Commentary

The long and difficult road to better evaluation of outcomes of prolonged mechanical ventilation: not yet a highway to heaven

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Abstract

The study conducted by Cox and coworkers included in this issue of *Critical Care* demonstrates that prolonged mechanical ventilation (MV; defined as MV for 21 days or longer) is more specific than Diagnosis Related Group 541/542 as a marker of resource utilization, hospital costs and potentially ineffective care. These patients also had greater 1-year mortality and lower functional ability than patients who had received MV for 48 to 96 hours, despite having better baseline functional status. However, predictors of mortality and long-term functional outcomes that are reliable and accurate at the level of the individual patient remain to be identified.

In this issue of *Critical Care*, Cox and coworkers [1] present interesting information on the outcomes of patients receiving prolonged mechanical ventilation (MV) in the intensive care unit (ICU). A tremendous increase in need for ICU care and associated expenditure is anticipated in the coming decades, as the 'baby boomer' generation approach the age of 65 years [2]. This group of individuals is projected to represent one in five (70 million) Americans by 2030. Beyond this age the burden of acute and chronic illness rises exponentially, as does the need for MV, which is an almost absolute indication for ICU admission. In fact, the incidence of MV during hospital admission has already increased sharply. Data from the North Carolina Hospital Database [3] indicate that, from 1996 to 2002, the number of patients requiring MV grew from 284 to 314 per 100,000 North Carolina residents. Notably, this 11% increase was accompanied by significantly fewer discharges to home, more discharges to nursing homes, and a greater burden of comorbidity. Furthermore, compared with other ICU patients, those on long-term MV consume a disproportionate amount of critical care resources, in view of the small fraction of the ICU population that they represent [4-8]. Therefore, to justify these considerable financial costs, detailed evaluation of their long-term outcomes is urgently needed.

Cox and coworkers [1] conducted secondary analyses of a cohort of 817 adult patients who had received MV for 48 hours or longer at the University of Pittsburgh Medical Center and who were followed up for 1 year. In the original study report, Chelluri and coworkers [7] showed that only 44% of these patients were alive 1 year after ICU admission, that long-term mortality was significantly associated with older age and poor pre-hospitalization functional status, and that more than half of survivors at 1 year required care giver assistance for basic daily activities. The primary objective of the secondary analyses conducted by Cox and coworkers was to compare health outcomes between two common definitions of prolonged MV, namely MV for 21 days or longer and MV for 96 hours or longer with placement of a tracheostomy (Center for Medicare and Medicaid Services Diagnosis Related Groups [DRGs] 541/542). A secondary objective was to compare the outcomes of these outlier patients with those of patients ventilated for shorter periods of time (48 to 96 hours).

Heterogeneous definitions of prolonged MV exist in the medical literature, but a uniform definition is essential in analyzing epidemiological studies, interpreting benchmark data, and guiding health care and reimbursement policies. Although information based on DRGs are widely used because they can be easily retrieved from large administrative databases, a consensus conference recently recommended that prolonged MV should be defined as need for at least 21 consecutive days of MV for at least 6 hours/day [9], because the majority of MV-dependent patients transferred to long-term acute care hospitals had received MV for at least 21 days.

DRG = Diagnosis Related Group; ICU = intensive care unit; MV = mechanical ventilation.

Several key messages emerge from the report by Cox and coworkers [1]. First, prolonged MV defined as MV for at least 21 days is more specific than DRG 541/542 as a marker of resource utilization and potentially ineffective care. These patients had greater hospital costs and higher 1-year mortality (58% versus 48%) than did patients with tracheostomies who were ventilated for at least 96 hours. Costs per 1-year survivor after at least 21 days of MV were also considerably higher (US$423,596 versus US$266,105). In addition, the rate of potential ineffective care, which was associated with age, male sex and number of pre-admission dependencies in activities of living, was significantly higher (41% versus 22%) for patients with MV duration of 21 days or longer. Finally, survivors of both prolonged MV groups reported lower functional capability than did patients who had received MV for 48 to 96 hours, despite having better baseline functional status.

Like previous reports [4-8], this descriptive series [1] provides essential information regarding both short-term and long-term outcomes after ICU care. However, several important limitations are worth emphasizing. First, as in many previous research studies in this field, the amount of data missing because of death or inability to complete interviews was considerable, although Cox and coworkers used sophisticated statistical methods to alleviate any bias resulting from this. These missing data might be responsible for an underestimation of the true burden of disabilities suffered by long-term MV survivors. Second, this study, once again like many others evaluating the outcomes of critically ill patients, does not offer predictors of mortality and functional outcomes that are reliable and accurate at the level of the individual patient. Such predictive models are eagerly awaited because they might provide patients and their families with reasonable expectations regarding outcomes; they may provide ICU physicians with valuable help in making difficult decisions regarding ICU admission, ICU discharge, or limitation of care; and they might allow health care policy makers and managers to allocate resources better.

Finally, many other opportunities for research 'from bench to bedside to administrative offices' exist in the field, which might ultimately lead to significant improvement in outcomes of patients undergoing prolonged MV [9]. This research may achieve the following: enhance our understanding of the molecular mechanisms that underlie chronic illness myopathy and of the impact of ageing on manifestations of chronic illnesses; facilitate better definition and application of weaning protocols, and nutritional and physical therapy strategies; permit identification and correction of iatrogenic factors that contribute to prolongation of MV; eliminate financial or organizational incentives to delay patient discharge; and promote development of a 'pay for performance' heath care system, with adequate benchmarking indicators for every institution providing prolonged MV.

Competing interests

The authors declare that they have no competing interests.

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