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THE USE OF VENTILATOR DEVICES IN HOSPITALS.

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ABSTRACT:

This report contains a review of the use of ventilator devices in hospitals, showing how and where they are used for health and care professional workers, and understanding the importance of the use of them since the beginning till today. Also explaining the difference between ventilator and respirator, something that could cause confusion to non-professionals in the sector due to the misinformation offered by the media, especially in times of the Covid-19 pandemic that are being experienced throughout the world. This study also shows the important role of this device nowadays, in order to determine how its use has increased, and the impact that such device has offered in hospitals during the last two years.

In this report is has been use a secondary data research, and an analysis of percentage based on secondary sources such as NHS government web site.

INTRODUCTION:

A mechanical ventilator is a device designed to help a person breathe when they are unable to do so on their own.

The use of assisted respiration dates to the Middle Ages, where evidence of the use of ventilators in animals could be found in the year 1500, but failed attempts in humans meant that there were no samples of successful devices for the next three hundred years/ It would not be until 1887 when the use of ventilators in humans was officially known, thus creating a successive improvement of the different devices that were used later. Currently, assisted ventilation systems have been improved dramatically, avoiding the patient suffering post-treatment sequelae. These devices can be found in different places in everyday life such as nursing homes, but is in hospitals where they play a crucial role, especially in these times that are being lived because of the Covid-19 pandemic.

HISTORY OF THE VENTILATOR:

In 1887 a surgeon named Georg Edward Fell created a pressure ventilation system, with which he treated patients poisoned by opium or morphine through a tracheostomy and later with a mask, preventing them from dying of respiratory failure. A year later, in 1888 the New Yorker Joseph O'Dwyer avoided the tracheostomy by creating a method of intubation using Fell's ventilator, the new apparatus was called Fell-O'Dwyer. (Romero, P. Marquez, C. and Cabrera, J. 2020)

After years of testing with positive pressure ventilators, it was in 1928 when engineers Drinker and Shaw created the so-called "Iron lung", the first negative pressure ventilator. Later, during 1952-1953 the use of negative ventilation was changed, creating new positive pressure ventilation machines. (Soto, G. 2016)

The following decades during the twentieth century, four generations of ventilators were created being the fourth generation those ones that are currently in use, within this last generation there are three different types of systems: adaptive assisted ventilation, proportionally assisted ventilation, and neuralgy adjusted ventilation which is much less aggressive than a hundred years ago. (Kacmarek, R. 2011)

DIFFERENCES BETWEEN VENTILATOR AND RESPIRATOR:

Since the beginning of the Covid-19 pandemic, the lack of ventilators and respirators in hospitals around the world began to be heard in the news, many people are under the impression that both devices they are the same, or even wrong the terms when speaking about them. Basically, a respirator is a mask used in health protection equipment to filter the air, and thus prevent professionals from catching viruses or bacteria. On the other hand, a ventilator is a device in charge of assisting the breathing of patients when they suffer respiratory failure. (Kelly, J. 2020)

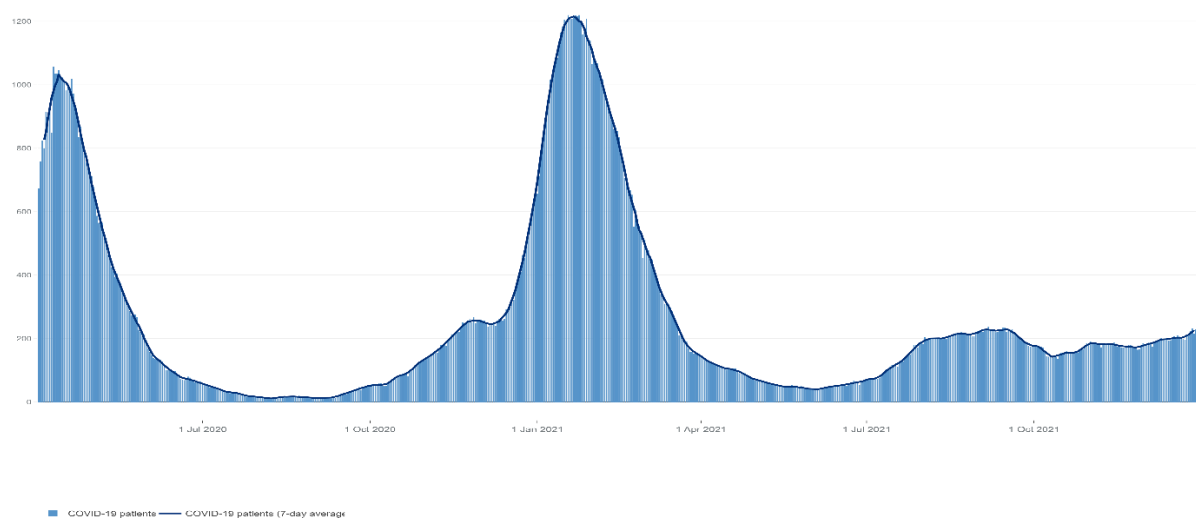
THE USE OF VENTILATORS IN HOSPITALS:

