Understanding better how emergency doctors work. Analysis of distribution of time and activities of emergency doctors; a systematic review and critical appraisal of time and motion studies

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Abstract

Background There are a number of reports in the literature that evaluate the proportion of time spent on individual tasks performed by senior emergency doctors. Time and motion studies (TMS) allow quantification of how emergency doctors spend their working time in the emergency department (ED). This can provide insights into improving working conditions and enhancing productivity. Three questions were addressed 1) How senior emergency doctors spend their time in the ED? 2) How much of their time is spent on multi-tasking? 3) What is the number of tasks completed per hour?

Methods The literature was systematically searched for peer-reviewed articles that described the senior emergency doctors' tasks using TMS. Studies were assessed for methodological quality via evidence-based measures relevant for TMS. Narrative synthesis was followed.

Results Fourteen TMS were included. The studies were liable to several biases including observer and Hawthorne bias. Overall, the time spent on direct clinical care accounted for at least around one-third of the senior emergency doctors' time. The remaining time was mostly spent on indirect clinical care such as communication and documentation. The amount of time spent on multi-tasking ranged from 10 to 23%. When reported, the number of tasks performed per hour was generally high.

Conclusion

The review revealed that senior emergency doctors spent at least around one-third of their time on direct face-to-face contact with patients. The review findings provided a grounded understanding of how senior emergency doctors spent their time in the ED and should be useful in implementing improvements to the emergency care systems.

What is already known on this subject?

- Various studies from different countries have studied how senior emergency doctors spend their time in the emergency department but there was no overall summary of their findings.

What this study adds?

- Senior emergency doctors spent one-third of their time in the emergency department on activities related to direct patient care. They are busy clinicians, responsible for multiple tasks and for managing more than one patient concurrently.
- A suggested task list of senior emergency doctors' activities is created based on the reviewed literature. We provide this tool for researchers in this field to enable them to produce collaborative research and comparable findings.

Background

Senior emergency doctors are the supervising providers and the most expensive human resource in the emergency department (ED) setting. They undertake 3-7 years of medical training after their medical degree to become certified providers in emergency medicine (1–3). They perform essential roles including administrative work, diagnosis, management of complex cases, supervision and teaching and liaison with police, ambulance and patients' relatives. A number of leading organisations in the UK, USA and Australia have formulated guidelines on specialist emergency doctors' workloads, which suggested that senior emergency doctors' duties should include direct clinical care and supervisory requirements as well as administrative duties (4–6).

Emergency doctors spend time on face-to-face contact with patients, gathering information, developing a relationship and maintaining their clinical knowledge base. However, there has been little study of the senior doctors' time as a resource. With the increased emphasis of health care managers and policy makers on value and efficiency of healthcare systems, quality time spent with the patients is an increasingly valuable resource. There are reports in the literature that associate time spent on direct patient care with better patient and staff satisfaction (7,8)**.**

In addition, healthcare professionals are required to manage more than one patient concurrently in time-constrained environments. Examining multi-tasking is an important element in understanding the clinical work context especially in the emergency department setting where timely evaluation and stabilisation of patients is critical. Understanding the frequency of multi-tasking by emergency doctors allows us to measure it more effectively and therefore evaluate its implications on patient safety.

The aim of this systematic review is to determine how senior emergency doctors spend their time in the ED and what tasks occupy the highest percentage of their time, and secondly, how much of their time is spent on multi-tasking and the number of tasks completed per hour. Lack of understanding of senior emergency doctors' activities and tasks can result in negative consequences on patient safety and human resource allocation and planning. The secondary objective for the review is to create a standardized classification of activities performed in the ED by senior doctors, in order to assist researchers in this field who may use this list of activities for future collaborative research.

Methods

The search strategy was adapted from a systematic review by Tipping et al that looked at time and motion studies of internal medicine physicians (9). The updated search strategy focused on three key terms: (time and motion studies) AND (emergency department OR emergency services) AND (physicians OR doctors). It did not include keywords from the desired outcomes as this limited the number of resultant studies.

