

PREHOSPITAL CARE

Emergency (999) calls to the ambulance service that do not result in the patient being transported to hospital: an epidemiological study

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Objective: To describe the demographic and clinical characteristics of patients who are not transported to hospital after an emergency (999) call to the East Midlands Ambulance Service, the reason for non-transportation, and the priority assigned when the ambulance is dispatched.

Methods: The first 500 consecutive non-transported patients from 1 March 2000 were identified from the ambulance service command and control data. Epidemiological and clinical data were then obtained from the patient report form completed by the attending ambulance crew and compared with the initial priority dispatch (AMPDS) code that determined the urgency of the ambulance response.

Results: Data were obtained for 498 patients. Twenty six per cent of these calls were assigned an AMPDS delta code (the most urgent category) at the time the call was received. Falls accounted for 34% of all non-transported calls. This group of patients were predominantly elderly people (over 70 years old) and the majority (89%) were identified as less urgent (coded AMPDS alpha or bravo) at telephone triage. The mean time that an ambulance was committed to each non-transported call was 34 minutes.

Conclusions: This study shows that falls in elderly people account for a significant proportion of non-transported 999 calls and are often assigned a low priority when the call is first received. There could be major gains if some of these patients could be triaged to an alternative response, both in terms of increasing the ability of the ambulance service to respond faster to clinically more urgent calls and improving the cost effectiveness of the health service. The AMPDS priority dispatch system has been shown to be sensitive but this study suggests that its specificity may be poor, resulting in rapid responses to relatively minor problems. More research is required to determine whether AMPDS prioritisation can reliably and safely identify 999 calls where an alternative to an emergency ambulance would be a more appropriate response.

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Each year, in the UK, a large number of emergency (999) calls received by ambulance services do not result in a patient being transported to hospital. These calls have implications both in terms of how rapidly an ambulance can respond to other emergencies and the efficiency of service delivery.¹ To date, little has been published on this group of 999 calls.

Chen *et al*² in Taiwan reported that 32% of all ambulances dispatched led to no patient being transported. In the United States, Hipskind *et al*³ found 30% of ambulance responses resulted in the patient refusing transportation. These patients were commonly asymptomatic, 11-40 years old and involved in motor vehicle accidents. However, this study did not investigate calls where the ambulance crew decided not to transport the patient and differences in the organisation and delivery of emergency health care may limit the relevance of such findings in the UK.

Currently, in England and Wales, 17% of patients are not conveyed to hospital after an emergency ambulance has attended a 999 call.⁴ Ambulance services are not required to transport all patients to an accident and emergency department⁵ and the Department of Health has now permitted careful piloting and evaluation of alternative ways of responding to the least serious (category C) emergency calls.⁶ While this has resulted in considerable interest in implementing service developments, a recent survey of ambulance services in the UK found that only two had carried out an audit of non-transported calls.⁷

Several studies have investigated the inappropriate use of the emergency ambulance service in the UK and provided

estimates ranging from 16% to 52%.⁸⁻¹¹ Victor *et al*⁸ recently studied one week's calls to the London Ambulance Service and reported that while the majority of calls required a 999 response, 40% could have been dealt with by primary care, psychiatric services, or social services. Non-transported calls (20%) were not identified as a separate category in this research, but it might be anticipated that a significant proportion did not need an emergency ambulance response.

Priority based dispatch systems have been introduced by nearly all ambulance services in the UK and are designed to match the urgency of the ambulance response to the clinical needs of the patient. The Advanced Medical Priority Dispatch System (AMPDS)¹² uses structured protocols and systematic questioning of the 999 caller to assign a series of alpha-numeric codes and is currently used by over 75% of ambulance services. It divides calls into specific categories according to priority, with delta codes representing the most urgent conditions and alpha codes the least serious. Department of Health national response time standards require ambulance services to respond to life threatening, category A calls within eight minutes¹³ and a set of AMPDS codes that necessitate this eight minute response time have been determined by the Department of Health.

In this study we describe, for the first time in the UK, the epidemiology of the group of patients who were not transported to hospital after an emergency (999) call, the priority assigned at that time, and the reasons for non-transportation.

