ORIGINAL ARTICLE

Announcing the emergent patient in the emergency department: a randomised trial

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Objective: To determine which of three commonly used methods for notifying medical staff of the arrival of an emergent case to the triage area of an emergency department (ED) is optimal.

Methods: Prospective, randomised trial. Patients arriving with conditions rated as emergencies (triage category 2) were randomised to one of three notification arms: by microphone, by telephone, or by computer. The proportion of patients seen by a doctor within 10 minutes of arrival to the ED in each arm was compared.

Results: A total of 1000 patients were enrolled. The proportion seen within 10 minutes for patients announced by microphone was significantly greater than those announced by telephone or computer (67.0% v 63.2% v 57.3%, respectively; χ^2 6.30, $p=0.04$). No method achieved the benchmark proportion of 80% of patients seen within 10 minutes of arrival.

Conclusions: A microphone announcement heard by overhead speakers should be incorporated with other strategies to improve the timeliness of medical assessment of emergent cases.

The Australasian Triage Scale (ATS) is a five point scale for rating the clinical urgency of patients arriving to an emergency department (ED). Patients triaged as category 2 on this scale have conditions rated as an emergency, requiring assessment and initiation of treatment within 10 minutes of arrival to the ED.¹ These include imminently life threatening conditions, conditions associated with severe pain where humane practice mandates analgesia within 10 minutes, or conditions with important time critical treatments (for example, antidote administration).² Current performance indicator thresholds of the Australasian College for Emergency Medicine (ACEM) state that 80% of ATS category 2 patients should be seen within 10 minutes of arrival to the ED.³ Many EDs, however, have difficulty meeting this benchmark with an average of 73% of ATS category 2 patients being seen within 10 minutes in one Australian state in 2004.⁴

There is currently no recognised standard of practice by which notification of medical staff to the arrival of a category 2 patient occurs in the ED and in many institutions this is done on an ad hoc basis. Early notification of medical staff to the arrival of a patient may be a method of improving timeliness of assessment. In the present study, we aimed to determine whether any of three commonly used methods for notifying medical staff of the arrival of a category 2 patient was more likely to result in the patient being seen within 10 minutes of arrival.

METHODS

This prospective, randomised trial was conducted in the ED of St George Hospital, Kogarah, Sydney, between May 2004 and January 2005. St George's is a tertiary referral centre with 500 beds, and the ED has approximately 46 000 presentations per year. The Southeast Health human research ethics committee approved the study. The committee agreed that consent was not necessary for patients to be enrolled in the study. ED staff were informed in general terms of the trial, but the details of the enrolment arms and the starting date were not revealed to staff other than the triage nurses.

The study population was a convenience sample of patients presenting between 8:30 am and 10:30 pm, seven days per

week, who were assigned an ATS category 2. This time period was chosen because medical staffing levels outside this period was considerably lower, in particular there was no consultant on duty in the department outside these times. Trained ED nurses triaged the patient immediately upon their arrival to the ED and, after deciding to assign the patient category 2 on the basis of their clinical status, enrolled the patient in the trial. Once enrolled, the triage nurse randomised the patient by selecting an opaque sealed envelope from a box that contained a randomly generated number assigning the patient to one of the three arms of the study. The envelope also had instructions for the triage nurse to follow, to notify medical staff of the arrival of the patient.

In the first study arm (arm 1), the patient and their location was announced by microphone that could be heard throughout the ED on overhead speakers. In the second arm (arm 2) the ED consultant was contacted on their handheld phone by the triage nurse and informed of a category 2 patient and their location. In the third arm (arm 3) the patient details were typed into an ED computer information system, the Emergency Department Information System (EDIS), which was accessible at multiple work stations throughout the department. This system is used in real time in the study ED. It contains no warning that a patient is approaching benchmark time for any triage category, but does have a visual indicator once the patient has exceeded their benchmark time, which was 10 minutes for this study population.

Once randomised, the patient's name and medical record number were recorded on a sheet of paper containing a unique patient identifier (UPI) number but no details of the allocation arm. This sheet was placed in a second box for collection. The UPI number was linked to the allocation arm in a remote database. Data entry using the UPI in a separate database was therefore blinded to the allocation arm. Clinical and clerical details for all patients were recorded in the EDIS.

