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Workload management in A&E: counting the uncountable and predicting the unpredictable

C J Taylor, F Bull, C Burdis, D G Ferguson

Abstract

The development of a workload management system for use in the accident and emergency department is described. The system is capable of capturing the work all professional groups, allowing the user to roster staff according to anticipated workload, and gives accurate information on whether staffing requirements are sufficient to provide the desired standard of care.

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Royal Hallamshire Hospital, CSUH NHS Trust, Sheffield S10 2JF, United Kingdom: Accident and Emergency Department
C J Taylor
C Burdis
D G Ferguson

Workload Management Coordinator, CSUH
F Bull

Correspondence to:
Chris Taylor FRCS, Accident and Emergency Department, James Paget Hospital NHS Trust, Gorleston, Great Yarmouth, Norfolk NR31 6LA.

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The development of a workload management system entails examining all aspects of complex working tasks in detail. It entails defining and precisely timing each individual activity at a workplace. Complex activities have to be broken down into their components. Once these studies are completed, who does what must be analysed, as well as how, when, and how long it takes to do each task. These objective data will then allow one to identify working patterns, establish deficiencies, and develop solutions that are based on evidence.

Workload management has been established practice in industry for many years. Unfortunately, the NHS has lagged behind in adapting existing models to capture the type of work carried out in hospitals. However, in view of the current economic climate and the Government's resource management initiative it is vital that the resources of staff time and skills are used effectively and efficiently. The Government's White Paper "Working for Patients"[1] states: "...local managers in consultation with their professional colleagues will be expected to re-examine all areas of work to identify the most effective use of skills. This may involve the reappraisal of traditional patterns and practices." For managers to fulfil those expectations, they require objective data on the use of substantive and casual labour within their organisation. To provide those data, the Central Sheffield University Hospitals developed a workload management system that is suitable for use on a hospital ward. It focuses on assessing patients' individual needs and managing resources in relation to the amount of care each patient requires, as opposed to purely relying on numbers of patients. It also emphasises the importance of developing standards of care relative to the resources available.

The system has been in use for many years, and although it is capable of capturing workloads of all professional staff (medical, nursing, clerical physiotherapists, etc), its main use is as a tool for rostering nursing staff—using individual patient charts for patient care plans and completing them daily, it is possible to determine how many hours of nursing care will be required over the following 24 hours and roster appropriate numbers of staff.

Over the last three years, we examined the possibility of adapting the system for use in accident and emergency (A&E). However, due to the nature of emergency work, it is impossible to predict the type of patients attending a department and the care they will require. A very different approach was necessary.

Workload management in A&E

CLASSIFICATION OF PATIENTS

One of the problems of developing a practical and workable workload management system in A&E is the sheer number of possible diagnoses that may present. Any system based on diagnosis alone must be either so detailed as to be unmanageable or so simplified as to be too inaccurate. A further complicating factor is that patients with the same diagnosis may present in clinically very different conditions: one patient with myocardial infarction may require little more than an ECG, glyceryl trinitrate, aspirin, diamorphine, and referral; another may require prolonged resuscitation. This will significantly vary the staff time required and as most A&E departments spend around 85-90% of their resources on personnel costs, the difference is too substantial to be ignored.

To solve the problem, we developed a simple but radical solution: we abandoned the usual classification according to medical diagnosis altogether and developed a system that uses only presenting complaint and clinical condition. The latter was a simple division of ill/potentially serious/walking wounded which roughly corresponds to the natural division of a modern A&E department: resuscitation area, trolley bay, and walking wounded. As a result, the classification no longer includes terms like "Myocardial infarct" or "Sprained ankle", but "Chest pain, moderate" and "Ankle injury, walking". This reduces the number of categories to a manageable few: instead of establishing categories for "Myocardial infarct", "?Myocardial infarct", "Pneumothorax", "Musculoskeletal chest pain", "Panic attack", "Dissecting thoracic aneurysm", "Pneumonia"

Table 1 Most common presenting complaints (and division into ill/moderately ill/well) seen in A&E department, Royal Hallamshire Hospital

Resuscitation room
Multiple trauma
Head injury - severe
Major burns
Cardiac arrest
Respiratory problems - severe
Unconscious patient
Unconscious overdose
Other resuscitation cases

Majors area
Chest pain
Chest pain - moderate
Chest pain - minor
Respiratory problems - moderate
Head injury - moderate
Head injury - mild (home)
Collapse ?cause (home)
Collapse ?cause (admit)
Conscious overdose
Fits
Medical patients
Surgical emergency
Vascular emergency
ENT emergency
Abdominal pain
Chest injury - moderate
Back injury - moderate
Back injury - minor
Limb injury
Psychiatric - complicated
Violent/confused patient
Social assessment
Certification of death (BID)
Other

Minors area
Head/facial injury
Neck injury
Back injury
Chest injury
Strains/sprains, shoulder and arm
Strains/sprains, wrist and hand
Fractures upper limb
Fractures lower limb
Wounds and burns, simple
Wounds and burns, complex
Rashes, stings and bites
ENT problems
Eye problems
Dental problems
Other

and the host of other conditions that may present as "chest pain", there are only three: chest pain (ill), chest pain (moderately ill/ potentially serious), and chest pain (clinically well).

