Clinical decision-making and mechanical ventilation in patients with respiratory failure due to an exacerbation of COPD

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Abstract – This paper reports a study undertaken to determine whether differences exist in practice between respiratory physicians, general physicians and intensivists or between individual clinicians in initiating mechanical ventilation in respiratory failure due to chronic obstructive pulmonary disease (COPD), the factors influencing decision-making and their relation to the evidence base. Of 725 questionnaires sent to clinicians, 350 (48%) were completed and analysed. Twenty-five variables were included which clinicians scored 0–3 according to their perceived relevance in the decision. The sum of all the responses was calculated for each clinician: respiratory 15–68, general 12–65, intensivists 16–64. The most important variables in withholding ventilation were lung cancer inoperable due to COPD, and nursing home resident. The least important variables were treated depression and osteoporosis. No significant differences existed in practice between specialties but there were great differences between individuals' practices. Clinicians were influenced by similar factors, but these did not reflect documented poor outcome predictors. Guidelines are needed.

KEY WORDS: chronic obstructive pulmonary disease (COPD), decision-making, intensive care, ventilation

Chronic obstructive pulmonary disease (COPD) is progressive and has substantial morbidity and mortality. Declining lung function, acute exacerbations with respiratory compromise, and deteriorating quality of life characterise its course. Patients with exacerbations requiring mechanical ventilation have a hospital mortality of 11–82%.[1–6] Survivors often do not regain their previous function.[2,5] So the wisdom of instituting invasive ventilation in such circumstances can be finely balanced.

Some perceive that physicians and intensivists make such decisions differently, and certain specialties do consider life-sustaining treatment more readily than others.[7] Physicians behave variably in withholding treatment for different conditions with similarly poor prognosis – ventilatory support is offered more often for end-stage COPD than for cancer.[7]

Outcome predictors in patients requiring invasive ventilation should influence rational practice. Studies show variable prognostic factors[2–6] making it difficult to identify outcome predictors. The recurring independent variables found in more than one study to predict poor prognosis are low serum albumin,[2,4,6] significant comorbidities and high APACHE 11 scores.[3,5,6] (The Acute Physiology and Chronic Health Evaluation (APACHE) score is an index based on physiological variables in critically ill patients that correlates with survival.)

This study investigates the perceived and real differences in opinion between intensivists, respiratory and general physicians, the magnitude of variance between individual clinicians, and the comorbidities that most influence decision-making.

Method

A questionnaire was circulated by post to 600 consultants (200 respiratory physicians, 200 general physicians and 200 intensivists) selected randomly from databases for each specialty. It was also distributed at meetings to 125 medical specialist registrars on dual accreditation programmes. The study was conducted between March and June 2002 in the UK. The responses were anonymous. No follow-up letters could be sent because one cohort was distributed confidentially by a separate agency.

One section in the questionnaire included information regarding the specialty and grade of the clinician, the use of non-invasive ventilation in their hospital in intensive care units (ICUs) or high dependency units (HDUs) and the perceived disagreement between intensivists and physicians. The other section comprised 25 different demographic, respiratory (pertaining to COPD) and comorbidity variables including those related to evidence-based predictors of outcome in COPD[2–6,8] and in elderly patients

hospitalised with chronic disease.[9] The questionnaire was refined after a pilot study.

Responders scored the variables on a scale of 0–3 according to the perceived relevance of the variable in the decision to embark on a trial of ventilation: 0 indicated 'irrelevant'; 1 was 'of some importance, so that if accompanied by three other similarly important factors would contraindicate full ventilation'; 2 was 'of moderate importance so that if accompanied by one other similarly important factor would contraindicate full ventilation'; and 3 was 'very important, in itself contraindicating full ventilation'. The data were analysed using the Statistical Package for the Social Sciences programme.