Abbreviations: ACEM, Australasian College for Emergency Medicine; ATS, Australasian Triage Scale; ED, emergency department; EDIS, Emergency Department Information System; UPI, unique patient identifier

Table 1 Proportion of patients seen within 10 minutes by study arm

	Arm 1 (microphone)	Arm 2 (telephone)	Arm 3 (computer)	Total
Seen within 10 minutes	213	213	176	602
Seen outside 10 minutes	105	124	131	360
Total	318	337	307	962

Time to be seen by a doctor was measured from time of patient arrival to the time a doctor placed their name next to the patient's on EDIS indicating that they were seeing the patient. Therefore the time taken to triage, randomise, and notify medical staff of the patient was included in the measured time to be seen. This method of assessing timeliness was the same as used in the pre-study period.

Statistical analysis

We performed a power calculation before the commencement of the study. On the basis of a baseline pre-study rate of 70% of patients seen within 10 minutes, and a clinically meaningful change of 10% with an α value of 0.05 and β value of 0.80 it was estimated 311 patients were needed for each arm of the study. A total of 1000 patients were randomised in anticipation of a non-completion rate of 5–10%. The primary outcome measure was whether the patient was seen by a doctor within the 10 minute benchmark. This and other clinical and demographic patient information was obtained from the EDIS. We analysed the data with SPSS (v.11), using Pearson's χ^2 and Kaplan–Meier survival curves. A p value of 0.05 was chosen as the threshold for statistical significance.

RESULTS

Of the 1000 patients who were enrolled, 38 were excluded from analysis for following reasons: allocated a triage code other than category 2; enrolment outside the hours specified in the study protocol; or insufficient data to identify the patient. Of the remaining 962 eligible patients, 318 were allocated to arm 1, 337 to arm 2, and 307 to arm 3. For the primary outcome measure, overall 62.6% of patients were seen within 10 minutes (table 1). Of those patients allocated to arm 1, 67.0% were seen within 10 minutes, compared with 63.2% in arm 2 and 57.3% in arm 3. This difference between the groups was statistically significant (χ^2 6.30, p = 0.043). Table 2 demonstrates that there was no significant difference between the groups in terms of likely confounding factors influencing time to be seen by a doctor.

We then used the patient being seen by a doctor as the defined event to plot Kaplan–Meier curves (fig 1). The survival curves showed that the three groups were significantly different with arm 1 being the superior allocation method (log rank 7.79, df = 2, p = 0.020). On the basis of these plots, it took 15 minutes for the threshold 80% of patients to be seen in arm 1, 17 minutes in arm 2, and 18 minutes in arm 3.

DISCUSSION

This study demonstrates that announcing the patient by microphone resulted in a significantly higher proportion of ATS category 2 patients being seen within the benchmark 10 minutes compared with the other two methods of announcing patients (telephone and computer notification). The reasons for this are speculative. It is possible that a larger number of medical staff come to know of the patient's

Table 2 Clinical and demographic characteristics of the patients in the three study arms

	Arm 1 (microphone)	Arm 2 (telephone)	Arm 3 (computer)	χ^2
Patient age group (years)				
0–19	83	94	72	8.18
20–39	50	62	49	df = 8
40–59	60	65	67	p = 0.416
60–79	77	81	68	
80+	48	35	51	
Area triaged to in ED				
Resuscitation	12	14	12	5.79
Acute care	183	190	185	df = 8
Subacute care	43	48	42	p = 0.671
Paediatrics	73	83	61	
Waiting room	7	2	7	
Sex				
Female	135	135	132	0.66
Male	183	202	175	df = 2
				p = 0.720
Seniority of doctor seeing patient				
JMO*	128	127	125	5.62
Registrar	148	143	133	df = 4
Consultant	42	67	49	p = 0.229

*Intern, resident medical officer, career medical officer.

Figure 1 Kaplan–Meier curves of the three study arms.

presence in the department by this method. In addition, there is evidence that clinicians respond more quickly to auditory rather than visual cues in critical patient monitoring,^{5,6} and placing a patient on a computer system relies on the vigilance of medical staff checking the system frequently for the arrival of an emergent case.