Although apparently crude, the classification proved highly accurate in practice: timing studies carried out in our department confirmed that the staff time required to deal with "Chest pain – ill" is virtually the same whether the eventual diagnosis is "Acute CCF due to MI" or "Haemorrhagic shock due to dissecting thoracic aneurysm".

To establish the list of "presenting complaints", we analysed three months of A&E records; table 1 details the presenting complaints we identified that capture 95% of our work. The remaining have been grouped under "other" for each of the three working areas.

Once the list had been established, medical and nursing staff worked in groups to prepare consensus lists of what should be done for each "presenting complaint/clinical condition" category. Table 2 lists the standards of care for medical staff for each of the three chest pain categories and their times; table 3 lists the corresponding direct nursing care task. (For timing studies see below.) Although there are no strict definitions of "clinical condition", in practice, A&E senior house officers (SHOs) are much more likely to agree on clinical condition than on diagnosis. In cases of doubt, an A&E sister will act as a referee

Table 2 Activities carried out by medical staff for the three categories of chest pain

Chest pain – ill		*Chest pain – moderately ill/potentially serious*		*Chest pain – mild*	
Activity	*Time (min)*	*Activity*	*Time (min)*	*Activity*	*Time (min)*
History	3	History	5	History	10
Examination	3	Examination	5	Examination	10
IV bloods	5	IV bloods	5		
IV drugs	2	IV drugs	2		
CXR	2	CXR	2		
ECG	5.5	ECG	5.5		
Refer	5	Refer	5		
Write records	3	Write records	3	Write records	3
Total time	28.5	Total time	32.5	Total time	23

IV, intravenous; CXR, chest *x* ray; ECG, electrocardiogram.

TIMING STUDIES, FOR MEDICAL AND NURSING STAFF

The workload management system we used was originally developed for hospital wards and measured total patient care within the framework of the nursing process. As the bulk of the field work in the development of a system is to capture, classify, and time nursing activities, we chose to use the data we already had available. Although this meant taking over some of its (historically determined) idiosyncrasies, it was preferable to having to start from scratch.

Total patient care, irrespective of the type of ward (general medical, surgical, orthopaedic, etc), is divided into two broad categories: *direct care*, which includes all tasks involving face to face patient contact, and *indirect care*, which includes those tasks that are performed away from the bedside. To give the reader an impression of the detail and scope of the analysis, we listed some of the direct care tasks and their timings in table 2. The hospital manual lists approximately 250 direct nursing care activities.

In order to classify the even larger number of indirect care tasks, these were subdivided into several categories: *General* (telephone calls, errands, cleaning, administrative, stocking), *Emotional support* (advice and counselling to patient or family), *Patient education* (teaching practical skills, explaining procedures), *Nursing process and overheads* (attendance at statutory lectures, staff teaching).

All activities (direct and indirect care tasks) are precisely defined and the definitions collected in a *Manual of operational definitions*. Each individual activity has been timed, either by actual timing studies (with stopwatch) or by groups of qualified nursing staff using their professional judgement and experience to establish consensus. Studies carried out in the hospital confirmed that consensus times are as accurate as those taken by stopwatch.

Once times are established, they are corrected with an *unpredictability factor*. This allows for all those instances where an average

Table 3 Total number of human hours (medical, nursing, clerical) to deal with patient with the three categories of chest pain

	Chest pain – ill Time (min)	*Chest pain – moderately ill Time (min)*	*Chest pain – mild Time (min)*
Medical staff	28.50	32.50	23.00
Total direct nursing care	108.10	85.60	37.30
Indirect nursing care	79.00	79.00	79.00
Clerical	18.00	18.00	18.00
Total (minutes)	233.60	215.10	157.30

task turns out to be more difficult than expected or takes longer due to interruptions and delays. Establishing the factor for each area requires detailed studies, as predictability varies from ward to ward and from specialty to specialty. On an average general medical ward, the unpredictability is around 18-20%; for our department it is 15%.

