

An observational study of emergency department intern activities

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Interns in most Australian states must complete an emergency medicine rotation at an accredited emergency department (ED) before they can attain full medical registration.¹ In Victoria, the ED rotation is of 8 weeks' duration. As graduates emerge from the increased medical school places offered by the Australian Government since 2004, intern numbers are expected to rise,² and there is concern that EDs will be unable to meet future demand for intern placements. Some have proposed substituting emergency medicine rotations in accredited EDs with alternative positions with some emergency exposure (eg, through rural general practices and non-accredited EDs).²

The ED is recognised as a key training ground, providing exposure to clinical skills that are transferable across many medical fields.^{3,4} If substitution of the ED rotation is to be considered, it would be prudent to analyse the current ED experience of interns.

Emergency experience at undergraduate level is limited, with, for example, 2 weeks allocated in the current 6-year University of Melbourne undergraduate medical course. Limited emergency experience has been linked to reduced clinical competence and procedural confidence among medical students.⁵ Procedural confidence is positively correlated with exposure to procedures,^{6,7} whereas formal theoretical teaching that is disconnected from direct clinical cases during internship is perceived to be of limited value.⁸

Intern procedural training usually follows an apprenticeship model whereby junior doctors' clinical activities are directly supervised by more senior clinicians.^{7,8} Time constraints of supervisors have been identified as major barriers to adequate supervision in the ED.⁴

There is little published information on how interns spend their time during emergency medicine terms in Australia or elsewhere. Further, the contexts in which ED activities are performed (eg, supervised or independent, face-to-face with patients) are yet to be described, but are important for understanding the nature of the ED intern rotation. We aimed to identify the range, frequency, duration and contexts of activities performed by ED interns in order to calculate the expected number of activities an intern is likely to undertake on a stand-

ABSTRACT

Objectives: To describe how intern time is spent, and the frequency of activities performed by interns during emergency department (ED) rotations.

Design and setting: Prospective observational study of 42 ED interns from three Melbourne city teaching hospitals during 5 months in 2006. Direct observations were made by a single researcher for 390.8 hours, sampling all days of the week and all hours of the day.

Main outcome measures: Proportion of time spent on tasks and number of procedures performed or observed by interns.

Results: Direct patient-related tasks accounted for 86.6% of total intern time, including 43.9% spent on liaising and documentation, 17.5% obtaining patient histories, 9.3% on physical examinations, 5.6% on procedures, 4.8% ordering or interpreting investigations, 3.0% on handover and 4.9% on other clinical activities. Intern time spent on non-clinical activities included 4.2% on breaks, 3.7% on downtime, 1.7% on education, and 1.3% on teaching others. Adjusted for an 8-week term, the ED intern would take 253 patient histories, consult more senior ED staff on 683 occasions, perform 237 intravenous cannulations/phlebotomies, 39 arterial punctures, 12 wound repairs and apply 16 plasters. They would perform chest compressions under supervision on seven occasions, observe defibrillation twice and intubation once, but may not see a thoracostomy.

Conclusions: The ED exposes interns to a broad range of activities. With the anticipated increase in intern numbers, dilution of the emergency medicine experience may occur, and requirements for supervision may increase. Substitution of ED rotations may deprive interns of a valuable learning experience.

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ard ED clinical rotation of 8 weeks working 38 hours per week (304 hours).

METHODS

We undertook a descriptive, observational study between 1 August and 31 December 2006, in the EDs of three public hospitals in Victoria — St Vincent's Hospital Melbourne (39 000 adult attendances per annum), Royal Melbourne Hospital, also a designated major trauma service (48 000 adult attendances) and Austin Hospital (45 000 adult and paediatric attendances).