The literature search was carried out in November 2016 and was restricted to the period 1998-2016 in order to take into account the introduction of the 1998 European Working Time Directive which restricted the maximum working hours of doctors to 48 hours per week in the UK and Europe. Both MeSH terminology and free-text words were used (See Appendix 1). Relevant studies were retrieved from the following databases: Cochrane Library, MEDLINE, EMBASE, Web of Science and SCOPUS. Reference lists and citations of the retrieved studies were scrutinized for additional studies.

Study registration and protocol

The review protocol is available at the international prospective register of systematic reviews PROSPERO registration number 42014014496 (10).

Eligibility criteria

Studies were included if they fulfilled the following inclusion criteria; observational time and motion or work-sampling studies. Studies were included whether the data was self-reported or collected via an observer; undertaken in adult or mixed population EDs in urban or rural settings, described the activities of emergency medicine (EM) senior doctors. Senior emergency doctor was defined as a consultant or an attending physician with an EM speciality qualification, or a senior registrar who works on the consultant rota. Finally studies were included when published as full-text peer-reviewed papers in English language. Studies were excluded if they were TM studies of emergency senior doctors during the hand-over period only, if studies observed a sample of junior emergency doctors only or a sample of both senior doctors and nurses where the results were not reported separately, and lastly if they were conference proceedings or abstract-only studies.

Study selection and data abstraction

Titles were screened for relevance. Abstracts or full-text papers, if necessary, were evaluated against the inclusion and exclusion criteria. Suggested Time And Motion Procedures (STAMP) checklist was used to extract the relevant information including information relevant to the review outcomes (11). The modified data extraction form STAMP outlines a set of 29 data information elements organized into eight main areas (See Appendix 2). The reported working time on different activities was converted to percentages when possible to provide a coherent picture across the review results.

Quality assessment

There is no formal quality assessment tool for observational time and motion studies, a quality assessment tool was designed based on criteria that are relevant to observational studies which include Hawthorne effect, seasonal variability, observer bias, and ethical grounds (12). Consideration was also given to whether the authors had taken any actions to improve the validity and reliability of the individual study results, for example if any measures were taken to reduce the identified biases in a particular study.

Data analysis

A narrative synthesis was used due to the diverse definitions of the measured outcomes in the included studies. Narrative synthesis is a process that primarily uses texts and words to describe the findings of individual studies in order to explore heterogeneity descriptively rather than statistically. Narrative synthesis provides deep and rich information while preserving the idiosyncratic nature of individual studies (13). Summary tables were produced to illustrate the findings of the review in terms of the included studies' characteristics and outcomes.

