all the IHOs prior to the study. Duty rosters of these doctors were analyzed to evaluate the length of different duty shifts, on-calls per week and night shifts per week. Normal duty hours were from 8.00 am to 4.00 pm on weekdays and 8.00 am to 2.00 pm on Saturdays. After-hour shifts were categorised in to two groups, a long day on-call duty is from 4.00 pm to 10.00 pm and night on-call was from 10 pm to 8.00 am next day. They were given a self-administered questionnaire to obtain information about current appointment, duty hours, on-call commitments and sleepiness at work during the last working week. Each of them was assigned a number and their names or personal details were not recorded. They were asked whether they had any medical errors during their current appointment due to work related fatigue or sleepiness. The Epworth Sleepiness Scale (ESS) was used to determine the level of daytime sleepiness. This is a validated questionnaire to assess daytime sleepiness and widely used to asess sleepiness at work in medicial research[5,6,14,15]. Mild excessive day time sleepiness, moderate excessive day time sleepiness, severe excessive day time sleepiness were categorised with ESS scores of 11-12, 13-15 and 16-24 respectively. IHOs were asked to grade their fatigue level at work in to one of the four categories during the past week of work: never (score 1), sometimes (score 2), most of the time (score 3) and always (score 4). To further categorize the risk at work we used the Australian Medical Association (AMA) national code of practice fatigue risk assessment model[16]. These scoring systems had been used for research done in Australia and also outside Australia to risk stratify the fatigue levels of hospital doctors[17] (Table 1). The questionaire is in

Table 1. Australian Medical Association (AMA) National Code of Practice fatigue risk assessment model for hospital doctors

Risk factor (for a working week)	*Lower risk (0 points)*	*Significant risk (1 point)*	*Higher risk (2 points)*
Hours worked	<50	50-70	>70
Shift length (hours)	All shifts <10	1 Shift ⩾14	At least 2 shifts ⩾ 14
Extended shifts	No shift longer than scheduled, all shifts <24 hours	At least 1 shift longer than scheduled but <24	At least 1 shift 24 hours
On call (days)	0-2	3-6	7
Night duty (n)	0-1	2	⩾3
Breaks <10 hours	0	1-2	>2
24-Hour breaks	⩾2	1	0
Schedule change	No change, predictable schedule	Predictable schedule change	Unpredictable schedule change
Sleep at night (23:00-07:00), No of nights	6-7	4-5	0-3
Enough sleep, No of days	6-7	4-5	0-3

Lower risk 0-6, significant risk 7-9, higher risk 10-20

English and has parameters that can be applicable to doctors working in hospitals in any country. Their work patterns were categorised into 3 different risk groups. Each IHO was assigned a total risk score according to his/her work patterns in the preceding week and was classified into lower risk, significant risk and higher risk groups. All the data were double entered to a latest SPSS data analysis package. Paired and non-paired t tests were used to obtain statistical significance and p value of <0.05 was taken as significant. Ethical clearance for the study was obtained from the Ethics Review Committee of Faculty of Medicial Sciences of the University of Sri Jayewardenepura.

Results

A total of 94 IHOs were included for the study, 60 were females. Mean age was 26.7 years. Sample characteristics are given in table 2.

Nearly three fourths (73.4%) of IHOs worked more than100 hours a week and 31.9% worked more than 125 hours of work a week. Notably, 38.3% did three night on-calls per week and 30.8% did more than this. Subjective fatigue level at work was reported as “most of the time” and “always” by more than 80% of the intern house officers. Based on ESS scores, 31.9% had severe and another 19.1% had moderate excessive day time sleepiness. Australian Medical Association national code of practice fatigue risk assessment model score indicated that 96.8% IHOs were in the high risk group (Table 3).

No significant gender difference was found in relation to work hours, number of night on-calls, ESS, AMA fatigue risk scores and number of medical errors. However female IHOs were found to be significantly more fatigued. IHOs at CSTH reported significantly lower level of fatiguability as compared to NHSL, LRH, DMH group of hospitals. Average number of hours of work among specialties was significantly different; surgery had the lowest (102.6 hours per week) and obstertics and gynaecology had the highest (125.8 hours per week). Average number of night on-calls was significantly lower in surgery appointment. About one third of IHOs reported medical errors due to fatigue and sleepiness at work. IHOs in medicine rotation reported significantly higher number of medical errors (Table 4).

