

VENTILATION TRAINING ANALYZER MANIKIN

TECHNICAL FIELD

The invention relates to a ventilation training analyzer manikin, for providing a quantitative measurement of the relative proportions of breathable gas volume delivered to a patient's lungs and to a patient's stomach during ventilation attempts by a user, thus indicating proper and improper ventilation methods and equipment operating techniques.

BACKGROUND OF THE ART

Emergency medical service providers require adequate training and frequent practice to master proper techniques and use of equipment in ventilating patients or applying to cardiopulmonary resuscitation.

In the field of cardiopulmonary resuscitation and respiratory resuscitation, the problem concerned with delivery of a consistent ventilation is well defined in the relevant literature. In particular, the quality of ventilation delivery when operator powered devices are used is particularly suspect and varies greatly according to experience, training and general coordination ability.

Operator powered devices include bag-valve-masks, face shields, and pocket masks. Air and oxygen are delivered with a bag-valve-mask when the operator physically squeezes the inflated bag to deliver a tidal volume of air to the patient's respiratory system.

In theory the medical service provider should pay attention to consistently timed tidal volumes of approximately equal volume and pressure dependent on the body size and age of the patient. In practice, however emergency care personnel are often under extreme stress and have many other duties to perform in urgent care situations that tend to reduce the attention and level of care directed to ventilation techniques. Manually operated valves delivering pressurized gas from storage cylinders are also used improperly since operators are busy and preoccupied with other duties and may not provide a consistent timing or volume of gas delivered.

In fact, there are no published medical studies on such devices, particularly bag-valve-masks that show that they are efficacious. On the contrary, there is a large volume of published papers showing that they do not function adequately in the hands of the majority of medical service providers. The efficacious use of manually operated ventilating devices varies greatly according to the attention of the user, their experience, training, and many other factors.

The problem in the emergency medical service field is that users generally perceive that they are competent in using the devices and that the devices and methods themselves are efficacious. Judging from the clinical research however, these beliefs are totally unfounded. Ideally, an automatic ventilator with appropriate patient condition monitoring circuits and cautionary alarms can be used to provide consistent care to the patient. However, due to the perceived high cost, many decision-makers are not persuaded to spend the extra funds on devices since they perceive that the manually operated devices function efficiently.

A particular problem with bag-valve-masks and other operator-powered devices is the delivery of excess volumes of gas at high-pressure in excess of the patient's need. Excessive pressure and volume of gas causes aspiration of the stomach contents once the limited resistance of the esophageal sphincter is overcome. There is a potential for

lung damage due to excessive pressure and in the worst cases death can result from lung rupture or from choking on stomach contents that back up the unconscious patient's esophagus.

The confidence that emergency medical personnel have in the operator powered ventilators is reflected in the prior art since there are few training manikins or devices specifically directed to the over pressure and excessive volume of gas delivered which results in aspiration of stomach contents. Many training devices relate to cardiopulmonary resuscitation (CPR) due to the need to train large numbers of otherwise medically unskilled persons. An absence of ventilation training devices illustrates the widespread misconception that medical care personnel are adequately trained with existing equipment.

U.S. Pat. No. 5,557,049 to Ratner discloses a disposable manometer, which is used on a CPR bag-valve-mask device to indicate the pressure of gas being delivered to the patient. The Ratner solution presumes that the user has time and attention available to view the manometer and adjust their ventilation efforts accordingly. However, in reality during literally life and death situations the operators are constantly preoccupied. The bag-valve-mask requires almost continuous contact with one hand of the user and thereby imposes extreme limitations on their actions. In an effort to accomplish more than one task at a time, the user can easily neglect the bag-valve-mask or deliver inconsistent ventilation to the patient.

U.S. Pat. No. 5,537,998 to Bauman provides a spring loaded piston which serves to detect and exhaust excess air pressure in a simple manual resuscitator with vent ports open depending on the extent of internal pressure delivered to the patient with the manual resuscitator.

U.S. Pat. No. 5,286,206 to Epstein et al. discloses a CPR manikin and disposable lung bag wherein the lung bag includes a primary portion inflated to mimic the inflation of the lungs and a secondary portion separated by a flow restricting orifice to mimic the aspiration of the stomach when air delivered to the lungs is of excessive volume or pressure in applying manual CPR.

U.S. Pat. No. 5,330,514 to Egelandsdal et al. discloses a dummy for practicing cardiopulmonary resuscitation which includes a flexible bag with high pressure relief port to mimic the inflation and deflation of a patient's lung during CPR application.

None of the prior art devices specifically teach the trainee to prevent stomach aspiration by limiting the pressure and volume of gas with any degree of accuracy.

It is an object of the present invention to provide a clear quantitative measurement of the volume of gas delivered to both the lungs and the stomach during respiratory resuscitation thereby providing an indication of the quality of the resuscitation efforts being delivered by the trainee.

It is a further object of the invention to provide a training manikin that imitates human anatomy and physiology to train persons involved in respiratory resuscitation in the proper methods of avoiding aspiration of stomach contents and delivery of excessive pressure or tidal volume.

A further object of the invention is to provide means to demonstrate particularly to experienced users that, despite their many years of conventional training and on-the-job experience, they are not performing ventilation functions correctly with operator powered devices and to provide users with a quantitative measurement of their incompetence with these devices thus allowing them to practice and perfect their skills in a real life situation.