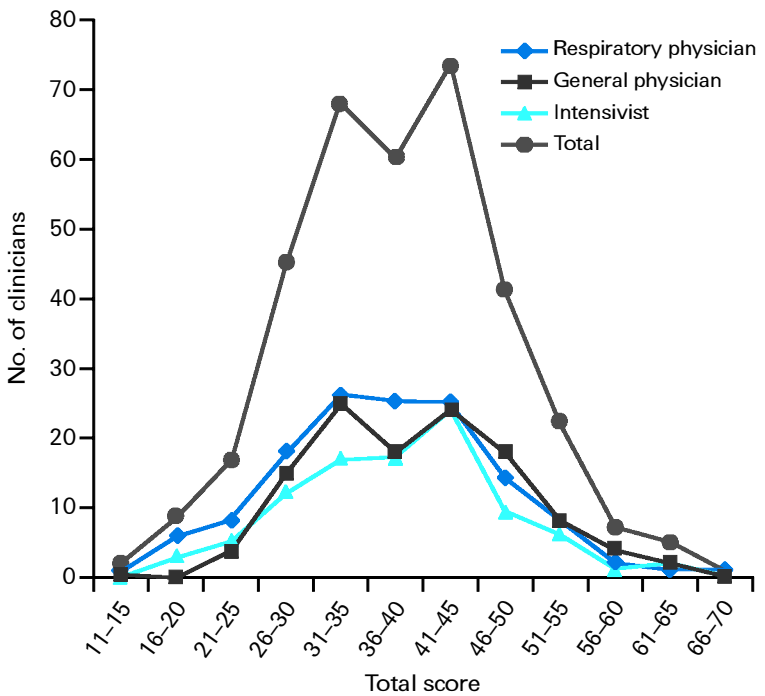
Results

A total of 356 questionnaires were returned and 350 (48%) of these were analysed; six were excluded because answers were incomplete. The breakdown by specialty was 135 (39%) respiratory physicians, 119 (34%) general physicians and 96 (27%) intensivists. 89.5% of respondents had non-invasive ventilation available in their hospitals either on an ICU or HDU.

Perceived difference between the specialties

Nineteen (5.4%) clinicians (10 respiratory, seven general physicians and two intensivists) thought there was disagreement between the physician and intensivist in more than 50% of cases discussed, while 179 (51%) thought there was disagreement in fewer than 10% of cases. Physicians and intensivists did not differ in their perception of disagreement.

Fig 1. Difference in practice between respiratory physicians, general physicians and intensivists, and between individual clinicians.



Difference in practice between specialties

The total score for the 25 variables was calculated for each clinician. The minimum score possible was 0, equating with a very low threshold to consider ventilation; the maximum was 75, suggesting a very high threshold to embark on ventilation, such that the clinician would be extremely unlikely to initiate ventilation in those circumstances.

The distribution of the scores, grouped by specialty, is shown graphically in Fig 1; there was no statistically significant difference in these distributions. The mean score for respiratory medicine was 37.5, 95% confidence interval (CI) 35.8–39.2; for general medicine 39.5, 95% CI 37.8–41.2; and for intensive care 38.6, 95% CI 36.7-40.5.

Difference in practice between individual clinicians

The range of the total scores for all the clinicians was 12–68; the cumulative graph being shown in Fig 1. Similar ranges were seen in each of the specialties: respiratory medicine 15–68; general medicine 12–65; and intensive care 16–64.

Variables influencing clinical decision-making

'Importance' attributed to the variables investigated Based on the whole group of clinicians, the mean score for each of the variables was calculated. They were arranged, by mean, in order of their perceived relevance in the decision to ventilate, as shown in Table 1, beginning with those regarded as 'irrelevant'. The ranking of the variables was similar across the specialties.

Variables causing the most variation in response The responses for each variable were analysed using Pearson's chi-squared test for statistical significance between clinicians of different specialties. Only five of the factors showed a statistically significant difference, namely 'continued smoking >20 cigarettes a day' (p <0.033); '$PaCO_2$ documented when stable to be >7.0 KPa' (p <0.004); 'established on home long-term oxygen treatment by concentrator' (p <0.005); 'chest severely over-inflated' (p <0.0001); and 'lung cancer deemed inoperable due to COPD' (p <0.012).

Emphasis placed on demographic, respiratory and comorbidity variables The variables were arranged in three broad groups: demographic (three questions), respiratory relevant to COPD (eight questions) and comorbid conditions (14 questions). The mean score was calculated for each question set and showed that demographic (mean 1.59), respiratory (mean 1.68), and comorbid (mean 1.47) issues were considered equally important. This did not vary significantly between specialties: for respiratory physicians, general physicians and intensivists respectively, demographic 1.54, 1.64, 1.59; COPD 1.62, 1.77, 1.66; and comor-

bidity 1.44, 1.48 and 1.48.

Selection of variables known to be predictors of outcome Four predictors of poor outcome identified from the literature were included in the 25 variables (chronic heart failure, chronic renal failure, cirrhosis, serum albumin). Only three of the clinicians responding graded these 'predictor' variables as very important, in themselves contraindicating ventilation.

Discussion

This study suggests that there are no significant group differences between respiratory and general physicians or intensivists in the decision to initiate ventilation. The variables studied were arranged in a similar order of importance irrespective of specialty and compared closely to a study among respiratory physicians only.[10] The ordering suggests a holistic approach with no distinction between demographic, respiratory and comorbidity variables. In another study, physicians selected categories of data they perceived as important.[11] Those selecting more social data were likely to withhold treatment whereas those selecting more physiological data were likely to intervene. The items weighted most variably between the specialties were in the respiratory group, perhaps reflecting differing skills. Intensivists are more accurate in predicting ICU survival.[12]

The data show a very wide variation in practice between individual clinicians. Some clinicians consider ventilation more readily than others in any situation. This may account for the perceived disagreement between physicians and intensivists. There are few studies that look at individual variation in decision-making. Clinicians planning treatment for a hypothetical patient with a COPD exacerbation divide almost equally between those choosing intubation (58%) and those choosing non-intubation (42%).[12] Our study differs in that the data are normally distributed, suggesting that at the extremes practice between clinicians is highly variable. This has substantial implications for patients, with practice varying between units or even within one unit according to the clinician on call that day. The questionnaire provides a tool for clinicians to compare their practice to that of colleagues.

