Study of early warning of accident and emergency departments by ambulance services

J F Harrison, M W Cooke

Abstract

***Objective*—To determine the warning time given to accident and emergency (A&E) departments by the ambulance service before arrival of a critically ill or injured patient. To determine if this could be increased by ambulance personnel alerting within five minutes of arrival at scene.**

***Methods*—Use of computerised ambulance control room data to find key times in process of attending a critically ill or injured patient. Modelling was undertaken with a scenario of the first responder alerting the A&E department five minutes after arrival on scene.**

***Results*—The average alert warning time was 7 min (range 1–15 min). Mean time on scene was 22 min (range 4–59 min). In trauma patients alone, the average alert time was 7 min, range 2–15 min, with an average on scene time of 23 min, range 4–53 min. There was a potential earlier alert time averaging 25 min (SD 18.6, range 2–59 min) if the alert call was made five minutes after arrival on scene.**

***Conclusions*—A&E departments could be alerted much earlier by the ambulance service. This would allow staff to be assembled and preparations to be made. Disadvantages may be an increased "alert rate" and wastage of staff time while waiting the ambulance arrival.**

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Keywords: trauma team; ambulance; communication; pre-hospital care

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Early warning of an accident and emergency (A&E) department of the imminent arrival of critical cases (an "alert") by the ambulance service allows A&E departments to prepare. In a well equipped resuscitation room, preparation of the equipment should only take a few minutes. Assembly of the personnel may take longer. Depending on the hospital this may involve calling staff from other parts of the hospital (for example cardiac arrest team, trauma team, or paediatrician) or calling staff from home. Adequate warning is therefore vital. An increase in warning time would allow such preparations to be more thorough.

The aim of this study was to determine the current length of warning given by the ambulance service, the accuracy of this estimated time, and whether this could be increased.

Method

The ambulance control room records of a large metropolitan ambulance service were analysed for seven consecutive days for all cases resulting in an "alert" of the hospital by the ambulance service. This was achieved by a search of the computerised system for "alert" either as a complete word or embedded in a word. The times from the control room records that were entered into a spreadsheet for analysis were: time of 999 call, the attendance time for the first responder arriving on scene, time of transporting ambulance leaving scene, time of arrival at hospital, and time of ambulance alert call. All but the last time are recorded as part of the automated vehicle tracking system by push button control in the ambulance cab. The alert time is recorded in an automatically time stamped radio message transcript. All timings were taken to the nearest minute. The

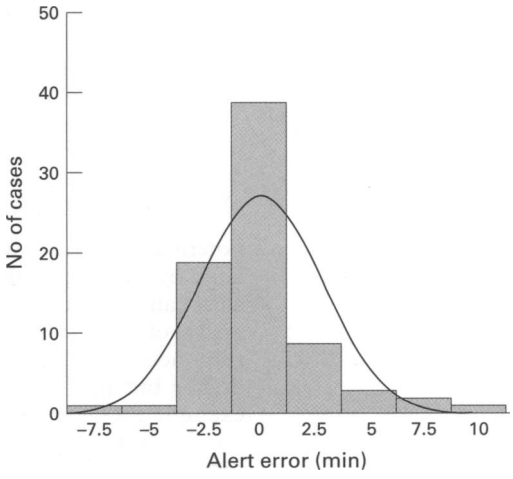

Figure 1 Error in alert estimation times (mean (SD) 0.0 (2.72); n = 75).

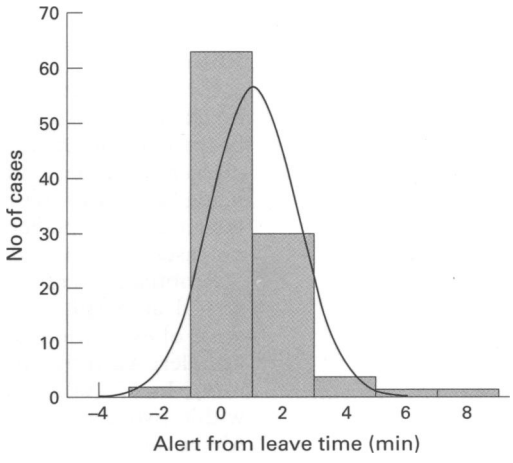

Figure 2 Time after leaving scene that alert issued (mean (SD) 1.0 (1.42); n = 101).

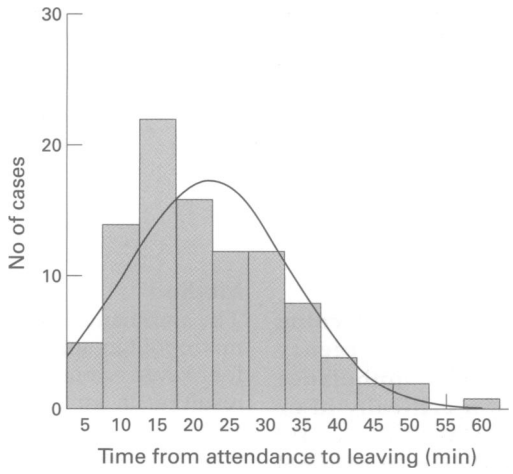

Figure 3 Time crew on scene (mean (SD) 21.9 (11.19); n = 98).