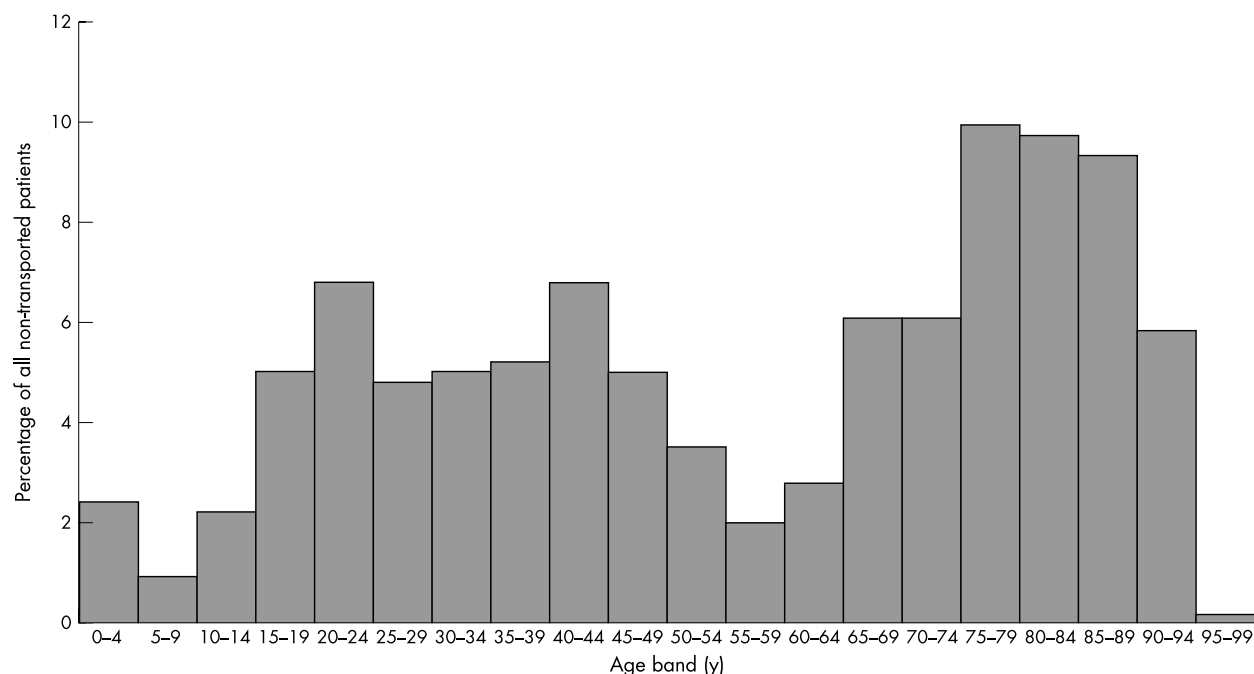


Figure 1 Age distribution of all non-transported patients.

METHODS

Non-transported cases were defined as those cases where a 999 call was made, an ambulance from any one of the 12 East Midlands ambulance stations in Nottinghamshire attended the scene, but the patient was not conveyed to hospital. Cases where the patient was dead before the arrival of the ambulance and those where the call was malicious were excluded. The computer databases that hold both the Command and Control data and information scanned routinely from patient report forms completed by the ambulance crew¹⁴ were searched to find the first 500 non-transported cases starting from 1 March 2000. The sample size was determined to provide 95% confidence limits of $\pm 5\%$ for each variable with an allowance made for missing data. The patient report forms for these cases were further examined by manual inspection and data entered on a database using Microsoft Access 97. Clinical categories were attributed to each case after examination of the free text description of the incident recorded on the patient report form. Each case was categorised by three researchers (OA, TD, and PM) using a system devised by the authors. Where there was disagreement about categorisation the case was discussed and a consensus reached.

Data collected comprised age, sex, type of residence, the initial AMPDS code assigned by control, category A status, clinical category, whether patient had been drinking alcohol, and the reason the patient was not transported to hospital. The time each ambulance was committed was calculated from the ambulance control records. This was taken as the interval between the call being passed to the ambulance crew and the time when they became available to respond to another call.

Proportions, means, medians, and 95% confidence intervals were calculated using SPSS for Windows version 9.0.

RESULTS

Of the 500 cases where data were extracted from the patient report forms, two were excluded because they were the result of malicious calls, leaving 498 cases. The age distribution (fig 1) shows a distinct bimodal distribution with peaks in early adulthood and between the ages of 65 and 90 years. Men accounted for 46% of the cases studied.

Table 1 Clinical categories of non-transported patients

Category	Number (%)
Road traffic accident	39 (8)
Falls	170 (34)
Other accident/injury	22 (4)
Assault	10 (2)
Cardiac	4 (1)
Respiratory	10 (2)
Epilepsy	15 (3)
Diabetes	26 (5)
Gastrointestinal	7 (1)
Neurological	1 (0)
Obstetrics and gynaecology	4 (1)
Musculoskeletal	10 (2)
Psychiatric (non self harm)	30 (6)
Self harm (including overdose)	14 (3)
General assistance	24 (5)
Non-specific illness	51 (10)
Intoxication	30 (6)
Insufficient to categorise	30 (6)
Total	497 (100)

Table 1 shows the clinical categories. Falls account for over a third of all non-transported calls and non-specific illnesses for one in ten. Alcohol intoxication was the primary diagnosis in 30 (6%) cases, and a further 18 (4%) were linked to alcohol.