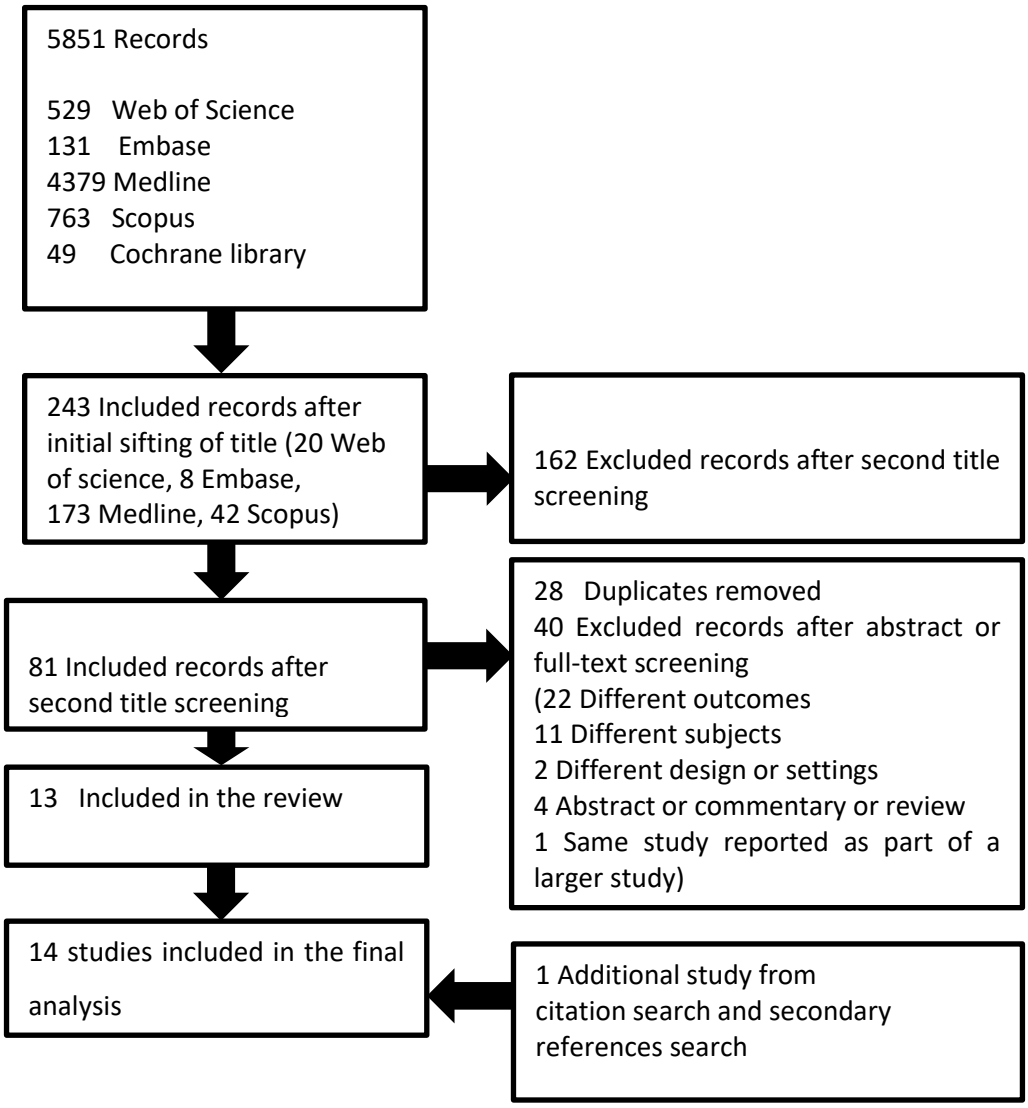

Figure 1 PRISMA chart

Results

Search results

After full verification of the abstracts and full-text against the inclusion criteria, a total of thirteen studies were included. Fourty studies were excluded from the review. See Appendix 3. Following citation and secondary references search, an additional study was included**.** Finally, the review included fourteen studies as shown in PRISMA Chart **Figure 1.**

Description of the included studies

All studies except one were observational time and motion studies which used an external observer. One was a self-reported diary (14).

All studies were conducted in developed country healthcare settings. Only two studies reported the task analysis of senior doctors activities in non-academic EDs (15,16) while the remaining studies were conducted in either academic EDs (EDs affiliated with teaching hospitals) or a mix of academic and non-academic EDs. The largest study sampled 169 participants from 11 EDs in Canada (17). The number of senior doctors observed ranged from 3 to 169 (IQR 9-22, median 10). The number of hours of observation of senior emergency doctors ranged widely across the included studies (IQR 58-613.5 hours) with a median of 113 hours. See **Table 1.**

All the studies reported the amount of time ED clinicians spent on various clinical and non-clinical tasks but the main focus for each study varied. Seven studies aimed to characterise the work activities of emergency clinicians (14,15,18–22) while the remainder of the studies adopted a different focus. These included: rate of interruptions (16,23), physician workload (24), time spent on patients of different triage categories (17), and the impact of newly introduced interventions in the ED on physician work activities (25–27).

