New method to evaluate the practice of positive pressure ventilation in intensive care units

Editor—We read with interest the paper by Roche and colleagues outlining the slow adoption of ‘protective’ ventilatory strategies in smaller hospitals, and outline how we have achieved almost full compliance with this concept in a small district general hospital.

A multicentre trial conducted by the Acute Respiratory Distress Syndrome Network (ARDSNet) examining the use of mechanical ventilation in patients with the Acute Respiratory Distress Syndrome (ARDS) was stopped in March 1999 because the use of lower tidal volumes was found to be efficacious. Results of the trial were subsequently published in the New England Journal of Medicine in 2000. They confirmed that mechanical ventilation with a lower tidal volume ($6.2 \pm 0.8$ ml kg$^{-1}$ predicted body weight) than traditionally used ($11.8 \pm 0.8$ ml kg$^{-1}$ predicted body weight) resulted in a significant decrease in mortality and increased the number of days without ventilator use. Patients randomized to receive lower tidal volumes had significantly lower plateau pressures ($P_{\text{plateau}}$) than those receiving more traditional tidal volumes.

Of note, $P_{\text{plateau}}$ was measured in the ARDSNet study, not peak inspiratory pressure ($P_{\text{insp}}$), as recorded by Roche and colleagues in their study. The plateau pressure arguably better approximates the average peak alveolar pressure and therefore alveolar ‘stretch’.

Despite these impressive results, many general intensive care units in the UK have been slow to adopt a ‘protective’ ventilatory strategy as highlighted by Dr Roche. There are probably several reasons for this. We suggest that one of the principal barriers is that compliance with the ARDSNet group strategy requires frequent adjustment of $F_{\text{io}_2}$, positive end expiratory pressure (PEEP), ventilatory frequency, and tidal volume. We have largely overcome this problem by providing the intensive care nurses with an individualized, computer-generated ventilation protocol for each patient.

When a patient is admitted to our intensive care unit with an acute lung injury/ARDS ($P_{\text{aO}_2}:F_{\text{io}_2}$ ratio <40 kPa, bilateral pulmonary infiltrates on chest x-ray and no clinical evidence of heart failure), the resident doctor enters their name, height, sex, and date of birth into a simple database written in FileMaker Pro. The computer program calculates their predicted body weight and generates a flowchart giving tidal volumes, allowable combinations of PEEP and $F_{\text{io}_2}$, ventilatory frequency, pH targets, oxygenation goals, and weaning strategy. The nurses manipulate the ventilator according to the flowchart to achieve acceptable oxygenation, pH and plateau pressures. By doing this, we have achieved almost 100% compliance with a low tidal volume approach to ventilation, and freed up valuable medical time.

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Editor—We thank Drs Hunter and Rothwell for their interest in our article. We will reply with respect to the specific points they raise.
(i) The reason for using peak as distinct from plateau pressure in our study was pragmatic, and related to the fact that nurses on the intensive care units in question were already documenting peak, but not plateau, pressure at the time of the study’s inception. Peak inspiratory pressure was felt to provide a reasonable surrogate marker for the degree of barotrauma.

It is worth stressing that the specific measures and cut-off values utilized in our study were all chosen for pragmatic reasons: it would be reasonable to argue that the cut-off values were not sufficiently stringent, but these were chosen, before starting the study, based on what it was thought it would be reasonable to achieve in a first audit cycle. There is no reason why audit ‘targets’ should not move with successive audit cycles—indeed, this seems to have been employed with some success by the Department of Health. The purpose of our article is to propose a simple audit method rather than precise parameters or cut-off values—even with available clinical data these must still be open to debate.

(ii) We agree with Drs Hunter and Rothwell that intensive care nurses have a pivotal role to play in the modernization of clinical practice on intensive care units. Indeed, we made this point in our paper. The use of a computer-generated protocol to guide ventilation practice is intriguing, though we utilized a less detailed approach, concentrating on getting the fundamentals of ventilatory care correct.

(iii) Given that the main thrust of our article related to an audit method to assess ventilation practice, we should be interested to find out what methods were used to audit the effects of Drs Hunter and Rothwell’s computer-driven nurse protocol.

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3 FileMaker Pro (www.filemaker.co.uk).

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