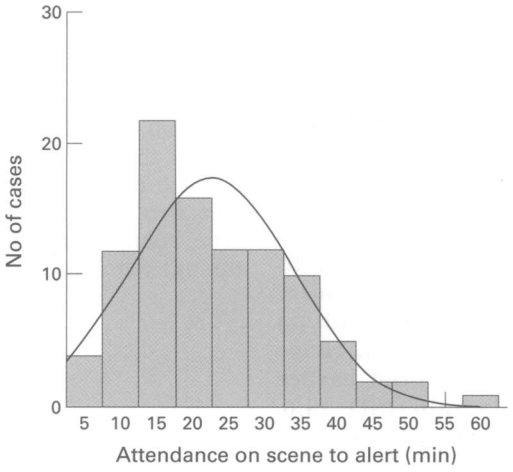

Figure 4 Time from attendance on scene to alert (mean (SD) 22.9 (11.08); n = 98).

potential increase in warning time was extrapolated by calculating the potential timing of the alert call if it had been made five minutes after arrival of the first responder on scene. This first responder is a trained ambulance person or doctor but may not be in an ambulance, for example they may be in a fast response car or on a motorcycle. Because trauma cases often require a more extensive and multidisciplinary team on arrival at hospital, a group of four consecutive weeks' trauma alerts were similarly analysed.

Results

A total of 104 cases were analysed; there were no exclusions. An alert call should be recorded in the control record at both the time of radio message and on confirmation of the message being relayed to the hospital. In all cases both instances were detected, hence we believe that no cases were missed during the study period.

Ambulance crews estimated their time of arrival at hospital correctly in 40 cases. The error of estimation is shown in fig 1. The average alert warning time was 7 min (range 1–15 min). In 62 (60%) cases, the alert was made within two minutes of leaving the scene (fig 2). Mean time on scene was 22 min (range 4–59 min; fig 3). If the alert call had been made within five minutes of the arrival of the first responder on scene, the A&E department would have been alerted 18 min (range −1 to +53 min) earlier. The range of actual alert times is demonstrated in fig 4.

In an overlapping one month study there were 34 trauma cases resulting in an alert. This included all cases in the study time period including those involving entrapment. The average alert time was 7 min (range 2–15 min) with a mean on scene time of 23 min (range 4–53 min). There was a potential earlier alert time averaging 25 min (range 2–59 min).

Discussion and conclusion

Time to definitive intervention has been shown to be important in several scenarios—for example myocardial infarction[1] and trauma.[2] Two studies have recently shown an absence of pre-hospital interventions in trauma patients, implying that the definitive intervention occurs at hospital.[3 4] Process re-engineering simplifies and minimises transactions to improve efficiency. But if a transaction is unavoidable, for example handover from ambulance to hospital, it should create minimal delay and error.

This study shows that ambulance crews make an accurate assessment of the length of the journey time to hospital, despite the unpredictable potential variations in inner city traffic flows. Variation may be greater in rural ambulance services where transit times are much greater. All crews in the ambulance service studied carry hand held radios enabling them to communicate with their control while away from their vehicles. The A&E department preparation time could be increased by a mean of 18 minutes for all alerts and 25 minutes for trauma cases.

Preparation time involves assembling the team, preparing equipment, and briefing individuals to their roles. The latter two can easily be achieved in the present average of 7 minutes warning. If staff are outside the A&E department it may be difficult to assemble them within this time. Even staff on call from home should be able to arrive in the department within 20 minutes (most on call staff are obliged to live within 10 miles of the hospital). Resident senior cover in the A&E department is widely debated.[5] If staff can reliably arrive in the department before the patient it may not be necessary. At times when a department is busy or overcrowded, extra warning would allow patients to be cleared from the A&E department and allow those waiting to be informed of the potential increase in waiting time. The broad distribution of alert times and potential improvements do however mean that many alert cases would still arrive with less than 10 minutes warning (13.4% in this study). It is our experience that many paediatric emergencies and those with penetrating trauma often self present rather than call an ambulance. Hassan recorded that two of 43 paediatric cardiac arrests were brought to A&E by the parents.[6] Figures from City Hospital, Birmingham demonstrate that at least 23% of those requiring attention within 10 minutes arrive unannounced by non-ambulance transport.[7] Reliance on an early warning system based on

the ambulance service could therefore prolong the medical response time within hospital for those self presenting.

Another disadvantage of increased alert warning times is the potential inefficient use of staff. If staff respond to an alert call by immediately assembling in the appropriate resuscitation area regardless of the length of the alert time then they may stand around, doing nothing other than waiting, for longer periods. Seriously ill patients already in the department may have treatment delayed longer as a consequence.

A system of early alerting may increase the pressure on ambulance personnel and result in an increased number of inappropriate alerts or false positives. They may issue alerts before they have had adequate time to assess their patients. Conversely it may mean that there is a more thorough assessment undertaken at an earlier stage; this may be particularly true in a multiple casualty situation.

We propose that a trial of earlier warning should be undertaken to determine actual benefit and disadvantages. Early warning may be of help to the A&E department but departments should not be reliant on this information.

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