Table 2 shows the reasons for non-transportation. In almost half the cases the reason is recorded as a refusal to travel, in a quarter no injuries were found, and in 13% a visit by the patient's general practitioner was arranged. Falls was the commonest clinical category for both the refusal to travel (30%) and no injuries (55%) groups, whilst general assistance (23%) was the largest category where the reason for non-conveyance was that a GP visit had been arranged.

AMPDS codes were available for 418 (84%) cases. Of those with codes available 108 (26%) were AMPDS code delta (the

Table 2 Reason for non-transportation given by ambulance crew

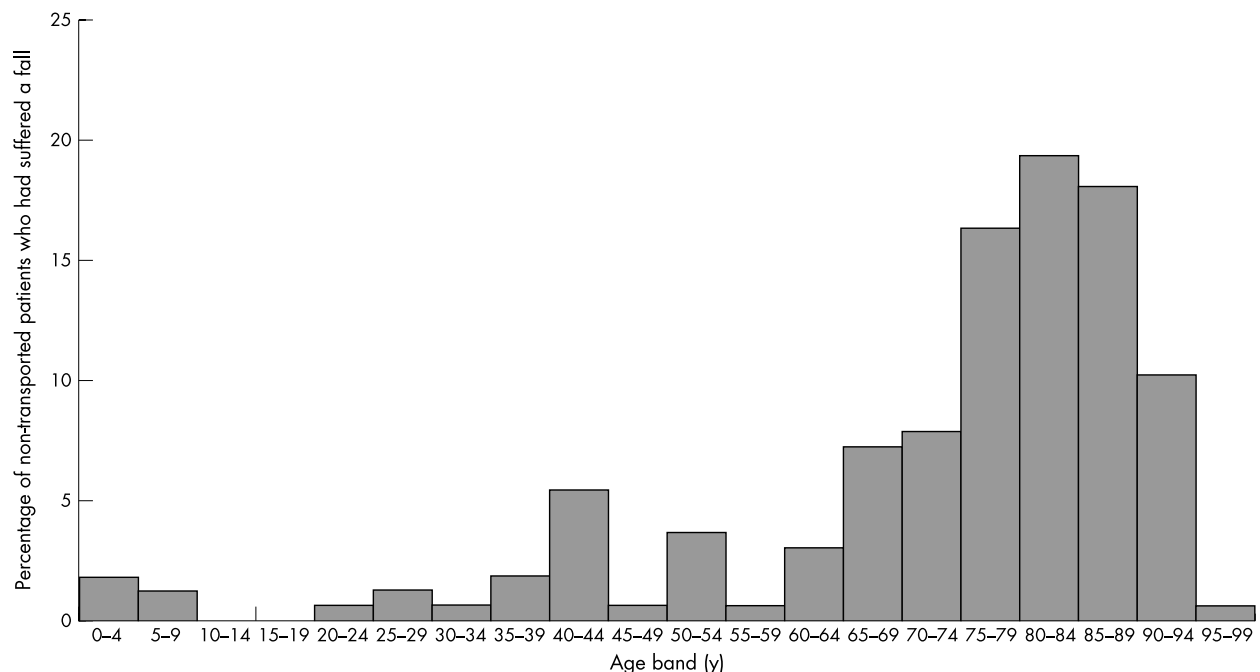
Reason for non-transportation	Number (%)
Refused to travel	232 (47)
No injuries	123 (25)
By own means	1 (0)
Patient absconded	5 (1)
Doctor to visit	56 (13)
False alarm good intent	3 (1)
Police dealing	10 (2)
Doctor released crew	2 (1)
Put back in bed/chair	9 (2)
Other	2 (1)
Total	443 (100)

most urgent code) and 93 (22%) were from AMPDS codes that constitute category A calls. For all clinical categories there was close agreement between AMPDS code delta and category A classifications, except for road traffic accidents where of the 28 cases where AMPDS codes were available 13 were classified as AMPDS code delta (46%, 95% CI 30% to 64%) and only 1 as category A (4%, 95%CI 1% to 18%).

The mean time the ambulance was committed was 34 minutes and the median 33 minutes (standard deviation 17 minutes, interquartile range 24–43 minutes).

