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# IMPACT OF WORKING 48 HOURS PER WEEK ON OPPORTUNITIES FOR TRAINING AND PATIENT CONTACT: THE EXPERIENCE OF IRISH INTERNS

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## ABSTRACT

**Objective.** The European Working Time Regulations (EWTR) have been criticised for its purported negative impact on the training of junior doctors. The aim of this study was to examine the amount of time interns spent engaging in various work activities. **Design.** An online time-use diary was used to collect data from interns. **Setting.** Two teaching hospitals in the Republic of Ireland. **Participants.** A total of 45 interns logged at least one 24 hour period. The logs were obtained from 67 shifts from a surgical rotation and 83 shifts from a medical rotation. **Main outcome measures.** The amount of time interns spent engaging in direct patient care, indirect patient care, educational activities, and personal activities. **Results.** On day shift, medical interns spent a significantly smaller proportion of the shift on direct care (159/613 minutes, 25.9%, versus 214/636 minutes, 33.6%) and a greater proportion on education (195/613 minutes, 31.8%, versus 139/636 minutes, 21.9%) than surgical interns. On extended days, medical interns spent a significantly larger proportion of the shift on education than surgical interns (243/814 minutes, 29.9%, versus 126/804, 15.7% minutes). On night shift, medical interns spent a significantly greater proportion of the shift on direct care (590/720 minutes, 81.9%, versus 346/727 minutes, 47.6%) and education (33/720 minutes, 4.6%, versus 6/727 minutes, 0.8%) than surgical interns. **Conclusions.** The interns in the study reported spending more time on direct patient care and educational activities, and less time on indirect patient care activities than interns in other countries.

## INTRODUCTION

The European Working Time Regulations (EWTR) legislation limits working hours. The key points of the regulation are:

- Working time should not exceed 48 hour working week.
- A 30 minute rest break for every 6 hours of work.
- 11 consecutive hours of rest every 24 hours, or equivalent compensatory rest, before the next period of work.
- 35 hours of consecutive rest every 7 days; or two periods of 35 hours; or one period of 59 hours consecutive rest every 14 days [1].

Trainee doctors in the EU now work hours that are considerably shorter than in the US, where junior doctors are restricted to a maximum of 80 hours of work per week [2]. The potential negative impact of reducing working hours upon the training of doctors is the focus of most of the discussion of the EWTR in the medical literature [3, 4]. A number of studies carried out in the last decade have found that interns spend little time on direct patient care with a large proportion of time on a shift devoted to indirect patient care activities such as writing notes or reviewing patient charts [5-7]. Further, the proportion of time spent on direct patient care has been decreasing through the years [5]. These changes have been attributed to policies to reduce the working hours of doctors [5, 8].

Doctor's work hours should allow for the provision of high quality patient care [9]. The restriction of working hours for junior doctors in Europe has been criticised for many reasons

including a purported negative impact on the training of interns, and the lack of educational activities for interns during night shifts [10, 11]. It was estimated that pre-EWTR surgical senior house officers (SHOs; the next level of training following preregistration training/internship in which the doctor undergoes training within a particular medical specialty) spent an average of 30,000 hours in training, but this time was reduced to 8,000 hours post-EWTD [12]. It has also been found that implementation of the EWTD led to an 18% decrease in the number of cases completed by registrars, and a 22% decrease for senior house officers, undergoing anaesthetic training [13]. In an Irish setting, implementation of the EWTD led to complaints by SHOs that patient care, continuity of care, and the quality and quantity of training provided were all negatively affected by the work hour restrictions although the majority (69%) of respondents reported an improvement in quality of life attributable to the reduced working hours [14].

The current study sought to investigate the distribution and characteristics of work performed by interns (the first year of work following graduation from medical school) in the Republic of Ireland following the implementation of the EWTR. Given the concerns about the negative impact of the EWTR on the education and development of junior doctors, there is a need for a better understanding of the tasks being carried out by junior doctors in hospitals in which the EWTR has been implemented. The specific aims of this study were to: (1) examine the amount of time interns spent engaging in direct patient care, indirect patient care, educational activities, and personal activities during their work hours; (2) compare the findings from the current study to international research examining how junior doctors spend their time; and (3) compare the distribution of work performed by medical and surgical interns.