Table 2. Sample characteristics (N=94)

Age (mean)	26.7 years
Sex (females)	60 (63.8%)
Specialty	
Medicine	32 (34.0%)
Surgery	38 (40.4%)
Paediatrics	15 (16.0%)
Obstetrics & Gyanaecology	9 (9.6%)
Hospital	
Colombo South Teaching Hospital	31 (33.0%)
National Hospital of Sri Lanka	49 (52.1%)
De Soysa Maternity Hospital	9 (9.6%)
Lady Ridgeway Children’s Hospital	5 (5.3%)

Table 3. Total hours of work per week, night on calls, fatigue levels, day time sleepiness and risk statification of IHOs

	Variable	*Number (%)*
Total number of hours worked per week	50-75	4 (4.2)
	75-100	21 (22.3)
	100-125	39 (41.5)
	>125	30 (31.9)
Night on calls per week (afer 10 pm)	1	7 (7.3)
	2	22 (23.4)
	3	36 (38.3)
	4	22 (23.4)
	5	6 (6.3)
	6	1 (1.1)
Fatigue level	1 - Never	5 (5.3)
	2 - Sometimes	12 (12.8)
	3 - Most of the time	63 (67.0)
	4 - Always	14 (14.9)
Epworth Sleeping Scale score	Lower normal daytime sleepiness (0-5)	7 (7.3)
	Higher normal daytime sleepiness (6-10)	25 (26.6)
	Mild excessive daytime sleepiness (11-12)	14 (14.9)
	Moderate excessive daytime sleepiness (13-15)	18 (19.1)
	Severe excessive daytime sleepiness (16-24)	30 (31.9)
Risk groups according to AMA national code of practice	Lower risk scores (0-6)	0 (0)
	Significant risk scores (7-9)	3 (3.2)
	Higher risk (10-20)	91 (96.8)

Table 4. Comparison of working hours per week, number of night on-calls, Epworth Sleeping Scale scores (ESS), Australian Medical Association (AMA) Code of Practice fatigue risk assessment model risk scores and self reported medical errors among different categories of IHOs

	N	Working hours per week	Night on calls per week	Fatigue level	ESS	AMA risk score	Self reported medical errors (%)
Female	60	113.1	3.4	3.02	13.1	15.2	35.3
Male	34	117.7	3.4	2.73	11.5	15.3	33.3
P value		0.16	0.46	0.03	0.66	0.41	0.42
Hospital							
CSTH	31	112.6	3.2	2.67	12.3	15.5	32.2
NHSL, LRH & DMH	63	115.8	3.5	3.03	12.6	15.2	34.9
P value		0.25	0.13	0.01	0.39	0.28	0.40
Speciality							
Medicine (M)	38	121.0	3.8	3.31	12.2	15.9	52.6
Surgery (S)	32	102.6	2.7	2.62	12.5	13.7	25.0
Paediatrics (P)	15	118.5	3.8	2.80	12.3	15.9	13.3
Obstetrics & Gyneacology (O)	9	125.8	3.6	2.89	14.1	16.8	22.2
P value*		M-S<0.001 S-P-0.01 S-O-0.0041	M-S<0.001 M-P<0.01 S-O-0.04	0.06	0.16	0.5	M-S – 0.01 M-P <0.001 M-O – 0.05

*Lowest or significant p values of different specialty comparison were given.

CSTH – Colombo South Teaching Hospital, NHSL – National Hospital Sri Lanka, LRH – Lady Ridgeway Children's Hospital, DMH – De Soysa Maternity Hospital

Discussion

Normal duty hours of IHOs include eight hours on weekdays and six hours on Saturdays. In addition to this regular long days, night on-calls are frequent. Duty rosters of IHOs are approved by the supervising Specialist Consultants. There is no dedicated time-off after the night on-calls for these doctors and therefore they continue to engage in normal work on the next morning.

Duty hours of junior doctors, length of on-call shifts, work related fatigue, performance at work, fatigue-related medical errors had been studied extensively during the past decade[3,6,7,8,18]. Because of work related risks and suboptimal patient care, at least three major revisions were done on duty hours of doctors since 2003 in United States[11,19]. They recommend duty hours of doctors as 80 hours a week, maximum duration of 16 hours per shift, not closer than every third day night on-calls and minimum of 12 hours time-off after a night on call[19]. European Working Time Directive (EWTD) recommends 48 hours of work per week[20]. However duty hours of medical doctors varies across the globe. EWTD compliant countries such as, Denmark, Sweden, Germany, Norway have limited it to 48 hours a week. In United Kingdom junior doctors can work up to 56 hours a week. Canada has restricted a maximum shift per day as 16 hours, but there is no agreement on weekly duty hours[20]. In India, the recomendation is to restrict the duty hours to 48 hours a week and not more than 12 hours per shift, however this is largely ignored[12]. In our study we found that three fourths of intern house officers worked more than 100 hours a week and nearly one third worked more than 125 hours a week, which are much higher than the above recommendations. A study done by Woodrow and others found that junior doctors worked 62.5 to 83 hours a week[14] and the study done by Kalmbach and others found the average number of hours worked per week by first year residents was 66 hours[8]. Both these studies were done in developed countries and the work settings are different to Sri Lanka. Number of patients seen by a Sri Lankan IHO per day is likely to be higher than in those countries resulting in a higher work intensity and stress. Therefore direct application of work hour recommendations of developed countries may not be suitable for us. However longer working hours result in a lower opportunity to sleep in between work shifts. This may directly affect the fatiguabily of IHOs at work and may result in poor patient care.