Falls

Falls accounted for 170 (34%) of the non-transported calls. The mean age of non-transported cases presenting with falls was 73 years (median 79 years, SD 20, interquartile range 68–86 years). The age distribution is shown in figure 2. Ninety two (59%) were female, 50 (33%) lived alone, and four (2%) lived in a nursing or residential home. Ten (6%) were linked to alcohol. Fifteen (10%) of fallers were classified as AMPDS code delta and 15 (10%) were category A while 89% of those aged over 70 were AMPDS code alpha or bravo.

**Figure 2** Age distribution of non-transported patients who had suffered a fall.

DISCUSSION

This is the first UK study to describe the epidemiology of non-transported 999 calls and link these data to the AMPDS code used to determine the priority of the ambulance service response. However, there are a number of limitations in the study design.

There was no independent validation of the clinical assessment made by the ambulance crew nor did this study follow up non-transported patients to establish the clinical outcome after the ambulance left the scene. In addition, few AMPDS codes were recorded by the crews after they had attended the patient so no comparison could be made with the initial code assigned by the call taker. Therefore, it was not possible to confirm from our data whether the decision not to transfer the patient to hospital was appropriate or to analyse whether the urgency assigned to the call by AMPDS was justified by the clinical need.

Clinical data on the nature of the incident could not be easily extracted from the routine computer database. Therefore the authors had to develop their own coding system to categorise the free text description of the incident on the patient report form and this limited comparisons between our survey and other published research. Manual inspection also introduced possible observer error into the study findings but this was minimised by three of the authors independently categorising each call.

The distinctive bimodal age distribution found in this study for non-transported calls is similar to a previous UK epidemiological survey of all 999 calls that also reported the highest prevalence of callers aged 15–39 and over 60.⁸ The largest clinical category was falls constituting over a third of the non-transported 999 calls in our series. However, accidents and other trauma have consistently been identified as the largest single reason for all 999 calls in previous UK studies.^{8–11} This finding suggests that falls are more likely than other problems to result in non-transportation of 999 calls to hospital.

The finding that a large number of elderly people with falls were assigned low priority when the calls were received and subsequently not transported to hospital suggests that an alternative response may be appropriate. However, there is a

need for caution, as the fact that some patients were left at home does not necessarily mean that this was the appropriate patient management. One study in the US¹⁵ found that between 3% and 11% of patients determined on scene not to need an ambulance had a critical event. A further US study¹⁶ found that 48% of patients who refused medical assistance from an ambulance crew sought further medical care within a week, with 7% being admitted to hospital. The current study found that falls was the commonest clinical group in those who were not transported because of a refusal to travel, but was unable to determine whether the opinion of the crew may have been a factor in the patient's decision to remain at home.

Previous research into the safety and reliability of the AMPDS priority dispatch system has reported its high sensitivity and the low risk of serious under prioritisation of emergency 999 calls.¹⁷ The current study has found that 26% of all non-transported calls are assigned the highest (delta) code when the ambulance is dispatched. This suggests this system may have a relatively low specificity for identifying life threatening calls but the factors associated with possible over prioritisation using AMPDS have not been explored. Furthermore, we were unable to evaluate other possible explanations for the unexpectedly high proportion of non-transported calls being assigned the highest priority AMPDS code. These might have included correctly prioritised life threatening conditions that could be effectively managed by the crew at the scene without hospital care (such as diabetic hypoglycaemia), a failure of ambulance crews in some cases to adequately assess a serious condition that did require hospital transfer and, finally, an improvement in the patients clinical status between the call being made and the arrival of the vehicle.

The demand for the emergency ambulance service in the UK has been rising steadily⁴ and attention has become increasingly focused on the management of less serious, non-life threatening category C calls. In 2000 there were 10 158 non-transported calls in Nottinghamshire, committing ambulances for almost 6000 hours. There are potentially major gains if some of these calls could be safely triaged by AMPDS to an alternative response, both in terms of increasing the ability of the ambulance service to respond more effectively to clinically urgent 999 calls and cost savings for the health service. Further research is needed to explore whether a group of non-transported 999 calls can be identified at the time the call is received and more appropriately managed without the dispatch of an emergency ambulance.

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Contributors

Peter Marks participated in the study design, data documentation, statistical analysis and interpretation of the findings and contributed to the writing of the paper. Tim Daniel initiated the study, participated in the study design, data documentation and interpretation of the

findings and contributed to writing the paper. Ola Afolabi participated in the design and execution of the study, particularly data collection, and edited the paper. Gary Spiers contributed to the design and execution of the study, particularly collection and interpretation of data, and edited the paper. Jonathan Van-Tam initiated the study, discussed core ideas, contributed to the study design and interpretation of findings and edited the paper.

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