Hearing half the message? A re-audit of the care of patients with acute asthma by emergency ambulance crews in London

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Problem: An initial audit of the care provided to emergency asthma patients by the ambulance service was carried out in 1996. Some under-recognition and under-treatment of severe asthma was found as well as a lack of documentation of patient condition on scene. A re-audit was undertaken in 1999.

Design: A multidisciplinary advisory group was reconvened. The same method was adopted as for the first audit. Patients included were those administered nebulised salbutamol by crews in the catchment areas of four hospitals and those diagnosed with asthma at the Accident & Emergency (A&E) departments of those hospitals between January and March 1999.


Key measures for improvement: (1) Accuracy of diagnosis and appropriateness of treatment, and (2) adherence to protocol.

Strategies for change: Following the first audit, treatment protocols were widened and brought into line with the British Thoracic Society guidelines for care of acute asthma patients. The results were widely disseminated within the service and training was initiated for all operational staff.

Effects of change: The number of patients included in the re-audit more than doubled (audit 1: n = 252, audit 2: n = 532). The increase occurred exclusively in those administered nebulised salbutamol by ambulance crews but diagnosed with conditions other than asthma in A&E (audit 1: n = 15, audit 2: n = 161). The proportion of patients diagnosed with asthma in A&E who were administered nebulised salbutamol by their attending crew rose from 58% to 75%. However, 43 asthma patients were not treated; several of these were not recognised as suffering from asthma and others fell within the changed protocols for treatment. Adherence to protocol for administration of salbutamol remained high. Pre-hospital documentation of key observations did not improve.

Lessons learnt: Messages from the first audit seem to have been acted upon selectively. Implementing change is complex, and re-audit is necessary to understand the effects of the changes made.

The new treatment protocols were distributed individually to all frontline staff and the audit findings were publicised widely throughout the Trust through newsletters and posters at ambulance stations. Members of the audit team presented the findings to trainers who incorporated a 2 hour session on the care of patients with acute asthma in the post-proficiency training that all crews undertook during the following year. The results of the first audit were presented at national conferences and published in an academic journal to increase the dissemination of findings.

OUTLINE OF PROBLEM
The aim of implementing these findings was to achieve change in practice that would improve the quality of care given to acute asthmatic patients in the pre-hospital environment. The difficulties of achieving change in practice based on audit or research findings are well documented, and a common criticism of audit projects is that all stages of the audit cycle are rarely completed.

This re-audit in 1999 sought to measure the effects of the changes made on patient care.

KEY MEASURES FOR IMPROVEMENT
The objectives of the re-audit focused on areas of concern from the original audit: (1) to assess the accuracy of diagnosis and the appropriateness of treatment of patients...
with acute asthma by LAS crews; and (2) to assess adherence to protocol by LAS personnel when administering nebulised salbutamol.

**STRATEGIES FOR CHANGE**

An Asthma Audit Advisory Group (AAAG) was reconvened, including frontline ambulance personnel and training staff, Accident and Emergency (A&E) consultants, an asthma specialist nurse, a lay person, a GP, respiratory physicians, and clinical audit staff.

The methods were as similar as possible to the first audit so that results could be compared and the impact of the changes made assessed. The audit was retrospective with patients included between 1 January and 31 March 1999, the same period of the year as in the first audit.

**Patient identification**

Inclusion criteria were identical to the first audit. Ambulance service and A&E records were retrieved for those who were either (1) administered nebulised salbutamol by attending crew in the catchment area of four participating A&E departments (one A&E department that had closed was replaced with a nearby department of a similar size) or (2) diagnosed with asthma in one of the participating A&E departments following conveyance by emergency ambulance.

Data were gathered for patients included in the audit from a manual check of patient report forms (PRFs) filled out by crews for each patient attended during the study period and from routine electronic A&E records supplemented with manually retrieved A&E cards where necessary.

**Power of study**

In the first audit, 58% of ambulance transported patients diagnosed with asthma in A&E were treated with nebulised salbutamol by their attending crew. In order to have a 90% chance of detecting an increase in salbutamol administration in this group of 25% at the 5% level of significance, the sample size required for the re-audit was 227.

**Analysis of data**

Statistical Package for Social Scientists (SPSS) for Windows was used for quantitative analysis. Descriptive data are presented with comparisons with the first audit where appropriate.

**OUTCOMES**

Of the 489 patients administered nebulised salbutamol by their ambulance crew, in 64 cases their A&E records were missing and in 108 no diagnosis was recorded in A&E. The number of patients included in the audit more than doubled (audit 1: n = 252, audit 2: n = 532), with increased numbers at each hospital as well as in those not conveyed to A&E.

**Objective 1: Accuracy of diagnosis and appropriateness of treatment of acute asthma by ambulance staff**

Patients diagnosed with asthma in A&E

For those who were diagnosed with asthma in A&E, the proportion of patients for whom nebulised salbutamol had been administered by their attending crew had risen from 58.2% (110/189) in the first audit to 75.2% (131/174) in the re-audit (95% CI of difference 16.5% to 17.5%; table 2).

