

EDITORIAL

Outcome from mechanical ventilation

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The prognostic assessment of patients requiring mechanical ventilation has two important aspects. Firstly, it has sound therapeutic implications, derived from a better understanding of the factors influencing outcome. Secondly, it has important ethical implications, in helping to identify the patients who are not likely to benefit from mechanical ventilation. In these patients, the use of mechanical ventilation would only add to their discomfort, prolong suffering, and also add useless costs, at a time when health care resources are becoming limited [1, 2].

In this issue of the Journal, JIMENEZ *et al.* [3] evaluated the outcome of 118 patients, 76 being ventilated for more than 72 h. Thirty three (28%) of these patients died. In the population studied, the best predictors of outcome were the number of associated complications and the degree of severity of the disease, as assessed by the simplified acute physiology score (SAPS), the degree of hypoxaemia, and the age of the patients. A logistic regression analysis revealed that the exclusion of the oxygenation index and the age did not reduce the prognostic assessment, indicating that the degree of global impairment was the major determinant of outcome.

One should emphasize that the study by JIMENEZ *et al.* [3], like those of others [4-8], included a mixture of underlying diseases, and the prognosis may be different in adult respiratory distress syndrome (ARDS), chronic obstructive pulmonary disease (COPD) and in other diseases. The present study included more than one third of postsurgical and traumatized patients, whose prognosis is known to be good [8], and only 8% of patients with ARDS. This can account for the Intensive Care Unit (ICU) mortality rate of only 28%, whilst this mortality rate was usually around 50% in other studies [4, 6, 8].

In patients with ARDS, the degree of hypoxaemia, and especially its time course, is an important prognostic factor [9-11], even though death is less commonly due to refractory hypoxaemia than to multiple organ failure [12]. However, ARDS is a heterogeneous syndrome, and the fatality rate also depends on the underlying problem. For instance, mortality is much higher when ARDS is due to sepsis than when it is due to fat embolism or aspiration of gastric content [13].

It is clear that the prognosis is related more to the degree of lung impairment in patients with COPD with other causes of respiratory failure [13]. Incidentally, there have recently been very few reports on the outcome from

mechanical ventilation in COPD patients, and it would be interesting to see whether changes in ventilatory management (especially the use of noninvasive mechanical ventilation) have influenced the outcome.

The study by JIMENEZ *et al.* [3] is in agreement with previous studies, indicating that the prognosis in patients requiring mechanical ventilation is determined by three major factors:

1. *The cause of mechanical ventilation.* It is clear that the outcome is poorer in patients who are ventilated after prolonged cardiopulmonary resuscitation than in patients with transient postoperative failure or with drug intoxication [8, 14-16].

2. *The number of organs failing and the number of complications* [4, 13]. Application of a severity index like the SAPS score has been sometimes, but not always [17], found useful.

3. *The age and the degree of physiology reserve.* Several studies [6, 8, 15, 18-20], but not all [4, 14], identified age as an important factor. A low serum albumin level [7], or the presence of cachexia [17], as signs of altered functional status have also been recognized as indicators of poor prognosis.

Once mechanical ventilation is initiated, the prognosis may also be related to its duration. For instance, SPICHER and WHITE [8] found that only 39% could be discharged from ICU when the duration of mechanical ventilation exceeded 10 days. A recent study indicated that prolonged mechanical ventilation may not be associated with a greater ICU mortality but with a greater one year mortality rate [21].

One should indeed emphasize that success of weaning from mechanical ventilation, ICU survival, and long-term survival represent three different aspects. Roughly one half of the ICU survivors will be alive one year later. For instance, STAUFFER *et al.* [15] observed a successful weaning in 67% of patients, an ICU survival of 61%, a hospital survival of 50%, and a survival rate one year later of only 30%. Similarly, ELPERN *et al.* [6] reported that one half of their patients died in the first year after discharge. In patients ventilated for 10 days or more SPICHER and WHITE [8] observed an acute survival of 39%, and one year survival of 29%. DAVIS *et al.* [1] reported a hospital survival of 44% and a 2 yr survival of 28%.

What are the clinical implications of these observations? Let us return to the two aspects outlined initially. In terms of therapeutic implications, it appears that fatal cases are more commonly related to extrapulmonary than to pulmonary factors. This strongly suggests that mechanical ventilation is less a form of treatment than a

form of organ support. This explains the difficulty in showing that any ventilatory technique can improve outcome. This should not temper our efforts to improve our ventilatory management, but the aim is generally more to limit the duration of mechanical ventilation and to prevent complications than to improve survival. These observations also stress the importance of considering the patient as a whole, rather than focusing attention on only one organ, namely the lung.

Concerning the ethical implications, we are left with the difficulty in objectively predicting the prognosis of ventilated patients. No single factor should be used alone to deny the use of mechanical ventilation. In particular, advanced age cannot, by itself, represent an obstacle to the use of mechanical ventilation [14, 20, 22]. The use of a severity index, such as the SAPS score used in the study by JIMENEZ *et al.* [3], or the more recent SAPS II Score [23], is not very helpful in this prognostic assessment. There are at least 10 reasons for this:

1. As mentioned above, the cause of mechanical ventilation is the most important determinant of outcome, and a simple scoring system cannot be valid for all groups of patients. As an example the APACHE II score is not reliable in patients with coronary problems, cardiogenic pulmonary oedema, burns trauma, or drug intoxication [20, 24].
2. These scoring systems are usually established only 24 h after ICU admission, and the decisions regarding the use of mechanical ventilation often come earlier.
3. All scoring systems are influenced by therapy. For instance, profound hypotension may have been corrected by high doses of vasopressor agents. Importantly, it is throughout the first 24 h that the score will be influenced by therapy.
4. All scoring systems remain subjective, especially in the choice of a primary diagnosis and the assessment of chronic health status.
5. All scoring systems are subject to selection bias and lead-time bias, *i.e.* there can be differences in selection criteria and variations in the evolution of the illness prior to ICU admission.
6. Scoring systems may not be very superior to the outcome assessment by doctors and nurses [25].
7. Simplicity and accuracy can hardly be combined. Scoring systems should include easily measurable and widely available parameters that could be combined in a simple calculation. Most scoring systems are relatively simple but not very accurate. The recent APACHE III score is the most sophisticated, but is also less easily manageable: such a system has become protected and access to it quite expensive. Nevertheless, no system will ever be highly accurate.
8. Scoring systems evaluate only the changes of survival; whereas, the quality of life is also an important determinant.
9. Perhaps most importantly, scoring systems cannot be applied to decisions concerning individual patients, because they lack sufficient sensitivity and specificity to dictate such individual decisions.
10. Nevertheless, there is a risk of abusive applications of scoring systems in ethical decisions. In particular,

some hospital administrators have started to use them as tools to influence medical decisions, with the aim of improving the performance of the ICU.

Thus, no scoring system is very helpful in assessing the prognosis of patients requiring the use of mechanical ventilation. When deciding whether a patient can benefit from mechanical ventilation, we are thus left with our clinical judgement. It is well-established that there is no real difference between withholding (not starting mechanical ventilation) and withdrawing (discontinuing mechanical ventilation), so that mechanical ventilation could be initiated even when the eventual benefit from this intervention is far from established. The overall situation could be re-evaluated later [26], even though doctors feel less comfortable with withdrawing than withholding [27], especially when the patient is conscious. I am afraid that the most sophisticated analysis, using the best computer program will not help us very much with this. Medicine will remain an Art.

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