Caring for the hospitalized ventilator-dependent patient outside the ICU: united and stand, or divided and fall?

As the number of patients on chronic mechanical ventilation outstrips the number of full-scale intensive care unit (ICU) beds, clinicians face the challenge of identifying new management strategies and new settings outside the ICU in which to care for these patients.[1–4]

Alternative settings for mechanical ventilation outside the acute care hospital include patients' homes, extended-care facilities, and noninstitutional group facilities.[4] Yet acute care hospitals are more frequently being used as way stations to the home or community or as a site for continued non-ICU hospital care (for example, weaning after organ system failures have resolved). As a result, acute care hospitals are accommodating ever-increasing numbers of ventilator-dependent patients. This editorial considers available evidence regarding choices for non-ICU hospital settings in which to care for mechanically ventilated patients.

■ *See Cordasco, p 505.*

The increasing misalignment between the need for and the availability of hospital-based facilities for ventilator-dependent patients has been the subject of recent investigative and editorial attention.[2–6] For example, Make et al[7] surveyed Massachusetts facilities caring for chronically ventilator-dependent patients and estimated that in 1986 the number of these patients totaled approximately 6,600 in the United States. Swinburne et al[8] identified a 156% increase in the number of patients on mechanical ventilation at Rochester General Hospital between 1974 and 1983. At the Cleveland Clinic Hospital, the number of patient-ventilator days in nursing units for which data are available (medical ICU, neurological ICU, and patients on ventilation outside the ICU) has risen from 3,660 in 1987 (10.03 ventilators/day) to 4,882 in 1990 (13.38 ventilators/day), a 33% rise.

As the number of these patients increases, and as the wisdom of non-ICU care becomes more obvious, two alternative settings are being employed: the "geographic ventilator ward," in which patients reside in a consolidated unit with dedicated support staff and facilities, and the "dispersal" strategy, in which chronically ventilator-dependent patients are divided among several regular nursing floors.

Of these two alternatives, the geographic ventilator ward or "noninvasive respiratory care unit" has been studied more extensively[2–5]: stable patients in need of continued mechanical ventilation beyond their course in a full-scale ICU are grouped together, either for continued weaning attempts, for continued hospitalization pending resolution of other non-critical illnesses, or as a way station to home or to an extended-care facility.[1–4,8] Hardly a new concept, progressively stepped-down care was outlined three decades ago by Lockwood et al,[9] and a "progressive respiratory care unit" was first implemented over a decade ago by Indihar and Forsberg.[1] Early assessments of these noninvasive ventilator units focused on cost savings; for example, Indihar and Forsberg cited a $452,051 savings over 18 months (1982 dollars) in a progressive respiratory care unit.[1] However, because acceptance of noninvasive ventilator units requires demonstration of efficacy, as well as cost savings, more recent studies of these special units have examined the clinical status and outcomes of these patients.[2,3,5,10,11]

A carefully designed efficacy study will pose the same questions asked by discerning clinicians whose patients are recommended to such units and by editors called upon to assess the credibility and impact of reports describing such units. For example, are patients more likely to be weaned or rehabilitated in noninvasive ventilator units than in traditional full-scale

ICUs? Is the length of hospitalization reduced, and are these patients less likely to incur complications in noninvasive ventilator units than in full-scale ICUs or elsewhere? Are complications due to unforeseen ventilator mishaps (for example, malfunction or disconnection) equally unlikely in both settings? Are nosocomial complications less likely in noninvasive ventilator units? Do patients prefer noninvasive ventilator units? Also not to be overlooked is whether family members and health care providers prefer noninvasive ventilator units to full-scale ICUs.