Although our results are statistically significant, their clinical significance is open to interpretation and should be treated with caution. On the one hand, ATS category 2 represents a time critical cohort of patients and even a few minutes difference in the time to be seen by a doctor may be clinically consequential. In addition, the microphone announcement has other advantages of simultaneously notifying all staff, medical and nursing, of an unwell patient in the ED. Microphone announcement may also be the most convenient method for the triage nurse. We incorporated the time it took for the nurse to enrol and allocate the patient in the outcome measure for this trial, but did not separately measure this triage component or compare it between the three arms. It is possible that some of the improved times with microphone are due to how quick that method is for the triage nurse compared with the other two, rather than the fact that more medical staff are notified by this method. For example it may take a nurse several attempts to get through to a consultant by telephone.

On the other hand, no method in the study approached the threshold benchmark of 80%, and it is an inherent assumption of these benchmarks that they represent minimum standards, and patients should be ideally seen well within the 10 minute time frame.² Furthermore, it will be possible to detect small differences with a large enough sample size but these may not be clinically consequential and distract clinicians from implementing strategies that may have a greater impact on waiting times. Therefore, although we contend that these results are of clinical consequence for the reasons outlined, and that a microphone system at triage is relatively easy to implement, other strategies clearly need to be considered in conjunction with the use of a microphone announcement system to minimise delay to treatment for emergent patients.

Several studies have addressed factors influencing ED patient waiting times, but we did not find any studies specifically regarding ATS category 2 patients. A study on waiting times in California EDs demonstrated that lower ratios of physicians and triage nurses to waiting room patients were associated with longer waiting times. Waiting times were also notably longer at hospitals in less affluent areas.⁷ Another US study showed considerable decreases in waiting times for urgent care and waiting room patients following multiple changes in ED practices.⁸ These included: a brief triage assessment; improved physician, nurse, and radiology staff to patient ratios; electronic ordering of radiology and laboratory investigations; and giving first priority to ED laboratory tests over other areas in the hospital. There is also evidence that reduced access block decreases waiting times for patients. A study from the ED of the Royal Adelaide Hospital showed that decreased inpatient bed occupancy by 5.9% resulted in a 37% decrease in overall waiting times for ATS category 2–5 patients. For category 2 patients waiting time was reduced by 45%.⁹ A study of a rapid assessment clinic in a New Zealand ED found no difference in waiting times for ATS category 2 or 3 patients but improvements in ATS category 4 and 5.¹⁰ Hence it appears that a combination of factors including improved methods of alerting medical staff to an ATS category 2 patient, improved staff to patient ratios, reduced access block and more efficient processing of investigations will maximise the number of category 2 patients seen within the benchmark.

Interestingly the figures for all arms were worse than the mean waiting times for the pre-study period. For the 12 months prior to the commencement of the study 69% of patients were seen within 10 minutes, and no arm of the study achieved this result. As mentioned, it is possible that the conduct of the trial has in itself contributed to additional delay for the patients enrolled; this was an unanticipated finding. Possible confounding factors influencing time to be seen by a doctor appear to have been evenly distributed amongst the three study groups and these results were not likely to be influenced by confounding. Although not statistically significant, the proportion of patients seen by a consultant was highest in arm 2 of the study, which complements the theory that the microphone announcement notifies more medical staff of the arrival of the patient. Clinical outcomes were beyond the scope of this study, and we have assumed that timeliness of clinical care improves

outcome in a time critical group, but it would be worthwhile conducting another trial and examining whether there were any differences in clinical outcomes among the groups.

Limitations of the our study

Any single centre trial with randomisation conducted on site raises the possibility of selection bias.¹¹ Allocation concealment is thought to have a stronger influence on the reduction of bias than blinding, and the method of allocation concealment we used should have been adequate to protect against selection bias.^{12–13} By the nature of the trial it was not possible to blind staff treating the patient to the allocation arm.

CONCLUSION

Microphone announcement of triage category 2 patients is superior to other notification methods. This should be incorporated with other strategies to maximise the proportion of these patients seen in a timely manner.

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