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To Calculate the Distance Travelled, Calories Consumed and Duration of Active Walking during a 12 Hours On-call Surgical Shift at Cumberland Infirmary, Carlisle, United Kingdom

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Abstract

Introduction: To calculate Distance travelled, Calories consumed and duration of active walking during 12-hour shift by the members of surgical team On-Call in District General Hospital.

Methods: Prospectively collected the data over 17 days with help of Pedometer. A separate pedometer was allocated to each member of the surgical team On-Call i.e. Consultant, Registrar, SHO and FY-1 (ward cover). Pedometer recordings were recorded prospectively.

Results: Our study showed that on average maximum distance was travelled by SHO On Call which was 8,688.75 steps (7.17 Km) and consumed 421 K calories in 71.2 minutes followed by Registrar which was 8,303.56 steps (6.22 Km) and consumed 365.26 K Calories in 93.87 minutes. Consultants walked minimum distance in average i.e. 6,542.26 steps (4.9 Km) and consumed 287.8 K Calories, in 71.2 minutes.

More over maximum distance travelled recorded was by SHO On-Call, which was 11,992 steps (8.99 Km) and consumed 527.6 K Calories in 130 minutes. However Registrar and consultant walked distance of about 11,002 steps (8.25 Km) and 10,998 steps (8.24 Km) respectively; they consumed 484.4 K Calories and 483.9 K Calories respectively in 118 minutes and 123 minutes.

Conclusion: It is evident that being On-Call as Surgical Team is very demanding not only mentally but also physically and specially for the most junior members of the team. It can affect not only the patient's care but also the doctors' physical being. Therefore this matter needed further research and investigations.

Keywords: Walking distance; Energy; Calories

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Introduction

An on-call shift can be very busy and stressful during normal and out-of-hours. On most occasions, only one or two doctors (excluding registrar) are covering all of the surgical patients during out of hours. The jobs for the on-call doctors can range from prescribing fluids to dealing with acute and life threatening surgical/medical emergencies. Therefore, on-call doctors must always be mentally and physically alert. Mental alertness and physical health go hand in hand, meaning that, if a doctor is physically tired, unwell or has low energy their mental alertness will have depreciated, as studies have shown [1]. This can have a detrimental effect on patient care. If a doctor is not mentally alert they can make human errors, such as, prescribing an incorrect dose of a drug or missing out a key investigation during a consultation, leading to patient harm.

During most on-call shifts a doctor will be mentally and physically strained, due to the workload and prioritising tasks. The levels of stress experienced during an on-call shift can lead to harmful effects on the doctor's personal health and possible job burnout [2]. In addition to this, the on-call doctor will be covering the entire hospital (as surgical patients lying in different wards), which leads to increased fatigue due to constantly having to walk from ward to ward or assisting in theatre. Our study was designed to measure the typical distance covered during an on-call surgical shift. We know that the more walking a doctor will do, will lead to physical and mental fatigue and more calories will need to be replenished to remain active and alert. This gets worst if doctors are not provided with a proper place for rest and breaks.

Table 1: Table showing distance travelled (km), calories consumed (kcal) and time spent walking (mins) by different grades during the study.

Doctor On-Call	Distance Travelled (km)		Calories Consumed (kcal)		Time Spent Walking (mins)	
	Mean	Range	Mean	Range	Mean	Range
Day Consultant	4.9 (6542 steps)	2.17-8.24 (2895-10998 steps)	287.8	127.3-483	71.2	32-123
Day Registrar	6.22 (8303 steps)	3.57-8.25 (4762-11002 steps)	365.3	209.5-484	93.9	46-118
Night Registrar	2.99 (4125 steps)	1.21-4.53 (2371-6154 steps)	175.4	70-265.9	45.9	19-70
Day SHO	7.17 (8689 steps)	4.69-11.82 (6265-12457 steps)	421.3	275.6-694	107.6	66-193
Night SHO	6.63 (8829 steps)	3.9-12.33 (5201-16443 steps)	392.7	250.1-723.5	104.6	54-199
Day FY1	5.19 (6930 steps)	3.04-7.61 (4126-10158 steps)	304.4	178.8-446.9	79.3	43-113

Methods

This study was performed at Cumberland Infirmary Carlisle which is medium sized Teaching Hospital in Carlisle. The data was collected prospectively for a total of 17 consecutive days during July 2016. The on-call surgical doctors were given a pedometer to carry, which would automatically calculate the distance covered, calories consumed and time spent walking.

The MAYMOC 3-D multifunction pedometer was used during this study. This pedometer measures, monitors and calculates steps taken by the individual wearing it. It uses Seamless 3D Advanced Tri-Axis sensing technology to deliver accurate results on all surfaces, including uphill, flat and whilst running. The pedometer eliminates step counting errors which were a common problem for pendulum-based machines. It provides data in metric (Km) or imperial (miles) units, and calories are displayed in Kcal. Pedometer used was 3D multifunctional and all were made of same make and model. The limitation of pedometer was that it only recorded when 10 or more step were taken during walk and it did not included time spent during standing.