The imperative to examine these alternative settings has led to several studies which, although preliminary, nevertheless suggest that noninvasive ventilator wards are effective and save money.[2–5,10,11] For example, preliminary data from Raoof[10] and Mishra[11] suggest that patients cared for in a 14-bed ventilator ward at Nassau County Medical Center have higher weaning success rates (48% vs 8.5%) and a lower frequency of pneumonia (8.4 vs 23 per 1,000 ventilator days) and pressure sores (6.2 vs 12.98 per 1,000 ventilator days) than patients cared for on regular medical wards. Compared with patients in a full-scale ICU, patients in this ventilator ward experienced fewer accidental extubations (1.57 vs 7.11 per 1,000 ventilator days) and at increased savings. In another study, Elpern et al[3] showed that the noninvasive respiratory care unit at Rush-Presbyterian-St. Luke's Medical Center in Chicago decreased the cost per ventilator day by 266% (from $3,164 to $1,188) while preserving hospital survival rates and lengths of stay for patients with respiratory failure. Finally, Nochomovitz et al[5] are conducting a trial in which ventilator-dependent patients are allocated randomly to continued care in a traditional ICU vs a geographic ventilator unit. Though available data are preliminary, clinical outcomes appear equivalent, and fewer diagnostic tests were performed in the geographic ventilator unit, lending early support to this strategy. The clamor continues for further high-quality investigation to examine the impact of alternative ventilator settings on the clinical outcome of ventilator-dependent patients.

THE DISPERSAL STRATEGY

In instances where noninvasive ventilator units have not been available, the surfeit of ventilator-dependent patients has forced clinicians to care for these patients on regular hospital floors, a strategy of dispersal which is the subject of the accompanying report[12] and another preliminary communication by Hardy et al.[13]

Hardy et al[13] describe a discouraging experience with 13 ICU admissions of six patients; of these six, three were weaned, two were discharged home on chronic ventilatory support, and one died. Complications in two of the six patients on the regular hospital floor (ie, gastrointestinal bleeding and tracheal obstruction) required transfer back to the full-scale ICU. Putative advantages of the dispersal strategy included decompressing the full-scale ICU to permit admitting sicker patients and an estimated savings of $105,000. Though the ICU re-admission rate was alarming in this report, the preliminary communication does not address the comparative efficacy of this alternative strategy to that of the full-scale ICU.

The accompanying report by Cordasco et al[12] describes a larger experience in 99 ventilator-dependent patients over an 8-year period (1981 to 1988). As in the report by Hardy et al,[13] these ventilator-dependent patients had been selected for transfer out of the full-scale ICU for further care on regular nursing floors scattered throughout the institution. Putative advantages of this dispersal strategy might include the need for even fewer resources than required by noninvasive ventilator wards, the decreased likelihood of burn out among caregivers dedicated to chronically ventilator-dependent patients, and the commensurate cost savings; however, looming concerns about adverse events accompanying the lower level of supervision provided to "dispersed" patients mandate caution. Careful studies will consider whether there is a greater frequency of ventilator-associated mishaps that would be averted in a more closely supervised setting, and whether a lower intensity of weaning efforts or general care given to dispersed ventilator-dependent patients detracts from weaning success. The current report[12] does not address these issues and, like the garnished appetizer, invites the fuller meal but does not supplant it. A thoughtful, balanced analysis of the dispersal strategy requires a detailed tally of adverse clinical events, especially those deemed avoidable by care in more highly supervised settings such as geographic units or even full-scale ICUs. Whether fewer respiratory therapists are needed for the dispersed-care strategy vs a geographic unit is unclear, and whether any such advantage would offset a seemingly higher risk of unwitnessed ventilator mishaps cannot be answered from the available data. In the meantime, the cautious reader will not misconstrue these descriptions of strategy as evidence supporting its use.

As pointed out by Elpern et al,[3] final endorsement of a "best" strategy must await the results of a randomized

trial comparing care in three settings—the full-scale ICU, the noninvasive ventilator unit, and the general hospital ward. Until such a trial is conducted, preliminary success with geographic ventilator units and daunting concerns about supervision and safety with dispersing these patients to general hospital wards suggest that these patients are better off united than divided.

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