## **METHODS**

### **Diary development**

An on-line time use diary, accessible via smartphone or computer, was used to log how medical and surgical interns in two teaching hospitals in the Republic of Ireland spend their time. Previous research found that almost all interns own a smartphone and use it to access the internet [15].

A pilot study was conducted with six interns to test the usability of the on-line diary. Each intern logged one 24 hour period. Based upon semi-structured interviews carried out with the participants in the pilot the complexity of the diary was reduced. The number of activities to be logged was reduced from 25 to 21 (e.g. admissions and discharge was combined), and the time period was increased from 15 minute to 30 minute intervals. Table 1 provides a list of the revised four categories and 21 specific tasks that were used to account for the interns' time.

Table 1. Categories of activities.

<b>Direct patient care</b>	<b>Indirect patient care</b>
<ul style="list-style-type: none"> <li>• Working in outpatients</li> <li>• Treating patients</li> <li>• Assisting in the operating room (surgical interns only)</li> </ul>	<ul style="list-style-type: none"> <li>• Team discussions/meeting</li> <li>• Admissions/discharge</li> <li>• Requesting investigations</li> <li>• Requesting consults</li> </ul>
<b>Education</b>	<b>Personal</b>
<ul style="list-style-type: none"> <li>• Ward rounds</li> <li>• Research</li> <li>• Attending formal teaching</li> <li>• Self-directed learning</li> </ul>	<ul style="list-style-type: none"> <li>• Sleeping</li> <li>• Eating/coffee break</li> <li>• Travel</li> <li>• Domestic chores</li> <li>• Internet, TV, computer games</li> <li>• Socialising</li> <li>• Hobbies</li> <li>• Exercise</li> <li>• Other activities of daily living</li> <li>• Unproductive time</li> </ul>

The categories and tasks were derived from previous time and motion studies carried out with junior doctors in Australia [7] and interns in the US [5, 6], the requirements of the Irish National Intern Training Programme core curriculum [16], and the eight domains of good professional practice identified by the Medical Council of Ireland [17]. In agreement with the US and Australian categories, direct patient care can be defined as all activities conducted face-to-face with patients [5]. Indirect patient care includes tasks such as reviewing patient records, or writing notes [5, 7], educational activities include activities such as rounds or receiving training [5-7]. Personal time is concerned with eating sleeping, and social activities [5-7]. Additional personal time activities (e.g. hobbies, domestic chores) were added in the current study to account for off-shift activities (tasks that were not recorded in the US or Australian studies as they only accounted for time on-shift).

## **Procedure**

Participants were recruited using a combination of convenience and snowball sampling methods. In order to detect a difference of 8% between how surgical and medical interns spend their on shift time ( $\alpha=0.04$ ,  $\beta=0.2$ ) requires 500 hours of data from each group. Therefore, conservatively estimating a shift length of 9 hours requires 56 shifts to be logged for each group. This was the minimum number of shift that we aimed to obtain for each group of interns.

Prior to logging activities the participants were provided with training on how to use the diary. The participants were told that this study was concerned with identifying the tasks performed by interns and it was important that they accounted for their time accurately. To attempt to avoid any social desirability behaviour, the participants were assured that the logs were anonymous.

Each participant had a unique self-generated identification code so to provide a means to track the submitted logs anonymously. The participants were asked to account for their activities every 30 minutes, during a 24 hour period. A researcher then contacted the participants and asked them to commence the period of logging. For those working a day shift, the 24 hour period of logging started at 6am, and for those on a night shift the period of logging started at 6pm. The participants received a text message at lunchtime and another in the early evening on each day reminding them to complete the log for that day.