All interns rostered to work in one of the three participating EDs were eligible for inclusion in the study. Sampling was based on intern rosters to incorporate every hour of every day of the week once only at each participating ED. This translated to 168 potential hours of intern activity data at each ED (504 hours total). Each data collection period was set at 8 hours, with a set maximum collective observation time of 16 hours per intern. At one ED, interns were rostered on during normal business hours only. Thus, data collection there was restricted to a third of that at other EDs to

prevent excessive representation of morning shift hours.

Eligible interns were identified from ED rosters at least 2 weeks before their anticipated participation. An information statement and invitation to participate were emailed to the interns about a week before data collection, and informed consent was sought on the day of data collection.

The observation tool used for identifying tasks performed by ED interns was developed by two medical students and refined using a Delphi panel of nine doctors from one participating ED. Three feedback rounds occurred. One week of training in data collection for JNZ and another researcher, followed by a week of interrater reliability assurance testing took place in August 2006 (Cohen's κ , 0.86; $P < 0.001$).

Following training, participants' activities and respective activity contexts were observed by one researcher (JNZ), who measured the duration of these with a stopwatch. All data were recorded on a pre-designed table with variable definitions verified by ED physicians. Where simultaneous activities were undertaken, only the principal activity was recorded. Interns were

1 Intern observation periods

Variable	Emergency department			
	A	B	C	All
Total number of interns observed	16	19	7	42
Total hours of data collected	167.9	167.3	55.6*	390.8
Mean hours of data collected per intern	6.2	7.9	8.0	7.1
Range of hours of observation per intern	1.0–8.4	7.8–8.1	7.1–8.2	1.0–8.4

* Emergency department C had interns rostered on morning shifts only, and thus data collection there was restricted to a third of that at the other two hospitals. ♦

instructed to continue their duties as usual, and communication between the participant and researcher was minimised. All collected data were de-identified.

Data were analysed with SPSS, version 15.0 (SPSS Inc, Chicago, Ill, USA). Descriptive statistics were calculated, including median (interquartile range), minimum, maximum and overall total percentage of time spent by ED interns on activities and activity contexts. The number of activities performed was totalled, and the mean duration of tasks was calculated (total activity time/activity frequency). The anticipated number of activities performed by interns in a 304-hour 8-week ED rotation was calculated by multiplying each relevant result by the total rostered hours over 8 weeks (304 hours) divided by the total hours observed (390.8 hours).

This study was authorised by the ethics committees of each of the participating institutions.

RESULTS

Fifty-one interns met the inclusion criteria. Of these, 42 were rostered during data collection periods and were subsequently observed. From a possible 504 hours of potential observation hours (all the hours in each day of 1 week at each site), 390.8 hours of data were recorded because of the absence of afternoon and night shifts for interns at one ED, and about an hour of unidentified time loss. The mean continuous observation period was 7.1 hours per intern, with observations ranging from 1.0–8.4 hours per intern (Box 1). Age and sex of the participants were comparable across hospitals (mean age, 26 years; range, 23–32; 20 [46.7%] were male).

Activities

Patient-management tasks not involving direct patient contact, such as communication, consultation and documentation, took

up most of the interns' time, 43.9%, (Box 2). The most frequent intern activity was walking around between tasks, taking up 2.5% of their time. Less than 15% of their time was spent on activities not directly involved in patient management such as educational tasks, breaks, downtime or teaching (Box 3). Adjusted for an 8-week 304-hour ED rotation, interns would consult senior ED staff on 683 occasions, communicate with other ED staff 702 times and with inpatient unit staff 346 times. They would take 253 patient histories and perform 176 cardiorespiratory examinations. Activities of longest duration were attending tutorials, plastic surgery and suturing procedures and meal breaks (all over 15 minutes).

During 8 weeks, interns could be expected to observe or perform 658 procedures, including 237 intravenous cannulations or venepunctures and 39 arterial punctures for blood gases (including repeat attempts). Advanced procedural tasks (eg, intubation, central line insertion) were rarely performed or observed (Box 2).

Activity types: Face-to-face communication with patients or staff accounted for more than half of total intern time (39% percent of time was face-to-face communication with patients); 16% of time was spent writing or typing, and 7% was spent on the phone (Box 4).