The on-call doctors included were; consultants, registrars, Senior House Officer (SHO) and (FY1 and FY2) which are equivalent to the previously called House Officers.

The doctor completing the shift and one of the doctors doing the study, note the on-call pattern in the rota is Consultant on-call 7 days straight on-call, Registrar, SHO and FY doctors 4 days Monday to Thursday and then weekend Friday to Sunday. Morning shift is 08:00 am to 20:00 pm; night shift is 20:00 pm to next day 08:00 am.

Doctors involved in the study were aware of the research and knew that the pedometer was recording the data. They were unable to alter the setting of the pedometer at any stage. There were no attempts to change the settings of the pedometer, as the pedometer readings were set and checked before and after every shift.

The study was conducted in the month of July, and all the days were busy as usual. There were no unexpected circumstances like any disasters or there were no unexpected staff shortages.

Results

The Cumberland Infirmary in Carlisle, United Kingdom is a building with three floors. Most of the surgical wards and the operating theatre are located on the first floor (Table 1).

Discussion

Our results show that the day SHO had the largest mean distance travelled (7.17 km), followed by the night SHO (6.63) and then the day registrar (6.22). The day SHO also had the highest mean calorie consumption (421.3 Kcal) and the highest mean time spent walking (107.6 min).

If we look at the maximum distance and calories consumed by each grade of doctor, it shows Consultant walked 8.24 Km and consumed 483 Kcal, registrar walked 8.25 Km and consumed 484 Kcal, SHO walked 12.33 Km and consumed 723.5 Kcal and FY1 walked 7.61 Km and Consumed 446.9 Kcal respectively in 12-hours shift. In this list as well SHO does the most walking.

This can be explained by the fact that the SHO is usually responsible for taking calls, clerking patients, requesting investigations, reviewing sick patients as the first on-call and sometimes assisting in operation theatre as well. The registrar spends most of their time in theatre during the day, as well as acting as a second on-call to support the SHO on the wards managing patients seen by SHO. The results also reflect that on calls tend to be busier during the daytime. The night registrar had the lowest mean distance travelled.

This further underlines that the on-call doctors especially SHO role is physically more demanding and requires the doctor to often cover many different wards and perform a number of different jobs.

On-call shifts are often very busy which means they are demanding both mentally and physically. Whilst we did not formally assess the mental demand of the on-call job, there is clear research, which shows that physical exhaustion, can lead to mental exhaustion. It is evident from previous studies that the two are closely linked, and this can affect rates of burnout, anxiety and also potentially jeopardise patient safety [2]. The on-call doctor is responsible for covering many different wards, operation theatre and accident emergency and this can involve a lot of walking. Covering large distances walking as well as interacting with patients and other staff consumes a lot of energy. Similarly consultant and registrar in addition spend a lot of time operating while standing which is not counted in this study due to limitation of pedometer. It is important to replace the lost calories so that clinicians are able to function safely and effectively, and so that the highest patient care is maintained [3]. Different job roles demand different levels of walking as demonstrated by our results. According to this study on-call SHO often has the most physically demanding job, while more senior members of the surgical team will spend a large proportion of their day in theatre while operating in standing position which has not been counted for due to limitation of pedometer. Therefore this pedometer study does not reflect exact time and physical activity of registrar and consultant while on-call. Our results highlight that on-call shifts for surgical doctors can be very varied and challenging [4]. They will often require a lot of exertion which in turn consumes energy in the form of calories. In order for clinicians to remain alert and effective, appropriate rest periods and energy replenishment must be considered. This will in turn help to

ensure the highest levels of patient safety and clinical care [5-9].

Recommendations

As a result of our study, we have suggested a number of recommendations which will help to reduce the distance walked by the on-call doctor and also help to reduce fatigue. Firstly, it is preferable that any outlying patients are located as closely to the main ward as possible. This may not always be feasible depending on the layout of the respective hospital, but will help to reduce the number of steps taken by the on-call doctor and subsequently reduce fatigue levels. Doctors should ensure they take adequate, regular breaks throughout their shift. They should also try to replenish any lost calories and fluid deficit during such breaks. This will help to keep the on-call doctor alert and less exhausted. In order for this to happen, there should be appropriate resting facilities for doctors. This should include comfortable seating and kitchen facilities if possible. In addition, it should be advised that each ward has a recognised jobs list for the on-call doctor, so that they can complete as many jobs as possible at one time to avoid them making repeated trips to the same ward during the on-call shift. This list should be flagged up to all nursing staff on the relevant wards and be updated throughout the day. By implementing the above recommendations, the on-call doctor would be under less physical and mental stress. This would mean they would be able to perform at a better level, remaining alert and focussed for longer. Subsequently this would help to reduce clinical errors and result in a safer level of patient care.

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