The shift structures of the two hospitals that participated in the current study, although not the same at both sites, were compliant with the EWTR. At Site 1, a regular day shift for surgical interns was from 0700 until 1700 and for medical interns was from 0800 until 1800. Every one in

ten shifts is a 24 hour period of on-call. At Site 2, a regular day shift was from 0730 until 1700, extended day shift from 0900 until 2200, and night shift from 2030 until 0900. Interns work an extended shift once every four weeks, and a night shift once every eight weeks. Both sites are large teaching hospitals, have an intern educational programme, and comparable in terms of size (casemix units greater than 100,000 per annum), and type of patients.

Ethical approval was received for the study from the ethics boards of both participating hospitals. The data were collected from medical and surgical interns at Site 1 in January 2014, from the surgical interns at Site 2 in November 2012 and medical interns at Site 2 in November 2013.

## **Analysis**

The data from the individual logs were downloaded and combined for analysis. The logs were screened to ensure that they were complete and represented a log of a shift carried out at the hospital. The data did not meet the assumptions of normality required for multivariate analysis. Therefore, simple statistical tests were used to assess whether there were significant differences in the percentage of a shift spent performing activities in each of the four categories outlined in Table 1 (direct care, indirect care, education, and personal) between medical and surgical interns: at Sites 1 and 2; and on day shift, extended day shift, and night shift. A comparison was also made between the number of hours of sleep based upon rotation and type of shift.



## **RESULTS**

### **Participants**

A total of 45 interns logged their activities for at least one 24 hour period. A total of 12 interns participated from site 1 (17.1% of the population), and 33 interns participated from site 2 (48.5% of the population). All of the participants were under 25 years of age and 25 out of 45 (55.6%) were male.

### **Intern Logs**

The mean number of 24 hour logs recorded by each intern was 3.89 (SD = 2.61). The logs included in the analysis were obtained for 67 shifts from a surgical rotation (18 regular day shifts from Site one, 35 regular day shifts, five extended day shifts, and 9 night shifts from Site 2), and 83 shifts from a medical rotation (13 regular day shifts from site one, 53 regular day shifts, eight extended day shifts, and 9 night shifts from Site 2).

A total of 18 additional logs not included in the analysis were six for which the intern was on a day off, two for which the intern was on a day of training away from the hospital, and 10 logs which were incomplete.

### **Medical Interns**

The time spent on the different tasks by the medical interns is summarised in Tables 2 and 4. No significant differences were found in the proportion of the day shift devoted to direct patient care, indirect patient care, educational activities, or personal activities between Sites 1 and 2, or

between the activities of male and female interns. In six of the nine medical rotation night shifts, no time was spent either on a break or eating or drinking. Overtime was reported for 26/66 (39.4%) of the day shifts and 6/8 (75%) of the extended day shifts. However, 6/9 (66.7%) night shifts logged at Site 2 indicated that interns ended their shift earlier than scheduled.

Table 2. Time logged by medical interns (hours: minutes).