Procedures: Eighty-five per cent of time spent on procedures was unsupervised (Box 5). Application, replacement or adjustment of oxygen therapy and intravenous cannulations, the procedures performed most frequently, were rarely supervised.

All regional anaesthetics, fracture reductions and enterogastric tube replacements were performed assisting others. (Box 5). Every episode of non-invasive ventilation, behavioural sedation, endotracheal intubation and central vascular access was observed rather than performed by interns.

On all occasions when interns performed life-critical procedures such as chest compressions, defibrillations or induction of general anaesthesia, they received supervision. The only procedure interns were observed to teach was suturing (Box 5).

There was no significant difference in the proportions of intern activities across shifts (morning, afternoon and night), between weekdays and weekends, or according to the sex of the intern or whether they had been undergraduate or postgraduate students. The activity proportions were also similar at the three hospital sites (data not displayed).

DISCUSSION

Our study shows that most ED intern time (86.6%) is spent on patient-related clinical tasks. This is comparable with an Australia-wide ED-based finding (84.1%),² but exceeds those of United States-based studies of ED,⁹ surgical,¹⁰ and internal medicine¹¹ intern rotations (58%, 40%, 30%–62%).

While the observation method used may have elicited practice changes secondary to the presence of an observer (the Hawthorne effect), covert observation of interns is unlikely to be ethical or possible. Indeed, the importance of direct observation has been previously emphasised.¹¹

Other potential threats to the study validity were the lack of urban, provincial, or rural EDs, a limited paediatric base and a non-uniform intern roster. Also, in two of the participating EDs, interns were rostered to manage short-stay units adjacent to their departments. The three EDs may be more representative of the intern ED experience than previous single-site studies,⁸ but extrapolation to all Australian EDs should be made with caution.

Data were collected over 4 months despite possible yearly variation in ED casemix and clinical tasks. Interns were in the 6th to 10th month of their intern year, and hence already had some experience. Samples of interns on their first or last rotations of an intern year may be different.

Our use of a single researcher to sample intern activities without secondary verification may have led to some observer bias, but was unavoidable. Attempts were made to mitigate this through pre-observation training and inter-rater reliability checks.

A study by the Postgraduate Medical Education Council of Queensland (PMCQ) reported that ED interns across four Australian states spent 18.9% of their time taking histories and performing examinations combined,² compared with 26.8% in our study.

2 Time spent on direct patient-related activities, and the predicted frequency of episodes of activity by emergency department (ED) interns over eight 38-hour working weeks

