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# Heuristic Evaluation of Usability of Ventilator Interface by Simulator

**Yuguo Chen***

*Department of Emergency, Shandong University, China*

## DESCRIPTION

In the realm of modern medicine, few inventions have played as vital a role as ventilators. These complex mechanical devices have revolutionized the treatment of patients with compromised respiratory systems, serving as a lifeline for those who are unable to breathe adequately on their own. Ventilators have evolved significantly since their inception, becoming indispensable tools in Intensive Care Units (ICUs) and emergency medical settings. In this article, we will delve into the workings of ventilators, their historical development, the various types available, their significance during the COVID-19 pandemic, and the future of this critical medical technology. The origins of ventilator technology can be traced back to the mid-20th century. Early versions of ventilators were large, cumbersome machines with limited functionalities. However, their potential to assist patients with respiratory distress was recognized early on. The iron lung, a negative pressure ventilator, gained prominence during the polio epidemic of the 1940s and 1950s. It operated by creating a vacuum around the patient's body, causing air to flow into the lungs. While effective, these devices had limitations and were eventually replaced by positive pressure ventilators. Positive pressure ventilators, which use mechanical force to push air into the lungs, represented a significant leap forward in the field of critical care. The development of these ventilators paved the way for more controlled and customizable respiratory support. Over time, advancements in technology led to the creation of sophisticated ventilators equipped with microprocessors, sensors, and intricate algorithms to optimize patient care. The pathway through which oxygen-rich air is delivered to the patient's lungs and carbon dioxide is removed. It consists of tubing, connectors, and valves. Ventilators are connected to a supply of medical-grade oxygen and air. Some ventilators can also provide a mix of gases, such as helium-oxygen blends, to reduce airway resistance. These devices monitor the patient's respiratory parameters, such as tidal volume (the amount of air inhaled or exhaled in a breath), pressure, and oxygen levels. The ventilator adjusts its settings based on these measurements. Modern ventilators are equipped with sophisticated microprocessors that process data from sensors and adjust ventilator settings accordingly. This ensures precise and individualized care for patients. Ventilators offer various ventilation modes, such as assist-control, pressure support, and Synchronized Intermittent Mandatory Ventilation (SIMV). These modes determine how the ventilator delivers breaths and interacts with the patient's natural breathing efforts. The basic working principle of a ventilator involves delivering a carefully controlled mixture of oxygen and air to the patient's lungs at a specific rate and pressure. The ventilator can operate in either invasive mode, where a tube is inserted into the patient's airway (endotracheal intubation), or non-invasive mode, where a mask or nasal prongs are used to deliver the air. These are designed for use in ICUs and are capable of delivering a wide range of ventilation modes to accommodate patients with varying respiratory needs. Portable and lightweight, these ventilators are intended for use during patient transport, ensuring continuous respiratory support enroute to different medical facilities. Patients with chronic respiratory conditions may require long-term ventilator support. Home ventilators are designed for ease of use and are often equipped with features that allow patients to maintain their quality of life.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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**Corresponding author** Yuguo Chen, Department of Emergency, Shandong University, China, E-mail: chen_919085@sdu.edu.cn

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