Tasks	Site 1		Site 2					
	Day (n=13)		Day (n=53)		Extended days (n=8)		Night (n=9)	
	M <sup>#</sup>	SD <sup>~</sup>	M	SD	M	SD	M	SD
Working in out-patients	0:09	0:32	0:31	1:31	-	-	-	-
Treating patients	2:50	1:33	2:05	1:49	4:48	3:01	9:50	1:40
<b>Direct patient care</b>	<b>3:00*</b>	<b>1:42</b>	<b>2:36</b>	<b>2:02</b>	<b>4:48</b>	<b>3:01</b>	<b>9:50</b>	<b>1:40</b>
Team discussion/meeting	0:43	0:54	1:01	0:43	0:22	0:39	0:36	0:25
Admission/discharge	1:00	1:03	0:54	1:03	0:26	0:47	-	-
Requesting investigations	1:09	0:42	1:10	0:56	1:33	2:18	0:40	0:56
Requesting consults	0:48	0:45	0:30	0:32	0:48	0:45	0:03	0:12
<b>Indirect patient care</b>	<b>3:41</b>	<b>1:38</b>	<b>3:36</b>	<b>1:31</b>	<b>3:11</b>	<b>2:30</b>	<b>1:20</b>	<b>0:46</b>
Ward rounds	2:48	1:52	2:33	1:26	3:15	1:37	0:33	0:58
Attending formal teaching	0:13	0:45	0:36	0:47	0:48	1:30	-	-
Research (on-shift)	-	-	0:01	0:15	-	-	-	-
Self-directed learning (on-shift)	0:04	0:21	0:05	0:28	-	-	-	-
<b>Education (on-shift)</b>	<b>3:06</b>	<b>1:52</b>	<b>3:16</b>	<b>1:17</b>	<b>4:03</b>	<b>1:16</b>	<b>0:33</b>	<b>0:58</b>
Self-directed learning (off-shift)	0:04	0:21	0:24	0:51	-	-	-	-
Research (off-shift)	0:04	0:14	0:31	1:22	-	-	0:13	0:50
<b>Education (off-shift)</b>	<b>0:09</b>	<b>0:23</b>	<b>0:56</b>	<b>1:44</b>	<b>-</b>	<b>-</b>	<b>0:13</b>	<b>0:50</b>
Sleeping (on-shift)	-	-	-	-	-	-	-	-
Eating/coffee break (on-shift)	0:32	0:28	0:31	0:32	0:18	0:28	0:03	0:12
Unproductive time (on-shift)	0:06	0:31	0:08	0:23	1:11	2:12	0:13	0:27
<b>Personal (on shift)</b>	<b>0:39</b>	<b>0:49</b>	<b>0:39</b>	<b>0:40</b>	<b>1:30</b>	<b>2:12</b>	<b>0:16</b>	<b>0:33</b>
Sleeping (off-shift)	7:41	1:53	7:02	1:50	7:07	0:44	5:30	3:15
Eating/coffee break (off-shift)	0:43	0:29	0:49	0:41	0:37	0:44	0:53	0:25
Travel	1:20	0:58	0:40	0:41	0:33	0:13	1:00	0:37
Domestic chores	1:04	1:05	0:27	0:41	0:18	0:40	0:40	0:50
Socialising	1:04	1:24	1:00	2:11	0:07	0:26	0:43	1:18
Hobbies	0:02	0:10	0:16	0:55	0:07	0:17	0:13	0:33
Exercise	0:09	0:28	0:23	0:41	0:03	0:13	0:06	0:25
TV/computer games/internet	0:25	0:30	0:58	1:23	0:56	0:31	1:00	1:24
Activities of daily living (ADL)	0:50	1:04	1:14	1:16	0:33	0:24	1:40	1:56
Unproductive time (off-shift)	-	-	-	-	-	-	-	-
<b>Personal (off-shift)</b>	<b>13:23</b>	<b>1:35</b>	<b>12:54</b>	<b>2:43</b>	<b>10:26</b>	<b>0:31</b>	<b>11:46</b>	<b>1:22</b>
<b>Shift length</b>	<b>10:27</b>	<b>1:36</b>	<b>10:10</b>	<b>1:36</b>	<b>13:34</b>	<b>0:31</b>	<b>12:00</b>	<b>0:53</b>
<b>Overtime</b>	<b>0:28</b>	<b>1:36</b>	<b>0:10</b>	<b>1:36</b>	<b>0:34</b>	<b>0:31</b>	<b>-0:30</b>	<b>0:53</b>

\*the sum of the time spent on individual tasks time for categories do not necessarily add up as it has been rounded to minutes for simplicity of interpretation in the table.

^ Negative number indicates that on night shift the interns were finishing early.

<sup>#</sup> M= Mean time spent performing the task (hours:minutes)

<sup>~</sup>SD= standard deviation

## **Surgical Interns**

The time spent by the surgical interns on the different tasks are summarised in Tables 3 and 4.