Activity	No. of episodes observed in 391 hours	Mean duration (min)	Predicted episodes in 8 weeks of ED	Proportion of total intern time
Patient management	5167	1.9	4018	43.9%
Communicating with ED staff	903	1.2	702	4.7%
Consulting more senior ED medical staff	878	1.8	683	6.7%
Drug treatment and planning	701	0.4	545	1.1%
Using the Internet for direct patient management	681	0.4	530	1.2%
Communicating with other hospitals or services	552	1.6	429	3.8%
Communicating with inpatient unit staff	445	1.1	346	2.2%
Liaising with patient or family and friends of patient	372	5.2	289	8.2%
Writing or typing clinical notes	242	11	188	11.3%
Communicating with GPs or other health care providers	154	5.2	120	3.4%
Consulting peers and others	171	1.0	133	0.7%
Writing certificates	68	1.9	53	0.6%
Clinical investigations	1737	0.6	1350	4.8%
Interpreting blood test results	827	0.3	643	0.9%
Diagnostic planning or ordering investigations	316	1.0	246	1.3%
Electrocardiogram interpretation	199	0.8	155	0.7%
Urinalysis interpretation	196	0.2	152	0.2%
Plain x-ray interpretation	147	1.6	114	1.0%
Performing ultrasound	27	0.7	21	0.1%
Computed tomography and other imaging interpretation	27	4.7	19	0.6%
Clinical examination of patients	1025	2.1	797	9.3%
Cardiorespiratory exam	226	2.7	176	2.6%
Vital signs	196	0.7	152	0.6%
Abdominal exam	195	2.4	152	2.0%
Neurological exam	91	4.4	71	1.7%
Ophthalmology exam — pupillary reflexes	89	0.3	69	0.1%
Mini-mental state exam	78	1.3	61	0.4%
Musculoskeletal exam	57	3.2	44	0.8%
Trauma assessment	51	1.5	40	0.3%
Other*	44	3.9	32	0.8%
Obtaining patient history	893	4.6	695	17.5%
From patient	325	6.9	253	9.6%
From documents	288	4.0	224	4.9%
From health professionals	181	3.2	141	1.4%
From patient's family, carers and/or friends	99	2.2	77	1.7%
Procedural tasks	846	1.6	658	5.6%
Oxygen therapy application/adjustment	337	0	262	0.1%
Intravenous cannulation or phlebotomy	305	0.7	237	0.9%
Arterial puncture for blood gases	50	1.5	39	0.3%
Local anaesthetic injection	35	1.1	27	0.2%
Plaster application	21	14.4	16	1.3%
Other procedural tasks†	19	2.8	12	0.2%
Plastic surgery and suturing procedures	16	31.8	12	2.0%
Nasogastric tube insertion	12	2.0	9	0.1%
Sedation — procedural and behavioural	9	3.6	7	0.2%
Chest compressions in cardiac arrest	9	0.9	7	0
Urinary catheterisation	8	3.9	6	0.1%
Regional anaesthesia administration	8	2.2	6	0.1%
Reductions of fractures/dislocations	6	2.5	5	0.1%
Non-invasive ventilation application	5	0.8	4	0
Enterogastric tube replacement	3	2.8	2	0
Defibrillation	3	0.7	2	0
Handover	53	13.1	41	3.0%
Walking around between tasks	4455	0.1	3466	2.5%

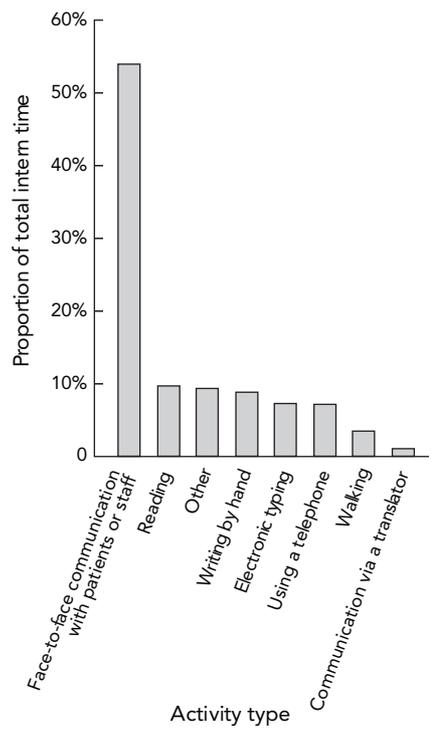
GP = general practitioner. * Includes ear, nose and throat; skin; pelvic; urogenital. † Includes one each of central venous catheter, suprapubic catheter, arterial line, nasopharyngeal airway insertion, endotracheal intubation, induction of general anaesthesia, lumbar puncture and 12 other minor procedures. ◆

RESEARCH

3 Time spent on activities not directly related to patient care, and the predicted frequency or episodes of activity by emergency department (ED) interns over eight 38-hour working weeks.