Out of the seven days of the week, up to three night on calls are recommended and sounds appropriate[19]. Majority of Sri Lankan house officers worked upto three night on-calls per week. However one third of them worked more than this. This finding is concerning, considering the fact that there is no time-off after the night on call. Therfore this indicates that more than one third of IHOs continued to work on the next day after night on-calls, three or more days a week. This could have a significant inpact on work reated fatgue and sleepiness.

Assessment of fatigualbility of IHOs at work was a challenging task. In this study we asked these doctors to grade the subjective fatiguabilty at work. Majority of the IHOs reported work related fatigue as “most of the time” they worked. In a United Kingdom study, more than 80% of anaesthesia trainees reported tired after an on-call shift to drive home[21]. Another European study found that inter-shift intervals of less than 10 hrs were associated with shorter periods of sleep and lead to increased fatigue at work[22]. A qualitative study found that in addition to long working hours, fatigue arises from work intensity and unpredictable mixture of shifts[23]. In this study we found that female intern house officers were more fatigued than males. This gender difference has not been reported before. NHSL, LRH, DMH group of hospital’s intern house officers reported more fatiguabilty at work as oppose to CSTH. We we are not able to assess the reason for this difference in this study. However difference in the working environment, number of casualty admissions, number of patients per day admission etc could be contributing for this. Both subjective and objective assessment scales are used to asess the day time sleepiness. ESS was used in this study which is a subjective scale. We found that about half of the interns had moderate or severe day time sleepiness. This finding raises serious concerns of patient care by IHOs. ESS, being a subjective scale it could over-estimate the sleepiness. Objective sleepiness asessment scales are time consuming and difficult to administer, however would be helpful to evaluate this aspect further.

Fatigue related risk at work among intern house officers was stratified using Australian Medical Association National Code of Practice fatigue risk assessment model. We used this model since there were no other accepted models for risk stratification of work-related fatigue among doctors. This model had been used in other developed countries other than Australia[17] but not in developing countries. The risk factors that are used in this scoring system are the number of hours worked, length of on-call shifts, number of on-calls etc (Table 1). We believe that these could be applicable to any doctor engaged in hospital based clinical work including IHOs of Sri Lanka. With this scoring system we found that almost all the IHOs were in the high risk group. This finding is important and is an eye opener.

We found surgical IHOs worked lesser number of hours per week and obstetrics and gynaecology interns worked highest. However, fatigue levels, ESS scores, sleepiness and risk scores were not significantly different in the four specialities. A comparable study revealed significantly high ESS score and long duty hours among surgery residents than non surgery residents; however surgery residents reported lower level of subjective fatiguability[14].

It was revealed that about one third of IHOs experienced medical errors due to fatigue and sleepiness. More than half of IHOs reported at least one medical error during the medicine rotation. In this study we did not specify the type of medical error. Since this is an anonymous questionnaire IHOs were free to report their errors. However we believe this is still under reported and the likely reasons being not being aware of the errors made and also forgetting them with passage of time.

There are limitations of our study. Firstly, the study was limited to four main hospitals in the country. Therefore, the findings may not be generalizable. ESS is a subjective test and this might overestimate the sleepiness at work. Medical errors were not classified and no guidelines were given on how to determine medical errors. AMA national code of practice fatigue risk assessment model scores can overestimate the risks in local settings.

Conclusions and recommendations

In Sri Lanka IHOs were found to be overworking. Majority of them reported sleepiness at work and were fatigued. Female IHOs were more fatigued at work. Number of self reported medical errors during internship were high, specially in the medicine rotation. We recommend establishing rules and regulations on working hours of doctors and especially having protected working hours for IHOs who are first on-call and are the most junior in their first year working as doctors.

Conflicts of interests

Authors declare no conflicts of interest.

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