The use of mechanical ventilation is different when it comes to neonates, children or adults, due to the difference in weight, height, rib cage, the type of disease, and state of the lungs. For all these characteristics, different methods are used as they can whether through intubation, tracheotomy or mask, it is possible that the device is similar, but it generally differs both in neonatology, pediatrics and adults. (Castillo, A. 2017). In most cases mechanical ventilation in hospitals is attributed to intensive care units and operating rooms, which is why its use is limited to a small number of professionals.

Among the necessary components to treat patients with assisted ventilation, one of the crucial factors to be able to carry out this practice is the bed space, which needs to be

provided by electricity, oxygen, medical gas, suction system and monitored equipment. Which means that in times of great influx of patients such as the current covid-19 pandemic, hospitals are saturated and therefore the percentage of use of ventilators increases considerably. (Ajao, A.et all. 2015). Only in the city of London since the beginning of the pandemic, during the high peaks of hospitalizations the average number of patients with Covid-19 in ventilation beds reached 1,200 in an average hospitalization of seven days, while in the low peaks it became 15 the number of patients in an average of seven days.

The following graph shows this data:



picture from: GOV.UK

For this reason, the NHS was forced to set up an additional hospital facility in East London's ExCeL exhibition centre, with the intention of avoiding the collapse of the city's hospitals, since outside the intensive care units it was practically impossible to fit ventilators in the rest of beds in the hospitals. That crisis was experienced in most countries affected by the Covid-19 pandemic, examples such as the construction of a hospital in just three weeks in the city of Wuhan in China, or the fitting out of a hospital in the IFEMA exhibition centre in Madrid, made clear the need to enable an extra number of beds with mechanical ventilation, since the hospitals were not able to cope with the number of patients suffering from respiratory failure due to the virus.

However, some of the studies affirm that the use of mechanical ventilation in some cases does not guarantee patient survival, in the article "Mechanical ventilation in Covid-19: interpreting the current epidemiology", Wunsch, H. (2020) explains that in an epidemiological study carried out in the United States in 2010, on people aged 85 years or older who were ventilated, 50% of them died during their hospital admission, and in addition to collecting data on newspaper in the United Kingdom, where it is ensured that 65% of mechanically

ventilated Covid-19 patients did not survive this disease. But since this disease it is still unknown in the scientific field, it is difficult to use these data to corroborate that ventilators are not being the key when treating the bilateral pneumonia caused by the recent Covid-19 virus, a more in-depth study would have to be done by analysing data, on those who died from Covid-19 in these two years of pandemic, taking into account age, lifestyle, if the patients suffered from other pathologies or even if they had received the vaccination guidelines. In other hand, in the article “Comparative analysis between the use of renin-angiotensin system antagonist and clinical outcomes of hospitalized patients with Covid-19 respiratory infection” (Martinez- del Rio, J. et all. 2020) based on data from a study carried out by the Hospital Universitario de Ciudad Real in Spain to 921 patients, between 1st of March and 30th of April 2020, the positive deaths in Covid-19 were older, and presented pathologies related to high blood pressure and heart failure among others, data that were not given in the other patients who survived, therefore, it could not be said that ventilators do not work in older patients, nor that in 65% of cases they did not help in the treatment of patients.

Another fundamental component to treat patients with assisted ventilation are the professionals trained to carry it out, critical care physicians, critical care nurses, specialist anaesthetises, and respiratory therapists are the only professionals trained to do it, which was another problem during the waves of the Covid-19 pandemic in hospitals. The lack of professionals already trained to deal with this respiratory symptom delay the whole care process.

