Acute Application of Noninvasive Ventilation Outside the ICU: When Is It Safe?

The literature supporting the use of noninvasive ventilatory support (NIV) in acute respiratory failure has markedly increased over the last 20 years.[1-3] Most would now consider NIV as first line therapy in the treatment of COPD exacerbations, cardiogenic pulmonary edema, and acute hypoxemic respiratory failure in a variety of settings.[1-3] The vast majority of the literature supporting the use of NIV has been obtained in the ICU, seemingly the most appropriate place to provide NIV for life support. However, paralleling the use of NIV in acute respiratory failure is an increasing body of literature supporting the use of NIV for chronic respiratory failure,[4,5] the most impressive being in the use of NIV in the management of chronic neuromuscular/neurologic disease,[4,5] as well as the large body of literature supporting the use of CPAP to manage sleep apnea.[6]

The increasing support for the use of NIV for both acute and chronic respiratory disease management has blurred the guidelines on where and how to properly provide NIV. It is hard to argue against the management of patients with sleep apnea, who have been using nocturnal CPAP for years at night, on a general medical/surgical unit, or the management of the patient with neuromuscular disease who uses NIV for 8 to 16 hours a day but can sustain spontaneous breathing for hours at a time, again on a general medical/surgical unit. However, what about the patient with hypoxemic and hypercapnic acute respiratory failure, who cannot tolerate even 2 min without NIV? Should we even consider managing this patient outside the ICU? Certainly these examples are the extremes, but what about all of the patients in between, those with an exacerbation of COPD, or with cardiogenic pulmonary edema, or the postoperative patient with moderate hypoxemic respiratory failure? Do these patients require care in the ICU, or can they be managed on general medical/surgical units?

In this issue of the Journal, Cabrini and associates[7] provide us some guidance. They interviewed 45 patients who were successfully managed with NIV for acute respiratory failure outside the ICU. Only half of the patients reported that they received help immediately when needed. All patients reported some level of complication, although most were minor. They also reported other issues regarding patient involvement in the choice of interface and the patient's ability to remove the mask if required. However, there are no data describing the level of severity of the respiratory failure in any of these patients. It is impossible to know if any of them required NIV for life support, or if the decision for initiating NIV occurred when the patient was admitted to the ward, or if the patient was discharged from the ICU on NIV. In addition, these results represent only those successfully managed with NIV. The authors do not report the number of patients who were on NIV outside the ICU environment during the study period. Also, patients who failed NIV, who were transferred to the ICU, or who died while on NIV were not included in these data. But most importantly, complications from NIV while the excluded patients were on the ward are not included. Although it is true that serious complications from NIV are extremely rare, what percentage of technical failure or clinical deterioration on the wards not immediately recognized is acceptable: 1 out of 10, 1 out of 100, or 1 out of 1,000? For the one patient where problems are not immediately recognized, even 1 out of 1,000,000 is too frequent.

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On the other side of this issue are limited resources, the primary being too few ICU beds, particularly outside of the United States, to accommodate all of the patients who could benefit from NIV.[8,9] An increasing number of patients in acute respiratory failure are being managed outside of ICU.[10-12] As a result, we need definitive and specific guidelines on the use of NIV outside the ICU to ensure that all patients are treated safely under all circumstances. It seems reasonable to establish as the primary guideline that patients who require NIV for life support should be managed in the ICU, where they will receive the same level of monitoring, by highly trained clinicians, highly skilled and experienced in the use of NIV, as intubated patients requiring mechanical ventilation for life support. The big question is, what constitutes life support? Recently published guidelines by the Society of Critical Care Medicine on the use of NIV define life support and the need for ICU care as an inability to sustain ventilation without NIV for 60 min.[13] We can, obviously, debate this time limit, but whether we finally establish 60 min or 30 min, it is clear that patients who cannot sustain themselves without NIV for even short periods *require* care in the ICU. It is most important for all of us to err on the side

of patient safety, and not on the side of financial concerns of the institution, when considering proper placement of patients receiving NIV.

In addition to the proper selection of NIV patients who may be managed outside the ICU, it is critical to establish guidelines for the care of patients receiving the acute application of NIV on the wards. Ideally, these patients should be coalesced in a unit specifically designed to care for patients with respiratory failure, where all clinical personnel caring for them are highly trained in the application of NIV. This includes physicians and nurses as well as respiratory therapists. These patients should also receive appropriate continuous cardiopulmonary monitoring, and alarms should be annunciated into the hallway for rapid identification and response. All of these patients should receive cardiac, pulse oximetry, and ventilator discontinuation monitoring.[14] Monitoring of the ventilator system is not available on many noninvasive bi-level ventilators, since most are developed for use at home. In these patients with acute respiratory failure, ventilator system monitoring is critical, regardless of whether the patient is managed inside or outside the ICU. If the ventilator used does not have incorporated alarms, then at minimum a pressure disconnection alarm needs be added to the system.

In conclusion, we agree with many of the conclusions by Cabrini et al,[7] and the fact that it is possible to manage many patients requiring NIV for acute respiratory failure outside the ICU. But we should be very cautious: patients need to be carefully selected, and appropriate preparations need to be made in the areas caring for these patients, to ensure their safety. It is not acceptable to assume that any non-ICU patient care unit is capable of caring for patients in acute respiratory failure who *require* NIV!

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Dr Kacmarek has disclosed relationships with Maquet, Newport Medical, Hamilton Medical, Bayer, KCI, and Hollester. Dr Villar has disclosed a relationship with Maquet.

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