The PRFs of the 43 patients diagnosed with asthma in A&E but not administered pre-hospital salbutamol were reviewed (table 3). In 25 cases no reason for not administering...
nebulised salbutamol was documented, nine gave a reason that should have been eliminated by the change in treatment protocols, and for seven patients the crew member had recorded that symptoms were mild. Pre-hospital vital signs were not consistently recorded for these patients and 20 were not recorded as having been administered oxygen, although 33 received nebulised bronchodilators in A&E and a quarter of this group were admitted to hospital from A&E.

Patients administered nebulised salbutamol by their attending crew
Only 131 patients (26.8%) given nebulised salbutamol by their attending crew received a diagnosis of asthma in A&E, with 32.9% (n = 161) receiving a diagnosis other than asthma, a much higher proportion than the 8.7% (n = 15) in audit 1 (χ² = 67.3, df 1, p = 0.000). Seventeen of the patients with diagnoses other than asthma in the re-audit gave cause for concern due to their condition at A&E—namely, those who were drowsy on arrival (n = 6), admitted to ICU/CCU (n = 5), or died (n = 2).

Objective 2: Adherence to protocol
Adherence to protocol for administration of salbutamol was high (n = 390, 81.6%, table 4), although lower than in audit 1 (95.9%). In most cases of non-compliance the patient was administered a lower initial dosage than now indicated in the protocol. Pre-hospital documentation of key observations showed a mixed picture, but did not improve overall (table 5).

LESSONS LEARNT
Summary of effects of change
The proportion of patients diagnosed with asthma in A&E who were given salbutamol by their attending crew (sensitivity) had risen substantially since the first audit. The number of patients administered nebulised salbutamol had more than doubled. However, the proportion of these patients diagnosed with asthma in A&E had fallen significantly, with a very large increase in patients diagnosed with chronic obstructive pulmonary disease (COPD). Adherence to the treatment protocol when salbutamol was given was high in terms of drug dosage levels, although documentation of key patient observations remained low.

Study limitations
In this study we used the asthma diagnosis in the A&E as the “gold standard” against which to compare pre-hospital treatment. Although deficiencies in A&E care meant this was not a perfect measure, this was judged by the AAAG to be the best standard available, and certainly preferable to confining data collection to ambulance service records only. However, the level of missing data from the participating A&E departments was high in both audits.

The design of this audit as a “before and after” study with no concurrent control means that any changes seen may not be attributable to the changes in protocol and associated
training. Other factors such as changes in recording practices could account for the differences found. While it is possible that these factors may have affected the audit findings, we have no evidence of any changes during the period of the study that indicate this to be the case.

**Implications for the service**

These findings were unanticipated and showed that crews responded to changes in the treatment protocol but were less receptive to other messages. Practice changed between the two audits, with a large increase seen in the numbers of people administered nebulised salbutamol and a reduction in the proportion of cases missed. This represents an improvement in the care of patients with acute asthma who call 999. It did also result in a large increase in the number of patients with COPD being administered nebulised salbutamol, an important treatment for this condition but carrying a small risk of carbon dioxide retention as a result of the high flow oxygen used to drive the nebulisers used in pre-hospital care. Certainly, a small number of patients arrived in A&E with a reduced level of consciousness, but whether this was a result of the primary problem or its treatment requires further investigation. The view of the clinical advisors to the study was that overtreatment is less of a concern than undertreatment, and a subset of those who should have received salbutamol before arrival at the hospital still did not.

Published research, reinforced by the BTS guidelines for the care of acute asthma patients, stresses the need to take and record key observations in order to avoid missing cases of serious asthma.11 19 20 This message was highlighted in all training, educational, and dissemination materials. It did not appear to be heard, however, with documentation of key training, educational, and dissemination materials. It did not appear to be heard, however, with documentation of key observations remaining patchy. This suggests that protocols were applied somewhat indiscriminately, without appropriately linking clinical observations to practice.

Services implementing measures to improve the quality and safety of care provided by ambulance crews should not assume that revision of treatment protocols and provision of additional training will necessarily achieve the improvements sought.

**NEXT STEPS**

Concern about overtreatment using the oxygen driven nebuliser has prompted new research in this service. The need for clear documentation is to be re-emphasised and will be monitored through continuous audit based on clinical supervision and performance indicators.

This re-audit demonstrates the complexity of changing practice in this setting and reinforces the need to carry out audit in a continuous cycle as the effects of change can be quite unpredictable.

**ACKNOWLEDGEMENTS**

The authors thank the members of the Asthma Audit Advisory Group, participating crews, and the staff of A&E departments who helped in the retrieval of notes.

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The study was funded within the ambulance service.

Competing interests: none.

HS designed and led the project and completed the drafting of the paper. MH undertook analysis and wrote the first draft of the paper. YP undertook data collection, coordinated the study, and contributed to the drafting of the paper. HB acted as clinical advisor to the project and contributed to the drafting of the paper. FM provided clinical guidance to the study and contributed to the drafting of the paper.

Following advice, ethical approval was not formally sought for this audit which did not involve approaching patients.

**REFERENCES**