To allow for the effects of shift work and long continuous hours of duty, the times are further multiplied with a *fatigue and delay factor*, which for us has been identified as 10%. On a ward, the next step would be to carry out frequency studies to determine the number of times an activity is carried out per patient per day; multiplying the two figures and adding them up for all patients on a ward equals the number of direct care hours required the following day. By the nature of its work, this type of prospective data cannot be gathered for A&E—all patients will have left the department. However, through retrospective analysis of workload over several months and averaging it out, the number of direct care hours required per shift can be established with sufficient accuracy.

The times for indirect care tasks are arrived at in a similar manner; timing and frequency studies determine the average total number of indirect care hours required per shift. Dividing them by the average number of patients seen gives the number of incorrect care hours per patient (table 4). The sum of direct and indirect care hours is the total amount of nursing time necessary to deal with a patient with a given complaint, given clinical condition, and given standard of care.

The timings for medical staff activities were arrived at in the same manner as for nursing staff, but as the number of tasks is comparatively small, there was no need to divide them into direct and indirect care tasks.

OTHER STAFF

The principles of developing a workload management system are identical whichever professional group is analysed: clerical, portering, physiotherapy. The times may be added on to the human hours required to deal with a patient.

Discussion

Measuring workload in A&E has been attempted before. Tandberg and Qualls[2] and Graff *et al*[3] both describe systems whereby the volume of patients, the length of stay, the acuteness, and timed interactivity are measured to calculate workload. It was felt that these methods were potentially inaccurate because of effects of unpredictable outside influences. O'Brian-Pallas *et al*[4] compared various workload measuring systems which had two main themes: categories of care and hours of care. Although in principle those systems were very similar to the one we developed, we feel that our methodology is simpler and more practical in a complex environment, and still provides robust data.

The mathematics are more complicated than outlined above, as they include correction factors for probability and averages; although the figures are based on retrospective data (as opposed to prospective data for the wards), regular use has shown them to be remarkably accurate. As a rule, experienced staff know when and why there is a shortage of staff and will often be able to predict quite accurately how many more human hours are necessary to cope with increases in workload. The advantage of a workload management system is that it provides objective data which are available for scrutiny by outsiders. If, for example, Patients' Charter standards cannot be met due to lack of nursing staff, the data can be supplied to the Health Authority as objective evidence why they cannot be met. It is then up to the purchasers to decide whether to increase the funds or to accept a decrease in standards of care—and if so, which ones. In other words, workload management data provide proof of adequate and responsible allocation of resources.

Following the introduction of the system in our department, we have implemented several changes because our initial data showed that with relatively little effort the quality of care could be improved while simultaneously reducing resources consumed—the "win-win" loved by all managers.

Our data showed that for certain periods of the day, the number of hours required to care for patients in the department was disproportionately high compared to the number of patients attending: thus for certain periods of the day the department saw a fairly regular influx of "trolley cases" which obviously required more hours of care than the same number of walking wounded would require. The medical staff duty roster was adjusted, with a consequent drop in waiting times.

Table 4 Times spend on indirect nursing care tasks per patient triaged into the different A&E areas

	Time (in minutes)								
	Adminstration	*Communication*	*Cleaning*	*Errands*	*Office work*	*Teaching*	*Care plan*	*Emotional support*	*Total indirect care*
Resuscitation cases	13	24	12	5	3	9	4	8	79
Trolley cases	13	24	12	5	3	9	4	8	79
Walking wounded	7	8	2	2	0.5	1	5	3	29

We could show that we needed an increase in our nursing establishment, the main pressure being on tasks not requiring qualified nurses. This released qualified staff for skilled procedures and teaching.

Lastly, in the process of establishing consensus lists of care needed by each patient with a given presenting complaint and clinical condition, we discovered a number of poor or inconsistent clinical practices which opened discussion on why we do things the way we do. We arrived at consensus lists that detailed what should ideally be done—and what should not be done. These lists now form agreed management protocols or "standards of care" and are incorporated into the departmental handbook given to new A&E SHOs. For nursing staff, those consensus lists have served as a basis for attempting to set standards throughout the department.

The workload management system we described is flexible enough to be used by other departments as it can be tailored to suit very different local peculiarities. Before embarking on this, it is vital to ensure the commitment of all staff at all levels. The system will probably show that some well loved practices are inefficient; everyone must be prepared to let go of the old and explore possibilities of change.

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4 O'Brian-Pallas L, Cockerill R, Leatt P. Different systems, different costs? An examination of the comparability of workload measurement systems. J Nursing Admin 1992; 22:17–22.