No significant differences were found in the proportion of the day shift devoted to direct patient care, indirect patient care, education, or personal time between Sites 1 and 2. Only four of the 67 surgical shifts (6%), all at Site 2, included any time assisting in theatre (see Table 3). Overtime was reported for 36/53 (67.9%) of the day shifts and 3/5 (60%) of the extended day shifts. A total of 6/9 (66.7%) night shifts logged at Site 2 indicated that interns ended their shift earlier than scheduled.

Table 3. Time logged by surgical interns (hours: minutes)

Tasks	Site 1		Site 2					
	Day (n=18)		Day (n=35)		Extended days (n=5)		Night (n=9)	
	M <sup>#</sup>	SD <sup>~</sup>	M	SD	M	SD	M	SD
Working in out-patients	0:15	0:55	0:12	0:56	-	-	-	-
Treating patients	3:33	1:42	3:00	1:46	3:42	2:58	5:46	1:08
Assisting in the operating room	-	-	0:12	0:56	-	-	-	-
<b>Direct patient care</b>	<b>3:48</b>	<b>1:44</b>	<b>3:25*</b>	<b>2:18</b>	<b>3:42</b>	<b>2:58</b>	<b>5:46</b>	<b>1:08</b>
Team discussion/meeting	0:36	0:35	0:35	0:42	0:24	0:31	0:20	0:26
Admission/discharge	1:01	0:47	1:58	2:19	2:48	2:18	0:13	0:33
Requesting investigations	1:13	0:55	0:43	0:50	1:48	1:27	0:56	0:48
Requesting consults	0:56	0:44	0:28	0:46	0:24	0:31	0:20	0:42
<b>Indirect patient care</b>	<b>3:48</b>	<b>1:43</b>	<b>3:45</b>	<b>2:50</b>	<b>5:24</b>	<b>2:52</b>	<b>1:50</b>	<b>1:05</b>
Ward rounds	2:01	0:55	1:30	1:27	1:00	0:46	-	-
Attending formal teaching	0:15	0:37	0:34	0:55	0:30	-	-	-
Research (on-shift)	0:06	0:35	0:02	0:14	-	-	-	-
Self-directed learning (on-shift)	0:01	0:08	0:09	0:34	0:36	1:22	0:06	0:25
<b>Education (on-shift)</b>	<b>2:25</b>	<b>1:04</b>	<b>2:16</b>	<b>1:56</b>	<b>2:06</b>	<b>2:17</b>	<b>0:06</b>	<b>0:25</b>
Self-directed learning (off-shift)	-	-	0:13	0:49	0:18	0:50	0:06	0:25
Research (off-shift)	0:06	0:35	0:16	0:46	-	-	0:16	0:50
<b>Education (off-shift)</b>	<b>0:06</b>	<b>0:35</b>	<b>0:30</b>	<b>1:03</b>	<b>0:18</b>	<b>0:50</b>	<b>0:23</b>	<b>0:52</b>
Sleeping (on-shift)	-	-	-	-	-	-	2:16	1:22
Eating/coffee break (on-shift)	0:33	0:25	0:46	0:46	1:36	0:49	0:26	0:12
Unproductive time (on-shift)	0:16	0:45	0:15	0:54	0:36	0:49	1:40	0:53
<b>Personal (on shift)</b>	<b>0:50</b>	<b>0:55</b>	<b>1:01</b>	<b>1:04</b>	<b>2:12</b>	<b>0:50</b>	<b>4:23</b>	<b>1:19</b>
Sleeping (off-shift)	<b>7:15</b>	<b>1:34</b>	7:38	1:38	7:00	1:10	6:10	1:59
Eating/coffee break (off-shift)	0:46	0:32	0:50	0:39	0:18	0:33	0:56	0:29
Travel	1:21	0:31	0:38	1:14	0:48	1:23	0:23	0:31
Domestic chores	0:35	0:47	0:30	0:40	0:12	0:20	0:23	0:31
Socialising	1:00	2:09	1:14	1:46	1:36	2:27	0:50	0:42
Hobbies	0:08	0:21	1:04	1:18	-	-	0:20	0:50
Exercise	0:45	1:06	0:22	0:49	0:12	0:33	0:46	0:57
TV/computer games/internet	0:41	1:13	0:02	0:19	-	-	1:03	0:48
Activities of daily living (ADL)	0:28	0:47	0:36	0:52	0:12	0:33	0:36	0:41
Unproductive time (off-shift)	-	-	0:01	0:08	-	-	-	-
<b>Personal (off-shift)</b>	<b>13:01</b>	<b>1:28</b>	<b>13:00</b>	<b>1:37</b>	<b>10:18</b>	<b>1:18</b>	<b>11:30</b>	<b>0:42</b>
<b>Shift length</b>	<b>10:51</b>	<b>1:10</b>	<b>10:29</b>	<b>1:44</b>	<b>13:24</b>	<b>0:32</b>	<b>12:07</b>	<b>0:25</b>
<b>Overtime</b>	<b>0:38</b>	<b>1:10</b>	<b>0:29</b>	<b>1:44</b>	<b>0:24</b>	<b>0:32</b>	<b>-0:23</b>	<b>0:25</b>

