Initiation of Mechanical Ventilation in Patients with Decompensated Respiratory Failure

Eric D. Signoff, MD[a,*], Jason Y. Adams, MD, MS[b], Brooks T. Kuhn, MD, MAS[b]

KEYWORDS

• Mechanical ventilation • Endotracheal intubation • COPD
• Acute respiratory distress syndrome • Heart failure • Ventilator weaning

HOSPITAL MEDICINE CLINICS CHECKLIST

1. Few absolute criteria for endotracheal intubation exist. Instead, knowledge of the driving disease and trajectory should guide clinicians to intubate at the safest time possible.
2. Hospitalists can play important roles in the management of patients in the peri-intubation period by being prepared for the effects of endotracheal intubation and the induction medications required, initiation of positive pressure ventilation, and subsequent sedation.
3. Mechanical ventilation is a tool to support severe respiratory failure, but comes with inherent risks, collectively termed ventilator-induced lung injury.
4. Initial ventilator settings vary by the disease that is being treated, but a strategy of low tidal volume ventilation is recommended in most patients.
5. Patients should be assessed for readiness to extubate shortly after intubation using a variety of predictive tools (eg, rapid shallow breathing index, spontaneous breathing trials), improvement of the reason for respiratory failure, and ability to prevent aspiration.

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[a] Section of Hospital Medicine, Department of Internal Medicine, UC Davis Medical Center, 4150 V Street, Suite 3400, Sacramento, CA 95817, USA; [b] Division of Pulmonary, Critical Care, and Sleep Medicine, Department of Internal Medicine, UC Davis Medical Center, 4150 V Street, Suite 3400, Sacramento, CA 95817, USA
* Corresponding author.
E-mail address: esignoff@ucdavis.edu

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INTRODUCTION

What is the role of the Hospitalist in the management of invasive mechanical ventilation?

The hospitalist is a relatively new position with constantly expanding scope in the care of hospitalized patients. Traditional boundaries limiting hospitalists to pre–intensive care unit (ICU) and post-ICU management are fading because of a shortfall of intensivists in the United States.[1,2] As hospitalists become more involved in the care of critically ill patients, skill in the management of invasive mechanical ventilation (MV) is increasingly valuable.

Acute respiratory failure (ARF) is the most common cause of admission to the ICU in the United States, most commonly due to acute exacerbations of chronic obstructive pulmonary disease (AE-COPD), congestive heart failure, acute respiratory distress syndrome (ARDS), sepsis, and pneumonia.[1–3] Hospitalists regularly manage the same diseases on the floor, while covering the ICU, and after ICU transfer. ARF is inherently unstable, requiring frequent assessment, intervention, and reassessment. Hospitalists possess the knowledge and skills to manage these diseases and meet the dynamic needs of these patients. In fact, as many as 75% of MV patients in community settings are managed by hospitalists.[4,5] Knowledge of the risks and benefits of endotracheal intubation and MV is important to adeptly care for critically ill patients.

ASSESSMENT

When should noninvasive positive pressure ventilation or high-flow nasal cannula be considered as alternatives to endotracheal intubation?

Although potentially life-saving, endotracheal intubation and MV each carry serious risks. Endotracheal intubation can lead to hemodynamic compromise, predominantly from sedative medications and subsequent positive pressure ventilation. Direct mechanical injury of the mouth, teeth, vocal cords, or rarely, the cervical spine (typically in patients with severe rheumatoid arthritis or Down syndrome) can occur from the laryngoscope, stylet, or tube, or from manipulation of the neck.[6,7] Nontraumatic complications can occur as well, such as bronchospasm, aspiration of gastric contents, elevated intracranial pressure, and tachyarrhythmia.[7] Ventilator-induced lung injury (VILI), barotrauma (pneumothorax, pneumomediastinum), atelectrauma (damage to alveoli from repeated opening and closing), and volutrauma (alveolar damage from excessive tidal volumes), are common and potentially life-threatening complications of MV (**Table 1**).[8] Prolonged endotracheal intubation itself is associated with nosocomial pneumonia, upper airway injury, longer ICU stays, and increased sedation requirements.[7,9]

Noninvasive positive pressure ventilation (NIPPV), encompassing bilevel and continuous positive airway pressure (BiPAP and CPAP, respectively), has a clear role for preventing the need for MV in several disease states. In AE-COPD, NIPPV has been shown to improve mortality, decrease the need for invasive MV, and decrease respiratory rate and dyspnea.[10,11] In cardiogenic pulmonary edema, NIPPV has been associated with a decreased need for intubation and lower mortality. The literature is unclear as to whether BiPAP offers any advantages over CPAP, but the authors suggest initiation of BiPAP over CPAP except in cases with known patient intolerance or high concern over gastric insufflation with air and subsequent aspiration.[12]