Activity	No. of episodes observed in 391 hours	Mean duration (min)	Predicted episodes in 8 weeks of ED	Proportion of total intern time
Teaching or advising others	670	0.5	522	1.3%
Giving consultations and advice ad hoc	667	0.4	519	1.2%
Tutorial and case presentations	2	9.6	2	0.1%
Clinical teaching	1	3.6	1	0
Non-patient-related administration	239	0.7	186	0.7%
Photocopying	208	0.3	162	0.2%
Emailing	10	2.3	8	0.1%
Other administrative tasks	9	6.9	7	0.3%
Faxing	9	0.3	7	0
Research related	3	10.4	2	0.1%
Educational for professional development	174	2.3	135	1.7%
Using information technology for professional development	170	0.9	132	0.7%
ED-based meetings, lectures and tutorials	4	59.6	3	1.0%
Downtime	168	5.2	131	3.7%
Breaks	145	6.8	113	4.2%
Meals	97	16.8	75	3.3%
Toilet	46	2	36	0.8%
Other break times	2	9.3	2	0.1%
Preparation and clean-up for procedures	98	4	76	1.7%
Other	6	4.2	5	0.1%
Total				13.4%

4 Percentage of total time spent on each activity by emergency department interns



Patient history-taking alone consumed more time (17.5%) than that reported in earlier international studies (8%¹² and 15.2%⁹).

Although the ED is perceived as an environment rich in procedural opportunities,^{6-9,13} procedures took up only 5.6% of intern time, and ranked sixth in terms of activity frequency, similar to other studies.^{2,9} Senior staff maybe more likely to manage the critically ill and may become distracted from involving interns in advanced procedures. Additionally, competition from other ED staff such as registrars training in emergency medicine may be an additional barrier to intern procedural exposure. Lack of procedural experience has been linked with lower confidence and competence.^{5,14,15}

It is often perceived that intern time is wasted on so-called “mindless” tasks⁸ that could be more efficiently performed by support staff. However, we found that such tasks, including non-patient-related administrative activities and procedural preparation and clean-up took up less than 3% of intern time. If looking for efficiencies, greater impact maybe obtained by exploring ways of decreasing the time required for obtaining patient histories (17.5%), documentation in clinical notes (11.3%) and the

other mainly communication processes required for patient management (32.6% of intern time).

Our study shows that synchronous communication modes (ie, when both individuals participate in the conversation simultaneously) accounted for almost two-thirds of total intern time, with face-to-face communication accounting for most of these. Interruptions created by immediate requests to speak are a characteristic of synchronous communication,¹⁶ the consequences of which include forgetfulness and errors.¹⁷ The ED may be construed as an event-driven environment with a high demand for immediate communication between both staff and patients. Therefore, training in the safe and efficient use of synchronous communication in the ED context may be useful, such as the recently described Situation-Background-Assessment-Recommendation technique.¹⁸

Seeking advice from more senior ED staff (6.7% of intern time) or peers (0.7%) consumed a comparable amount of intern time to that reported in the PMCQ study (9.8%).² Lack of immediate availability of more senior doctors could result in delays in providing guidance to interns, and hence delays in patient flow. In 8 weeks, each intern would

5 Expected frequency of intern procedural experience in 304 hours, and percentage performed in different contexts, including supervision

Procedural task	Expected no. of times performed in a 304-hour emergency department rotation	Procedural contexts				
		Alone	Assisted others	Observed others	Taught others	Supervised by others
Oxygen therapy administration	262	83%	0	17%	0	0
Intravenous cannulation or venepuncture	237	100%	0	0	0	0
Arterial blood gases	39	91%	0	0	0	9%
Local anaesthesia	27	100%	0	0	0	0
Plastering	16	94%	6%	0	0	0
Other procedures*	12	94%	0	6%	0	0
Plastic surgery and suturing procedures	12	82%	12%	0	6%	0
Nasogastric intubation	9	0	0	0	0	100% [†]
Chest compressions	7	0	0	0	0	100%
Urinary catheterisation	6	100%	0	0	0	0
Regional anaesthesia	6	0	100%	0	0	0
Procedural sedation	5	0	0	15%	0	85%
Reduction of fracture or dislocation	5	0	100%	0	0	0
Non-invasive ventilation	4	0	0	100%	0	0
Behavioural sedation	2	0	0	100%	0	0
Defibrillation	2	0	0	0	0	100%
Enterogastric tube replacement	2	0	100%	0	0	0
Nasopharyngeal tube insertion	1	100%	0	0	0	0
Arterial line insertion	1	0	0	0	0	100%
Suprapubic catheterisation	1	0	0	0	0	100%
General anaesthesia	1	0	0	0	0	100%
Endotracheal intubation	1	0	0	100%	0	0
Central vascular access	1	0	0	100%	0	0
Lumbar puncture	1	0	0	100%	0	0
All procedures	660	85.3%	8.8%	2.5%	2.0%	1.4%