\*the sum of the time spent on individual tasks time for categories do not necessarily add up as it has been rounded to minutes for simplicity of interpretation in the table.

^ Negative number indicates that on night shift the interns were finishing early.

# M= Mean time spent performing the task (hours:minutes)

~SD= standard deviation

### Comparisons between categories of tasks performed on surgical and medical shifts

On day shift, medical interns spent a significantly smaller proportion of the shift on direct care and personal tasks and significantly more time on education than surgical interns (see Table 4).

On extended days, medical interns spent a significantly smaller proportion of the shift on education than surgical interns (see Table 4). On night shift, medical interns spent a significantly larger proportion of the shift on direct care and education and a significantly smaller proportion of the shift on personal activities than surgical interns (see Table 4).

Table 4. Comparisons of the percentage of a shift spent by surgical and medical interns on the four categories of tasks on day, extended day, and nights shifts.

Category	Day			Extended day			Night		
	Surgical M (SD) <sup>#</sup>	Medical M (SD)	p	Surgical M (SD)	Medical M (SD)	p	Surgical M (SD)	Medical M (SD)	p
N	53	66	-	5	8	-	9	9	-
Direct care	33.4 (15.0)	25.9 (14.4)	0.01 <sup>*</sup>	27.5 (17.4)	35.5 (18.1)	0.45	47.7 (7.5)	82.2 (11.3)	<0.001 <sup>*</sup>
Indirect care	35.4 (18.6)	35.6 (12.3)	0.95	40.6 (18.0)	23.4 (14.6)	0.09	15.1 (7.6)	11.1 (5.0)	0.19
Education	21.5 (12.0)	31.8 (10.4)	<0.001 <sup>*</sup>	15.5 (12.9)	30.0 (7.4)	0.02 <sup>*</sup>	0.9 (2.7)	4.5 (6.2)	0.14
Personal	9.6 (9.0)	6.6 (5.5)	0.03 <sup>*</sup>	16.4 (5.1)	11.1 (13.2)	0.33	36.3 (8.9)	2.2 (3.5)	<0.001 <sup>*</sup>

\* $p < 0.04$  (significance value incorporates a Bonferroni correction to keep the familywise alpha value at 0.05). <sup>#</sup> M (SD)= Mean percentages (standard deviation).

### Sleep

A total of 116/150 (77.3%) of the interns reported seven or more hours of sleep in each 24 hour period, with 13/150 (8.7%) reporting less than five hours of sleep. Due to violations of normality of the hours of sleep logged it was not possible to carry out an analysis of variance. However, it was found that those interns on a surgical rotation obtained significantly more hours of sleep

than those on a medical rotation ( $p= 0.01$ ). Surgical interns reported a mean of 7 hours and 36 minutes of sleep, as compared to a mean of 6 hours and 59 minutes of sleep reported by medical interns. A Kruskal-Wallis test was used to compare the hours of sleep obtained by interns on a day, extended day, or night shifts. No significant difference resulted ( $p= 0.59$ ).