Table 1 Description of the included studies

Study and country of origin	Setting	Study design	Number of observers	Observer assignment	Provider type	Study duration	Hours of observation	Classification of tasks
Anderson 2009(17), Canada	11 EDs, academic and non -academic	TMS and workload analysis	3	NR	169 emergency doctors	Sporadically over 1 year	4736 hours	13 categories
Asaro 2004 (25), USA	Academic ED	TMS	NR	NR	ED clinicians including 7 emergency doctors	NR	36 hours	3 categories and 25 subcategories
Benda 2016(27), USA	Academic ED	Pre-post observational TMS	2	NR	ED clinicians including 9 emergency doctors	Sporadically over the course of a year	84 hours	5 categories
Brown 2000(14), UK	9 EDs, academic and non -academic	Self-reported diary	NA	NA	9 emergency doctors	1 month	170 hour per consultant	6 categories
Chisholm 2001(16), USA	5 EDs, non-academic	TMS	1	NA	22 emergency doctors	2 months	66 hours	9 categories
Chisholm 2010(18), USA	4 EDs, academic and non -academic	TMS	2	NR	85 emergency doctors	2 months	406 hours	3 main categories
France 2005(26), USA	Academic ED	Pre-post TMS	1	NA	ED clinicians including 10 emergency doctors	9 months	50 hours	13 categories
Friedman 2005(19), Canada	Academic ED	TMS	1	NA	11 emergency doctors	NR	96 hours	13 categories
Hollingsworth 1998 (20), USA	Academic ED	TMS	1	NA	ED clinicians including 10 emergency doctors	1 month	NR	3 main categories and 26 subcategories
Innes 2005 (24), Canada	Academic ED	TMS	NR	NR	20 emergency doctors	1.5 months	NR	12 categories
Kee 2012 (15), Australia	Non-academic ED	TMS	1	NA	17 emergency doctors	< 1 month	130 hours	7 main categories and 38 subcategories
Mache 2012(21), Germany	3 EDs , type not reported	TMS	1	NA	25 emergency doctors	5 months	821 hours	12 categories
Perry 2013 (22), USA	Academic ED	TMS	1	NA	ED clinicians including 3 emergency doctors	<1 month	20 hours	7 main categories and 33 subcategories
Westbrook 2010 (23), Australia	Academic ED	TMS	1	NA	5 emergency doctors	6 months	210.45 hours	10 main categories and 16 subcategories

NA, Not applicable; NR, not reported; ED, emergency department; academic ED, affiliated with a teaching hospital; TMS, time and motion study

Quality assessment of included studies

There were nine single-site versus five multiple-site studies. Eight studies observed senior emergency doctors during day and night shifts, weekdays and weekends. Observer bias was accounted for in two studies through the employment of two observers recording data simultaneously and then the measurement of inter-observer agreement. Inter-rater reliability was high in these studies (18,23). Data collection methods varied. Seven studies used a computer-based data collection tool. The use of handheld computers presents more accurate findings and can also account for overlapping and multitasking (26). One study asked senior doctors to report their activities using a work-based diary (14). All studies except two (14,25) reported Hawthorne effect i.e. the subjects' awareness that their actions are observed can result in alteration of their behaviours and attitudes (12). These studies undertook some measures to minimize its influence such as keeping the observer at a distance from the senior doctor. Seasonal variability was considered in six studies and reported as a limitation (15,17,19,20,22,27) but it can be argued that all studies suffered from Hawthorne and seasonal variability biases.

There was a lack of a standard categorisation of emergency doctors' tasks in the ED. Five studies acknowledged previous similar work, where their categories were adapted from previous studies and were modified to fit the specific aims of their studies (16,18,22,23,27). In another four studies, the task classification was developed in consultation with expert ED staff (15,17,21,26) while five studies did not report information with regard to the development of their task classification (14,20,24,25,27). Finally, ethical approval was reportedly granted in all studies except one (25). See **Table 2.**