Recognised outcome predictors did not influence the order of the variables. Pearlman found similar results when physicians were given three 'critical' pieces of data and only four of 205 physicians selected this information.[11] Judgements about likely survival influence decision to admit to ICU. Physicians vary considerably in their predictions for the same patient and overestimate the prognostic importance of certain factors.[11,14] Major decisions are made without considering known predictors. Clear guidelines based on recognised predictors are needed. The production of such guidelines is difficult and needs to be based on prospective studies calculating predictive models for a homogeneous group of patients with similar aetiology underlying an exacerbation. Existing studies looking at ventilation are generally limited by the fact patients have already been admitted to an ICU, and so subjected to local admission policies.

This study only considered initiation of invasive ventilation. Non-invasive ventilation (NIV) is a valuable treatment in acute hypercapnic respiratory failure[15] and reduces intubation rate, mortality and ICU demand.[16] However, in a patient failing a trial of NIV, intubation may become necessary. Patients who are late failures have a significant mortality.[17]

The study has limitations. The response rate was less than 50%. The clinicians answering may have been self-selected by their interest in the issues raised by this study. The questionnaires were distributed by two methods and responders had different times in which to reply, conceivably influencing the results. Finally, the study only looked at theoretical clinical practice. Previous studies have shown an apparent similarity between specialties in willingness to initiate life-sustaining treatments but differences in actual practice.[7] Further studies comparing the real practice between respiratory and general physicians and intensivists would be informative.

Table 1. 'Order' of importance placed on the different variables arranged by overall mean. 0 = 'irrelevant'; 1 = 'of some importance, so that if accompanied by three other similarly important factors would contraindicate full ventilation'; 2 = 'of moderate importance, so that if accompanied by one other similarly important factor would contraindicate full ventilation'; 3 = 'very important, in itself contraindicating full ventilation'.

	Mean
Documented depression requiring treatment	0.50
Osteoporosis – chronic pain from vertebral body collapse	0.67
Continued smoking >20 cigarettes a day	0.73
Plasma albumin <30 g/dl	0.78
Above knee amputation for peripheral vascular disease	0.80
Severe rheumatoid arthritis with iatrogenic Cushing's syndrome	0.99
Aged 80 years or more	1.03
Chest severely over-inflated	1.07
Chronic renal impairment – creatinine >300 μmol/l	1.17
Cachexia – body mass index <18	1.25
$PaCO_2$ documented when stable to be >7.0 KPa	1.37
Morbid obesity – body mass index >40	1.45
Unable to walk 50 yards without stopping because of breathlessness	1.58
Chronic alcoholism with INR >2.0	1.61
FEV1 documented when stable to be <20% predicted	1.69
Impaired left ventricular function – ejection fraction <30%	1.69
Established on home long-term oxygen treatment by concentrator	1.77
Dependent on social care – failing 3 of 5 activities of daily living	1.98
Bone metastases from carcinoma of breast recently diagnosed	2.06
Housebound by breathlessness	2.13
Difficult weaning from ventilation one year ago, when on ICU for 35 days	2.15
Previous CVA – aphasic or chair-bound	2.27
Documented permanent cognitive dysfunction, needing constant supervision	2.55
Nursing home resident – failing all activities of daily living	2.60
Lung cancer deemed inoperable because of COPD	2.71

COPD = chronic obstructive pulmonary disease; CVA = cerebrovascular accident; FEV1 = forced expiratory volume in one second; INR = international normalised ratio.

Key Points

The decision whether to initiate mechanical ventilation in a patient with respiratory failure due to an exacerbation of chronic obstructive pulmonary disease (COPD) is difficult and controversial

There do not appear to be significant group differences in practice in the decision to initiate ventilation between respiratory physicians, general physicians and intensivists

There is wide individual variation in the decision to initiate ventilation, highlighting the need for guidelines

Clinicians in respiratory medicine, general medicine and intensive care select similar factors as being important or irrelevant to the decision to initiate or withhold ventilation but these do not reflect predictors of poor outcome

This study may provide a tool by which clinicians can compare their practice to that of colleagues

Decision-making in COPD often occurs late. The majority of respiratory physicians do not discuss ventilation before it becomes necessary.[18] Discussions take place at the time of an exacerbation on the ward, in ICU[10] or in an *ad hoc* manner in casualty with little knowledge of the patient.[5] Considering end-of-life issues is less difficult when a physician knows the patient[18] and ideally should be addressed in clinics, when a patient is better able to make well-informed decisions. There has been some use of scenario-based decision aids in prearranged interviews,[19] which is an area for further study. Finally, patient and doctor may view quality of life and 'benefit' differently, and life-sustaining interventions may not always be appropriate. Patients with COPD in their last few months of life prefer 'comfort care' and actively choose not to be ventilated.[20] Many value a peaceful and dignified death. There is little health gain in a futile extended process of dying on ICU.

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