**CHRONIC OBSTRUCTIVE PULMONARY DISEASE**

Evidence for a link between mortality in acute COPD and hospital type and resources

C M Roberts, S Barnes, D Lowe, M G Pearson, on behalf of the Clinical Effectiveness Evaluation Unit, Royal College of Physicians and the Audit Subcommittee of the British Thoracic Society

**Background:** The 1997 BTS/RCP national audit of acute care of chronic obstructive pulmonary disease (COPD) found wide variations in mortality between hospitals which were only partially explained by known audit indicators of outcome. It was hypothesised that some of the unexplained variation may result from differences in hospital type, organisation and resources. This pilot study examined the hypothesis as a factor to be included in a future national audit programme.

**Methods:** Thirty hospitals in England and Wales were randomly selected by geographical region and hospital type (teaching, large district general hospital (DGH), small DGH). Data on process and outcome of care (death and length of stay) were collected retrospectively at 90 days on all prospectively identified COPD admissions over an 8 week period. Each centre completed a questionnaire relating to organisation and resources available for the care of COPD patients.

**Results:** Eleven teaching hospitals, nine large DGHs, and 10 small DGHs provided data on 1274 cases. Mortality was high (14%) with wide variation between centres (IQR 9–19%). Small DGHs had a higher mortality (17.5%) than teaching hospitals (11.9%) and large DGHs (11.2%). When corrected for confounding factors, an excess of deaths in small DGHs was still observed (OR 1.56 (CI 1.04 to 2.35)) teaching hospitals. Analysis of resource and organisational factors suggested higher mortality was associated with fewer doctors (OR 1.5) and with fewer patients being under the care of a specialist physician (OR 1.8). Small DGHs had fewest resources.

**Conclusion:** Significant differences in mortality may exist between hospital types. The findings justify further study in a proposed national audit.

Acute exacerbations of chronic obstructive pulmonary disease (COPD) are responsible for more than 6% of all admissions and 10% of acute medical admissions in the UK and have a high mortality. The 1997 British Thoracic Society (BTS)/Royal College of Physicians (RCP) audit of acute hospital care of COPD showed a 90 day mortality of 14% and observed wide variation between hospitals. We hypothesised that some of the variability in outcome may be the result of hospital type and size, with organisation of care and available resources contributing to these differences. We examined this hypothesis by auditing the outcome of death at 90 days following acute admission for COPD in hospitals subdivided by type and size. The results of this study were to inform proposals for a future national audit programme for the UK.

**METHODS**

All acute hospitals in England and Wales were identified as eligible to participate. Teaching hospitals were classed separately with the sample selected at random. District general hospitals (DGHs) were classed as large (>600 beds) or small (<600 beds) according to Department of Health criteria, and were grouped into five regions with random sampling of large and small hospitals from each region. A refusal generated an invitation to the next hospital on the list until 30 hospitals were recruited. Each centre identified a consultant respiratory lead for the project. Cases of acute COPD (physician made diagnosis) admitted to hospital were identified prospectively over an 8 week period and data were collected retrospectively at 90 days following admission. The audit proforma included 23 process items suggested by previous audit as valuable or by the BTS guidelines as essential management interventions, and two outcome measures (death and length of stay). Deaths were recorded as in-hospital or after discharge. The accuracy of the data was checked by an external auditor, duplicating entries at 21 of the participating centres to give 293 cases in all. A separate questionnaire recorded details of available resources and organisation at each centre. Both sets of data were entered onto a modified access database (Microsoft Inc, Redmond, USA) and analysed centrally using SPSS Version 11 (SPSS (UK) Ltd, Woking, UK).

**Statistical methods**

The reliability of the data was checked by comparing the duplicate data using the Kappa statistic for which values of 0.60 and above represents “good” agreement between hospital and external auditors. Kappa statistics were 0.59 for performance status, 0.67 for the recording of blood urea, and 0.99 for blood gases on admission. Agreement on actual urea values was achieved for 90% of cases and on pH values for 95%. There was agreement on the date of death in all but four cases.

Binary logistic regression was used to compute odds ratios (ORs) and confidence intervals (CI) for mortality in small and large DGHs relative to teaching hospitals, corrected for the known important indicators of increased mortality, performance status, arterial blood pH, and blood urea.

*Available at www.rcplondon.ac.uk/college/ceeu/ceeu_copd_prev.htm/.
DISCUSSION

This pilot audit suggests that mortality may be lower in larger hospitals and that the organisation of care and resources available for that care could be important factors in such a difference in outcome. Previous studies of acute care of COPD have identified a number of patient factors that determine outcome. Hospitals cannot influence the severity of illness or debility of patients before admission, but can plan to manage patients after admission. The better survival in teaching and larger hospitals is in keeping with other recent studies from North America examining outcomes in other areas of medical practice. An assessment of overall mortality in UK hospitals concluded that better staffing levels were associated with better outcome. While these observations have been reported and suggestions made that resource issues are important determinants of outcome, little supportive evidence has been provided.

We acknowledge that there are limitations to this study. This was a pilot study that examined a small number of hospitals. Data collection in some hospitals may have been incomplete and some inaccuracies in retrospective audits are inevitable. However, when checked by the external auditor, the reproducibility of the data was reasonably good. Some centres contributed larger numbers to the study than others, thereby weighting the results. The level of analysis reflects the nature of this pilot and, within a national audit, a more detailed interrogation of within and between hospital variation within the data set will need to be undertaken. Notwithstanding these limitations, the data provided here show consistency and face validity.

Hospital type and size were related in this pilot, with fewer doctors allocated to medical care per 10 COPD admissions and less than 45% of patients allocated to care by specialist respiratory physicians. Availability of more doctors and specialist care were associated with better outcome. While these individual resources are not necessarily the reason for improved outcome, they are an indicator of the more complex organisational and resource issues that constitute a teaching hospital. Donabedian described the three linked components that audit should address—organisation of care, processes of care, and outcome—and suggested that good organisation leads to better process and then to better outcomes. The national audits of stroke care have shown that better organisation is linked to better process, and improving the “time to needle” for myocardial infarction thrombolysis is driving better organisation/resources for patients arriving at hospital and dramatic improvements have been achieved.

This pilot study suggests that some of the observed variance in mortality between hospitals may be due
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Authors’ affiliations
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REFERENCES

LUNG ALERT

Energy intake and weight are increased by antibiotics in children with cystic fibrosis

Anti-Pseudomonas antibiotics have previously been shown to improve nutritional status in patients with cystic fibrosis, although the exact mechanism for this is unclear. In this prospective study 16 children of mean age 12.1 years with cystic fibrosis and chronic Pseudomonas aeruginosa colonisation were studied during and after a pulmonary exacerbation. Before a 2 week course of home intravenous antibiotics, aspects of their energy intake and expenditure were measured and body composition analysed to derive fat and fat free masses. Energy intake was measured with detailed 1 week food records and was significantly decreased by 4.1% after antibiotic treatment.

The authors suggest that an increase in weight and energy intake following antibiotic treatment directly promotes physical activity in children with cystic fibrosis and that this may have beneficial effects on their lifestyles.

S D West
Specialist Registrar, Oxford Centre for Respiratory Medicine, Oxford, UK

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