Table 2 Quality assessment of the included studies

Study author and year	Single site versus multiple -site study	Day-night shifts, weekdays-weekends included	Observer bias considered	Data collection tool	Seasonal variability considered	Hawthorne bias considered	Acknowledgement of previous task classification schemes	Development and validation of new task classification	Ethical approval granted
Anderson 2009 (17)	M	Y	Y	Handheld personal digital assistant	Y	Y	N	Y	Y
Asaro 2004 (25)	S	NR	Y	PALM Data collection tool specifically designed for the study	N	N	NR	NR	NR
Benda 2016 (27)	S	NR	Y	Paper-based form and a stop-watch	Y	Y	Y	Y	Y
Brown 2000 (14)	M	Y	NA	Self-reported diary	N	N	N	N	Y
Chisholm 2001 (16)	M	Y	Y	NR	N	Y	Y	Y	Y
Chisholm 2010 (18)	M	Y	Y	Paper-based form	N	Y	Y	Y	Y
France 2005 (26)	S	N	N	Wireless handheld computer device	N	N	N	Y	Y
Friedman 2005 (19)	S	Y	N	Standardized collection form with one minute increments	Y	Y	NR	NR	Y
Hollingsworth 1998 (20)	S	N	N	Paper-based form and a stop-watch	Y	Y	NR	NR	Y
Innes 2005 (24)	S	Y	Y	Structured paper-based form	N	Y	NR	NR	Y
Kee 2012 (15)	S	Y	Y	Handheld computer supported with software designed for the study.	Y	Y	NR	Y	Y
Mache 2012 (21)	M	N	Y	Handheld computer	NR	Y	N	Y	Y
Perry 2013 (22)	S	Y	N	Two iPods, one as a stopwatch and one as a data collection tool.	Y	Y	Y	Y	Y
Westbrook 2010 (23)	S	N	Y	Personal digital assistant	N	Y	Y	N	Y

NA, not applicable ; NR, not reported; N, No; Y, yes; S, single centre study; M, Multi-centre study

Primary outcomes

See **Table 3.**

Direct patient care

Direct patient care was reported in eight studies (16,18,20,21,23–26). The definition of direct care varied across the included studies. Five studies considered any activity directly related to the care of a patient at the bedside as the only form of direct care (16,20,21,24,26). Asaro, like Westbrook added communication with relatives to their definitions of direct patient care (23,25). Finally, Chisholm 2010 considered ordering diagnostic tests, therapies and interpreting ECGs, in addition to patient care at the bedside, as direct patient care (18).

On the other hand, the remaining six out of the fourteen studies included studies classified the emergency doctors' activities without labelling any of them as direct care (14,15,17,19,22,27). The percentage of time spent on direct patient care activities in these studies was calculated from the other reported categories (clinical, history and physical exam, time in the patient room, communication with patients and their family) to allow comparison across the studies.

In seven studies, direct patient care occupied around one quarter to more than one third of the senior doctors' time with a mean and median of 29.95% and 30% respectively (14–16,18,20,23,27). An American study by France reported that their pooled senior doctors group spent approximately 40% of all observed time on direct patient care tasks (26). This was similar to a large Canadian study which reported that senior doctors spent approximately 38% of direct patient care inside the patient room as well as on discussions with relatives (17).

Indirect patient care

Six studies reported the percentage of time spent on indirect patient care. These studies took different approaches to define indirect patient care.

Three studies considered indirect patient care as any activities apart from direct contact with the patient (direct patient care) and personal activities (18,20,25). In these studies, indirect patient care could include communication, documentation and teaching. As expected, the percentage of time spent on indirect patient care in these studies was high and ranged from 45%-65.2% (18,20,25). On the other hand, in the remaining three studies, indirect patient care was defined as reviewing patients' investigation and medical records (16,21,23). In these studies, time spent on indirect care was as low as 6.6% as reported by Chisholm 2001 (16) and as high as 25.7% as reported by the more recent Australian study by Westbrook (23).

Documentation

Documentation as an independent category was reported in ten studies (15–17,19,21–24,26,27). Sometimes it was reported as charting or dictation (17,24,26), paperwork (22,27) or 'data' (19) but it basically referred to the recording of patient information on paper, or on the computer. Time spent on documentation ranged from around 10% in the Australian study by Kee (15) to as high as 28% according to Chisholm 2001(16). In four studies, documentation occupied more than 20% of the senior doctors' time (16,17,22,26).