* Procedures such as removal of foreign body, abdominal paracentesis, incision of abscess, removal of sutures, dressing of wounds, injections for tetanus immunoprophylaxis. † All instances of nasogastric tube insertion were supervised by senior nursing staff.

have an average of 683 consultations with more senior ED staff. Each extra intern in an ED could mean a requirement for existing ED staff to service around 20 more consultations per 10-hour shift. An increase in the number of Australian interns may reduce or dilute access to senior medical advice, or decrease the time senior staff have for their other tasks, unless accompanied by a similar increase in the number of senior medical staff. Designated educators are already available for junior US doctors⁹ and Australian nurses.¹⁹ This approach could be adopted for Australian ED junior medical staff.

At less than 2%, structured and incidental educational tasks accounted for substantially less intern time than that indicated by the PCMQ report (9.1%)² and an Australian study conducted almost two decades ago

(12%).⁸ This may reflect the interns' working week being substantially shorter than a generation ago, with less time available for educational tasks.⁸

Personal or miscellaneous tasks (breaks, downtime and "other" activities) accounted for just 8.0% of total intern time, comparable to the PCMQ finding (6.9%)² but much less than that reported in the US (20%).⁹ In contrast to Victorian ED interns, those in the US are often on call, and so sleeping was also considered personal time use.⁹ The small amount of "downtime" when there were no tasks observed (3.7%) indicates that interns are usually performing a work-related task, and that they are therefore not available to see new emergency patients about 96% of the time. Other emergency services (fire, ambulance) aim for a much

higher percentage of downtime to ensure their availability for emergencies. Notwithstanding the supervision requirements, this low amount of downtime implies that there could be capacity within EDs for more interns, as it is likely that there would be patients available to be seen; however, further analysis looking at all factors involved would be needed to determine this.

Breaks were only 27 minutes on average per day, including a 17-minute meal break. This is just over half of the meal break entitlement for shifts exceeding five consecutive hours according to Victorian industrial relations law.²⁰ Although EDs had the safest working hours of all hospital departments according to the Australian Medical Association's Safe Hours Audit in 2006,²¹ departmental heads may need to consider rostering

30-minute meal breaks to meet industrial requirements.

While not directly recorded in our study, another Australian study has observed that registrars provide the bulk of intern supervision.²² It has been suggested that reliance on “the voluntary contributions of many clinicians who teach” is unsustainable.²³ The recognition by a recent Productivity Commission report that quality procedural supervision and education take time and appropriate resources is important.²⁴

The ED offers a unique environment for interns to undertake a comprehensive range of clinical and procedural activities. The expected increase in intern numbers should not precipitate hasty decisions to devise alternatives to the ED rotation without further assessing the impact on EDs of hosting more interns, or the effect on interns of being deprived of their ED experience. Currently, there appears to be no shortage of patients available to be seen in the ED by interns. It is likely that ED attendances will continue to increase, providing more exposure to clinical opportunities for interns and more need for ED manpower. To maintain the positive educational and clinical outcomes for interns in the ED, sufficient preparation and supervision of the increased numbers of interns will be required. An analysis of EDs across Australia in terms of their ability to accept increasing intern rotations may be beneficial.

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COMPETING INTERESTS

None identified.

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