Predicting death from pneumonia

Mark Woodhead

"Much sweat and plenty of urine, a diarrhoea, bleeding at nose, flowing of the menstruas, or the haemorrhoids do frequently promise good in this distemper"

So wrote Thomas Willis about pneumonia in 1684.[1] The advent of treatments which may alter the course of pneumonia and save lives, such as antibiotics and intensive care, has meant that the emphasis in prognostic forecasting has shifted from predicting those who might survive to those who might die. Death in community acquired pneumonia may occur early in the course of the disease with 25% of deaths occurring within 48 hours of hospital admission and 50% within five days.[2] If medical intervention is to prevent death, it may therefore be important to identify "at risk" patients early, ideally as soon as medical contact is established. Any prognostic forecast must therefore be sensitive, specific, and based on simple criteria available at that first medical contact.

Many features have been shown to be associated with increased risk of death in patients with community acquired pneumonia,[3] but no single factor is sufficiently closely related to outcome to be of clinical value in the individual patient. A number of studies have therefore evaluated the use of a combination of features in predicting outcome. This should be distinguished from severity of disease scoring systems used in critically ill patients, such as the APACHE system,[4] which were designed to provide information on the risk of death in groups rather than individual patients.

In 1987 the British Thoracic Society (BTS) reported a study of 453 adults admitted to a number of British hospitals with a diagnosis of community acquired pneumonia.[5] From 23 features significantly related to death on univariate analysis, only diastolic hypotension (≤ 60 mm Hg) on admission and uraemia (>7 mmol/l) during the admission remained associated with death in three different logistic regression models. Combining raised respiratory rate (≥ 30/min) with these two factors produced a simple discriminant "rule" where the presence of two or more of the three factors identified a group with a 20% risk of death compared with only 1% in those with one or less of these features.

In this issue of *Thorax* Neill *et al*[6] describe a study of 255 adults with community acquired pneumonia in which they have prospectively tested a modification of this rule where the presence of two or more of the above three features plus confusion was tested as a marker of severe community acquired pneumonia. The results are remarkable for their similarity to those found in the original BTS study and in the two other studies from the USA and New Zealand which have prospectively evaluated the BTS findings.[3,7] The consistency of the results in four different populations suggests that this is a robust approach to the identification of those at risk of death from community acquired pneumonia.

One other relevant finding of Neill *et al* is the underestimation of the severity of community acquired pneumonia by routine clinical assessment. In a retrospective study of deaths from pneumonia in young adults, severity markers were frequently not recorded and deficiencies in management were, perhaps not surprisingly, common.[8]

Doubts remain about the value of these prognostic markers in elderly patients, largely because an increased level of blood urea is a common finding in this age group. Such patients (age >74) were excluded from the BTS study[5] but were included in the other three studies. Neill *et al* did not find a blood urea concentration of >7 mmol/l to be an independent predictor of mortality in the elderly, but data from the other New Zealand study suggest that the "rule" may still be of value in the elderly.[7] While further studies focusing on this group are required, there now appears to be sufficient evidence to support the use of the BTS rule as an aid to the identification of the severely ill patient.

How should the severely ill patient with community acquired pneumonia be managed? National guidelines may help since they all recommend a different management strategy for the severely ill patient.[9–14] Specific details which require attention in such patients include early administration of antibiotics, the use of combinations of antibiotics appropriate to the likely causative pathogen(s), a more careful and perhaps more aggressive approach to the determination of the microbiological cause, careful assessment and optimisation of fluid balance and gas exchange and, when appropriate, early and elective admission to an intensive care unit. None of these approaches is new but, sadly, many are deficient in current practice.[8]

It remains to be seen whether this approach will actually improve outcome. Despite the suggestion that, in severe pneumonia, death may be predetermined[15] and not altered by medical intervention including intensive care,[16] the deficiencies in our current methods of management, together with the survival rate of 50–70% for patients admitted to the intensive care unit for community acquired pneumonia,[2] suggest that lives could be saved. These data therefore support the use of the BTS rule as part of good clinical practice in the management of adults with community acquired pneumonia.

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