## **DISCUSSION**

The results of the current study reveal that the work time of interns in the Republic of Ireland is distributed relatively equally between direct patient care, indirect patient care, and educational activities during day shifts and extended day shifts. However, surgical interns spent less time during night shifts carrying out direct patient care activities than was reported by medical interns. The limited time devoted to educational activities during night shifts was apparent in the diary logs of both medical and surgical interns.

The findings of the current study are encouraging. They reveal that interns in the Republic of Ireland devote a majority of their working time to direct patient care and educational activities. Although engagement in indirect patient care is important for intern education [6], time spent on direct patient care is essential for doctors-in-training as it provides the opportunity to practise core procedural skills as well as nontechnical skills such as clinical reasoning, and problem-solving [18]. Doctor-patient interactions are important to a patients perception of the quality of the care they have received [19].

The Irish Health Service Executive's National Intern Training Programme has invested heavily in intern education in recent years. In a survey of junior doctors in Ireland, carried out prior to

the introduction of the intern training programme, it was found that there were perceived difficulties with obtaining protected educational time, benefiting from clinical learning opportunities or gaining access to a relevant educational programme [20]. The data collected in the current study suggest that this investment in education has resulted in interns participating in formal, and informal, educational activities. This agrees with previous research that found that dedicated training time for junior doctors is well received [21], and effective [22, 23].

Our findings regarding the distribution of interns' work tasks are in contrast with the results of previous international studies of intern work activities in the US [5, 6] and Australia [7]. Studies conducted in these countries, which are not subject to EWTR, have reported a much lower proportion of time devoted to direct patient care (ranging from 11% [7] to 12% [5, 6] across studies) as compared to a range from a mean of 159/613 minutes (25.9%) for medical interns on day shift to 590/720 minutes (81.9%) for medical interns on night shift in the current study. It was found that U.S. interns spend 12% [5] of their time on shift carrying out educational activities, as compared to a range from 6/727 (0.8%) spent on educational activities for surgical interns on night shift, to a mean of 195/613 (31.8%) for day shift medical interns in the current study.

Two studies conducted in the US [5, 6] have reported a preponderance of time devoted to indirect care activities, almost double that of the current study, 63.6% and 40% respectively, while Australian interns spent 19% of their time on indirect patient care activities and 34% of time on communication activities (also classified as indirect patient care activities in the current study) [7]. In the US, junior doctors work up to 80 hours per week [2]. However, the benefit of



working longer hours than their EU peers for their training and skill development may be questioned given the overwhelming devotion of time to indirect patient care activities. While such activities are not without merit [6], a high proportion may be primarily administrative and so have limited educational value for interns. In this way, while the quantity of exposure interns in the US receive may be greater than in the EU, the findings from the current study suggest that the quality of the exposure from an educational perspective may be higher in the Republic of Ireland.

Significant differences were found in the proportion of the time interns of surgical and medical rotations spent their time on a shift. During the day shift, surgical interns are largely left on their own to care for the patients on the surgical wards while the rest of the team is in theatre.

Therefore, a surgical intern's day shift is a little more focused on direct patient care activities than is the case for medical interns. The significant difference in the time spent on education between day shift medical and surgical interns can be attributed to the fact that medical ward rounds are longer than surgical ward rounds. The surgical ward round only focuses on the surgical problems- which are generally less complex than medical issues. However, the largest differences in the tasks performed by medical and surgical interns was found on night shift.

Night shift is largely concerned with managing acutely unwell unwell patients with limited staff. As such, for the medical interns, there is a lot of focus on direct patient care. However, if a patient under the care of a surgical intern develops a problem during the night, it is more likely to be a medical issues (e.g. sepsis, pulmonary embolism) than a surgical issue. Therefore, the patient's management becomes the responsibility of the medical team. As a result, the surgical intern have less work to do during the night, and so can take the opportunity to sleep.