Communication

Nine studies reported data on this outcome. Four studies reported time spent on professional communication as a task category (15,20,23,24). In another five studies, communication was calculated from similar categories. These were discussion and consultation with health care professionals in a study by Anderson (17) or exchanging patient information, phone calls and verbal orders with a provider (26) or care planning with other providers (25) or meetings (14). In another study, by Friedman, communication was calculated from two categories: consultation with a nurse and other health care professionals and answering the pager (19).

Time spent on communication ranged widely from around 8% to more than 40% (14,15,17,19,20,23–26). There was a big variation among the results. No particular trend was detected.

Teaching

Teaching or supervision was reported in ten studies. This was either reported as an independent category (14,19,23–26) or as a subcategory (18,20,22). In a study by Anderson, teaching was calculated from two categories: consultation with medical students and consultation with medical trainees (17).

In all these studies except one by Brown (14), time spent on teaching and supervision was considerably lower than other categories and occupied less than 10% of the senior doctors' time.

Administrative activities

Six studies reported data on administrative activities (14,19,21–24). Westbrook defined administrative duties as any activity not related to direct or indirect patient care such as employment issues and bed allocation (23). The remaining studies included phone calls and paperwork (19,21,22) or departmental problems (24) in this category. In four of these studies, administrative tasks occupied around 10% of the senior doctors' time. However, in two studies by Brown and Mache, this increased to more than one fifth of senior doctor's time (14,21).

Personal activities

Nine studies reported the time senior emergency doctors spent on personal activities, which included restroom breaks, meal breaks and social conversations (15,16,18–23,25). In three studies, time spent waiting was included in the personal activities category (18,20,25). Personal time accounted for 3% to around 16% of the senior doctors' time.

Multi-tasking

In the most recent TMS study by Benda, senior doctors undertook 1.9 tasks per minute (114 tasks/hour) (27). Similarly, Kee et al reported that consultants undertook more than 100 tasks an hour (15). This is higher than the 34 tasks per hour as reported by France 2005 (26) or 80 tasks per working day as reported by Mache (21).

Three studies reported the number of patients who were seen simultaneously by the senior emergency doctor (16,18,26). Chisholm 2001 reported that 1.2 patient were seen concurrently (16). This increased to five patients in the more recent study by Chisholm 2010 (18). In that study, emergency doctors who worked in academic EDs (EDs affiliated with teaching hospitals) seemed busier than those who worked in community EDs, supervising the management of an average of seven patients simultaneously (18). France, on the other hand, reported that senior emergency doctors were responsible for an average of 9.8 patients at the same time (26).

Four studies reported the percentage of time spent on multi-tasking by the senior doctors (16,21,23,25) which was variable across these studies: 23%, 16.4 %, 12.8% and 10.6% as reported by Mache, Asaro, Westbrook and Chisholm 2001 respectively (16,21,23,25).

Table 3 Summary of outcome measures of included studies

Study identifier	Direct care	Indirect care	Documentation	Communication	Teaching /supervision	Administration	Personal/social activities	Multitasking
Anderson 2009** (17)	37.6%‡	-	20.9%	8.8%	6%	NR	NR	NR
Asaro 2004 (25)	28.1%	65.2%	12.8%	18.6%	1.4%	NR	6.1%	16.4% of tasks involved overlapping with another task
Benda 2016* (27)	31.6%	NR	NR	NR	NR	NR	NR	1.9 task per minute (114 per hour)
Brown 2000 (14)	30%	NR	NR	14%	21%	12-28%	NR	NR
Chisholm 2001* (16)	33%	6.6%	28%	NR	NR	NR	16.5%	10.6% of time was spent on multi-tasking Number of patient seen concurrently = 1.2
Chisholm 2010* (18)	30% - 34.1% †	53 % - 45% †	Reported as part of indirect care category			NR	3%-6.5%†	Number of patient seen simultaneously = 5
France 2005*** (26)	40%	NR	21%	29%	NR	NR	NR	34 tasks per hour, Number of patients simultaneously seen = 9.8
Friedman 2005 (19)	29%	NR	16.7%	16.10%	5.67%	1.85%	16.2%	25 tasks per hour
Hollingsworth 1998* (20)	32.2%	51.3%	Reported as part of indirect care category			NR	13.5%	NR
Innes 2005* (24)	31.2%	-	19.3 %	8.3%	7.3%	9.4%	NR	NR
Kee 2012* (15)	35.5%	NR	10.4%	44.3%	1.6%	NR	9.1%	100 task per hour
Mache 2012* (21)	NR	15.5%	NR	NR	10%	21%	5%	80 task per 9 hour shift 23% of time was spent on multitasking
Perry 2013 (22)	24.2%	NR	21.6%	NR (as a separate category)	NR (as a separate category)	2.4%	7.6%	NR
Westbrook 2010* (23)	28.6%	25.7%	13.3%	24.2%	1.7%	2.3%	5.7%	12.8% of time was spent on multitasking was

