

Emergency Department Treatment of the Mechanically Ventilated Patient



Rory Spiegel, MD^a, Haney Mallemat, MD^{b,*}

KEYWORDS

- Mechanical ventilation • Volume control • Pressure control
- Synchronized intermittent mandatory ventilation • Airway pressure release ventilation
- Pressure support ventilation

KEY POINTS

- Mechanical ventilation is a commonly used but sometimes poorly understood modality in the emergency department.
- In the modern emergency department, where patients remain under the care of the emergency physician for a longer duration, physicians must become comfortable with treating ventilated patients for extended periods.
- Emergency physicians need to understand how to initiate, titrate, and manage mechanical ventilation.
- Emergency physicians must have the ability to adapt ventilatory strategies for specific patients, understand the potential harms of mechanical ventilation, and take action to reduce their incidence.

HISTORY OF MECHANICAL VENTILATION

Mechanical ventilation has a long, storied history. Descriptions of positive-pressure ventilation can be found in the Old Testament, in writings dating from 800 BC. A passage from *Kings* 4:34 to 35 describes the Prophet Elisha performing mouth-to-mouth ventilation on a dying child¹:

And he went up, and lay upon the child, and put his mouth upon his mouth, and his eyes upon his eyes, and his hands upon his hands: and stretched himself upon the child; and the flesh of the child waxed warm.

Disclosures: None.

The article was copyedited by Linda J. Kesselring, MS, ELS, the technical editor/writer in the Department of Emergency Medicine at the University of Maryland School of Medicine.

^a Department of Emergency Medicine, Stony Brook Medical Center, 101 Nicolls Rd, Stony Brook, NY 11790, USA; ^b University of Maryland School of Medicine, 110 South Paca Street, 6th Floor, Suite 200, Baltimore, MD 21201, USA

* Corresponding author.

E-mail address: haney.mallemat@gmail.com

Emerg Med Clin N Am 34 (2016) 63–75
<http://dx.doi.org/10.1016/j.emc.2015.08.005>

emed.theclinics.com

0733-8627/16/\$ – see front matter © 2016 Elsevier Inc. All rights reserved.

Hippocrates described the process of endotracheal intubation in his book *Treatise on Air*, published in 460 BC: “One should introduce a cannula into the trachea along the jaw bone so that air can be drawn into the lungs.”¹

Despite these early forays into positive-pressure ventilation, our application of mechanical ventilation took a dark turn in England in the 18th century. Doctors used bellows and a long tube inserted in the rectum to blow smoke into a drowned patient’s gastrointestinal tract. Their intention was to stimulate the failing myocardium and dry the recently submerged body from the inside.² As medical knowledge advanced, this practice lost favor because of its obvious absurdity. Although some would say our understanding of mechanical ventilation has grown immensely since that era, others would argue that we have merely learned the appropriate orifice through which to ventilate!

This article reviews the common modes of mechanical ventilation that emergency physicians are likely to experience in their practice, discusses the strengths and weaknesses of the various approaches, and proposes a strategy of how best to initiate and maintain mechanical ventilation in the wide range of patients who are intubated in the emergency department.

INTRODUCTION TO VARIABLES

In 1493, Paracelsus, a Swiss German renaissance physician, inserted a tube connected to fire bellows into a patient’s mouth to assist with ventilation. A person pumped the bellows, delivering breaths to the patient. The force, rate, and timing of each breath were left to the prerogative of whoever was squeezing the bellows.³ In modern ventilators, we have outsourced these tasks to a mechanical circuit with adjustable settings.

Imagine that you have just intubated a patient and now must provide adequate ventilator support. Instead of a modern ventilator, you have a turn-of-the-century bellows device. You also have an assistant, who will pump the device in your absence. How would you instruct him to ventilate your patient?

Management of Ventilation

Trigger

When should your eager assistant pump the bellows? After all, you cannot stand next to the bedside, commanding him to pump the bellows each time you want to give your patient some air. If you instructed him to pump the bellows once every 6 seconds, then your patient would receive a fixed respiratory rate independent of his or her own respiratory efforts. On the other hand, if you instructed your assistant to pump the bellows only when the patient initiated a spontaneous breath, you would simply be augmenting your patient’s own respiratory rate. The trigger is simply the stimulus that notifies your assistant or the modern-day ventilator when to deliver a breath.^{4,5}

Limit

Now that you have instructed your assistant when to pump the bellows, how much air should he deliver? Should he deliver the maximum volume the bellows contains, or would it be prudent to tailor the amount of gas delivered to the size and requirements of the patient? Traditionally, the quantity of breath delivered is controlled in 2 ways: volume controlled and pressure controlled. Volume-controlled ventilation delivers a fixed volume of gas with each breath.⁴ But, in some cases, control over the volume of breath delivered is not ideal (discussed in more detail later). In such scenarios, the assistant should be instructed to pump the bellows until a specific pressure is reached on the manometer attached to the bellows device. Once this threshold is

Download English Version:

<https://daneshyari.com/en/article/3236672>

Download Persian Version:

<https://daneshyari.com/article/3236672>

[Daneshyari.com](https://daneshyari.com)