## **Limitations**

There were a number of limitations to the current study. First, the design of the study is a post-intervention only evaluation. A major limitation is that there is no comparison before/after the adoption of the EWTR. A non-probabilistic sampling method was used to recruit the participants into the study. However, as the interns were logging how they spent their time, as opposed to providing information on attitudes or opinions, it is not believed that this is a large threat to the validity of the findings. It may be that, for some activities, 30 minute blocks of time may be too long a timeframe to adequately capture information regarding specific tasks that may be of shorter duration. Also, it is possible that the interns were engaged in more than one activity during the time period, and this information was not captured. However, the pilot study demonstrated that capturing the information in shorter time periods or with a larger number of more detailed categories was excessively burdensome for participants.

Only simple one-way statistical comparisons were carried out. The reason for this approach was that the data did not meet normal distribution assumptions for more complex multivariate analysis. Therefore, it was not possible to address potential issues such as a lack of independence resulting from the same interns logging multiple shifts.

The study relied on self-reported data. As such, the data suffers from the same limitations of all self-reported data in that it relies upon honest and accurate reporting by the participants. In order to facilitate accurate reporting the data was collected anonymously (to limit any social

desirability behaviour), with reminders to complete the log sent out at midday and in the evening.

An additional limitation is the validity of comparing the data collected from the interns in the Republic of Ireland using self-report data with the data collected from trained observers in the US [5, 6] and Australia [7]. In comparison to data collected by trained observers, self-report data has been found to underestimate the time spent on indirect patient care tasks and activities such as breaks or eating/drinking [24]. Nevertheless, given the large differences between the proportion of a shift spent on indirect patient care activities by the Irish interns as compared to US and Australian interns, even acknowledging a possible underestimation, it is suggested that the differences are credible.

Data was collected at different time periods (from surgical intern in site one in January, with the other data collected in November). Multiple periods of data collection were necessary in order to obtain a sufficient amount of data. However, the shift structure between the years was the same, and there were no major changes in how work was organised that were likely to impact the interns. Therefore, we do not believe that collecting the data in different years was a threat to the validity or reliability of the data. It is possible that learning may occur between November and January such that interns become more efficient in performing certain tasks (e.g. admitting a patient) and so logged less time on these tasks. However, we believe that the differences in this particular time period are not likely to be great. In a study of errors made in the ordering of blood products by interns working in a hospital in the Republic of Ireland it was found that interns were performing at the same level as more senior doctors within 13 weeks of the beginning of

internship (September) [25]. Finally, we only collected data from medical and surgical interns. No information was obtained from interns on other rotations (e.g. paediatrics, general practice).

### **Future research**

Our findings suggest a number of avenues for future research. Additional research is needed to examine the external validity of our findings regarding the distribution of intern work activities. While our findings were discrepant with those of studies conducted in the US [5, 6] and Australia, [7] data were not available to allow comparison with intern work in other EU countries. The collection of such data in the UK and other countries is important for elucidating intern experience during EWTR compliant work schedules and for identifying any areas for concern that warrant consideration or intervention.

### **CONCLUSIONS**

In order to develop a well-rounded independent practitioner an intern should be able to carry out a range of clinical and administrative tasks. The ideal amount of time an intern should spend doing each of these tasks is not known. However, an understanding of how interns spend their time provides medical educators with the information required to consider how the clinical experience of a junior doctor can be maximised within the time available during the intern year.

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## **COMPETING INTERESTS STATEMENT**

None of the authors have any competing interests.

## **CONTRIBUTORSHIP STATEMENT**

POC contributed to the experimental design, data analysis, and drafting of the manuscript. SL carried out the literature review and helped draft, and redraft the manuscript. GO, SA, and BM all participated in the data collection and drafting of the manuscript. DB contributed to the experimental design, data collection, and drafting of the manuscript. All authors read and approved the final manuscript.

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