Yr. year; NR Not reported; *recorded in minutes and converted to percentages ;** in this study communication was reported as care planning with other providers or discussing patient care with nurses and other ED team and post-graduates , physicians and surgeons and teaching was reported as consultation with medical students; ** *extracted from graph presentation in the study ;† represents findings for community EDs versus academic EDs in this study ;‡ calculated from adding up two categories (inpatient room and discussion with patient family). If the study observed more than one subject type, for example nurses and senior doctors, only information related to the senior doctors were extracted. Authors were contacted if the study subject qualification and level of training is not clear.

Suggested task list of work activities of emergency doctors

As previously stated, studies used heterogeneous and variable task classification schemes which required additional effort to attempt to assemble similar categories together to produce meaningful and useful comparisons. In order to account for this limitation in future TM studies of emergency doctors, it is proposed that future TM studies of emergency doctors can use the suggested task categorisation scheme,that incorporates all the key categories reported in the individual studies. See **Table 4.**

Table 4 Suggested task list of work activities of emergency doctors

Duties performed at the emergency department	
1. Direct patient care	• History and physical examination • Procedures at bed side • Reviewing patient file • Thoughtful contemplation outside cubicle • Reading textbook in relation to the patient presentation • Communication with patient • Communication with patient's family • Any other activity involving direct interaction with patient
2. Indirect patient care	
Documentation	• Medical record, charting, dictation, discharge letter, sick certificate, other
Computer use	• Diagnostic tests ordering • Medication ordering • ED information system, tracking radiology, pathology results, medication reference, medical e-texts, other e-knowledge, other
Communication	• Face to face communication with staff (communication with nurses , physicians , social workers , other staff) • Phone calls and consults with staff
Teaching and supervision	
Personal and other	• Searching for staff - walking • Searching for patient file (board or screen viewing – interaction) • Procedure planning (washing hands, getting supplies , cleaning up, processing lab specimens) • Staffing cases for research • Personal (eating, restroom, social conversation with colleagues , surfing the net) • Waiting

Duties performed away from the emergency department	
Administrative, education and research	• Administration - meetings , staffing , reports , e-mails • Research activities away from the emergency department • Education - Reading , continuous professional development

Discussion

This systematic review identified fourteen time and motion observational studies. The majority were small single-site studies conducted in developed countries. Studies used different methods in terms of the number of observers, data collection tools, task categorisation and definitions. Generally, studies were liable to several biases including observer and Hawthorne biases. All the studies except two (15,16) were conducted either in academic EDs or a mix of both academic and non-academic EDs. Interestingly, direct patient care activities were very similar across both settings. In a study by Chisholm, senior doctors in academic sites spent a slightly longer amount of time on indirect care activities compared to those working in non-academic EDs (18). Chisholm attributed this to the possible higher complexity of some of those patients received at the acadmeic sites and the higher number of calls required to coordinate the care of multiple consulting physicians (18).

Direct clinical care was mostly described as patient care at the bedside, although sometimes this term extended to cover planning patient care outside the cubicle as well as communication with patients' relatives. Overall, the time spent on direct patient clinical care accounted for around a third of the senior emergency doctors' time. Although, the mean proportion of time spent on direct clinical care sounds much lower than the 75% recommended by the Royal College of Emergency Medicine (RCEM), the RCEM definition of direct clinical care, unlike its definition in most of the included research studies, is much more inclusive where it refers to all clinical duties in the ED and not merely face-to-face contact with patients (4).

There is no robust evidence which suggests that increasing the senior doctors' face-to-face time with the patient will improve quality of patient care but there are several suggestions that could be applied to improve ED efficiency and reduce the burden of other tasks. These could include increasing staff resources – although this has cost implications -, optimising documentation systems via speech or writing recognition systems, and reallocation of the doctors' tasks to perform other duties and to delegate other tasks to appropriate staff.

The other categories produced greater variation. Senior emergency doctors spent around a quarter of their time on administrative duties in the UK study by Brown (14). This contrasts with the more recent Australian study in which only around two per cent of the senior doctors' time was spent on administrative duties (23). Certainly, this could be explained by the differences in design and methods of these two studies as well as the difference in health systems and job expectations. The Australian study by Westbrook monitored the senior emergency doctors in the ED only (23). In comparison, Brown 2000, asked senior doctors to keep a self-diary of their activities for one month (14).

Time spent on training and supervision of junior staff was less than 10% in studies conducted in the USA, Canada and Australia while the UK study by Brown reported around 21% of the senior doctors' time was spent on supervising junior clinicians (14). This again could reflect the differences in how health care systems are run in various countries, and how closely junior staff are supervised.

Similar to the findings of a previous systematic review of TM studies of general physicians, our review showed no consistent reports on time spent on other non-direct clinical activities (9).

The evidence also revealed that senior emergency doctors frequently multitask. Multi-tasking has important implications on efficiency and performance. It is an important skill where clinicians need to continuously assess and prioritise their workloads. When reported, the amount of time spent on multi-tasking ranged from 10 to 23% (16,21,23,25). The number of tasks performed by senior emergency doctors per hour ranged widely from 34 tasks to more than a hundred. The wide range of number of tasks reported can be attributed to the different task definitions and classification schemes used in the included studies. Despite, this the number of tasks completed per hour by senior emergency doctors seemed comparable to other health care professionals; a prospective study evaluating nursing staff, showed that nurses completed around 72 tasks per hour with a mean task length of 55 seconds (7).

Limitations

There was an obvious heterogeneity in the classification of tasks across the studies. This necessitated following a narrative synthesis approach rather than a meta-analysis. Similar task categories (e.g. documentation, charting, paperwork) from different studies were compared against each other in an attempt to address this limitation. Furthermore, this review presented a new task classification scheme after consulting all categories in the individual studies. The task classification should assist ED clinicians and researchers to conduct future research in this field and allow cross-country comparisons to be made. A table of suggested task classification is presented. See

Table 4.

Additionally, the literature search period of 18 years (1998-2016), although more inclusive, allowed older evidence to be included in the review which may not reflect current practice. Despite this, the amount of time spent on direct and indirect clinical care has changed little during the past two decades. The rapid increase in adoption of information technology and the evolving role of emergency physicians seems to have not significantly affected these time allocations.

The initial literature search and data extraction was conducted by one researcher which can lead to selective reporting bias or missing some of the relevant literature. However, an exhaustive search strategy was developed and run on all the relevant databases. Moreover, a uniform abstraction sheet was used for all the studies. Finally, as with any review, publication bias of individual studies might have influenced the review results.

Conclusion

The review findings showed that around one third of the emergency doctors' time is spent on direct patient care. It also revealed that senior emergency doctors are responsible for managing multiple patients at once and that they frequently multi-task. The findings of the review were limited by the differences in study designs and the heterogeneous task classification and categorisation schemes used in the individual studies. The review suggests a framework of task activities that could be implemented in future time and motion studies of senior emergency doctors.

List of figures

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