As well explains Anandaciva, S. (2020), within the severity levels in intensive care being level 2 intermediate and level 3 critical, in NHS hospitals in England, a nurse for every two patients at level 2 and one nurse per patient at level 3 is required per protocol, which also helps hospitals collapse since it is not only about having enough beds with assisted ventilation, but also necessary qualified health personnel to care for patients properly. Given the high demand for professionals during the high peaks of hospitalizations due to Covid-19, a number of nurses who work for example in operating rooms, they were trained to help other intensive care professionals, the protocols were changed by the NHS allowing them to be cared for more patients, allowing a nurse who normally cared for a single patient, could attend up to six patients with the help of two other nurses not specialized in intensive care, in the case of doctors, a specialist was allowed to ask to treat 30 patients with the help of two non-intensive care doctors. In other countries, and due to the wave of infected people with covid 19 symptoms, health care professionals had to adopt similar approaches about protocols of action when dealing with such a huge number of unwell patients.

CONCLUSION:

For almost two hundred years, the use of ventilators in patients with respiratory failure has been increasing, and above all improving the characteristics of the devices, in order to offer more benefits with less risk to the patients. Among these improvements, it is worth noting how light and efficient the latest generation of ventilators are, thus making them available outside hospitals such as in intensive care ambulances, or even in nursing homes, although obviously much of the use of ventilators is carried out in the intensive care units of hospitals, or during operations on anesthetized patients. However, this study not only shows how necessary ventilators are in hospitals, but also how necessary it is to have a qualified healthcare personnel to be able to use them, thus avoiding collapses in healthcare.

The future of assisted ventilation continues to advance, in fact the so-called ECMO is already being used, an extracorporeal membrane oxygenation system, basically insufflating oxygen through the vein, although at the moment it is only used as a rescue technique in cases in which the Ventilator does not eliminate carbon dioxide in very inflamed lungs, at the moment it is not considered an alternative to ventilators, since it is a technique that causes more risks and side effects (Carretero, A. 2020). Therefore, it could be said that ventilators are the only device that currently exists to assist patients with respiratory failure.

REFERENCES:

Ajao, A. et al. (2015) "Assessing the Capacity of the US Health Care System to Use Additional Mechanical Ventilators During a Large-Scale Public Health Emergency", *Disaster Med Public Health Prep*, 9 (6), pp 634-641, [Online]. Available from:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4636910/> (Accessed: 2 January 2022).

Anandaciva, S. (2020) "Critical care services in the English NHS", *The Kings Found*, [Online]. Available from: <https://www.kingsfund.org.uk/publications/critical-care-services-nhs> (Accessed: 3 January 2022).

Castillo, A. (2017) "Pediatric Invasive Mechanical Ventilation", *Original Articles*, 12 (1), pp 15-22, [Online]. Available from: <https://neumologiapediatrica.cl/index.php/NP/article/view/282/257> (Accessed: 2 January 2022).

Carretero, A. (2020) *What is ECMO and in which cases is it used?* [Online]. Available from: <https://www.tucanaldesalud.es/es/tecnologia/articulos/ecmo-casos-utiliza> (Accessed: 5 January 2022).

Kacmarek, R. (2011) "The Mechanical Ventilator: Past, Present, and Future", *Respiratory Care*, 56 (8). [Online]. Available from: <http://rc.rcjournal.com/content/56/8/1170> (Accessed: 30 December 2021).

Kelly, J. (2020) *What Is the Difference Between A "Respirator" And A "Ventilator"?* [Online]. Available from: <https://www.dictionary.com/e/respirator-vs-ventilator/> (Accessed: 1 January 2022).

Martinez- del Rio, J. et all. (2020) "Comparative analysis between the use of renin-angiotensin system antagonist and clinical outcomes of hospitalized patients with Covid-19 respiratory infection", *Clinic Medicine*, 155 (11), pp 473-481, [Online]. Available from: <https://www.sciencedirect.com/science/article/pii/S0025775320304802> (Accessed: 3 January 2022).

Romero, P. Marquez, C. and Cabrera, J. (2011) "The History of Mechanical Ventilation. From Antiquity to Copenhagen 1952", *Revista Medica de Chile*, 148 (6), pp 822-830, [Online]. Available from: https://www.scielo.cl/scielo.php?script=sci_arttext&pid=S0034-98872020000600822 (Accessed: 30 December 2021).

Soto, G. (2016) "Mechanical Ventilation: A Short History", *Original Articles*, 11 (4), pp 151-154, [Online]. Available from: https://www.scielo.cl/scielo.php?script=sci_arttext&pid=S0034-98872020000600822 (Accessed: 31 December 2021).

Wunsch, H. (2020) "Mechanical Ventilation in COVID-19: Interpreting the current epidemiology", *American Journal of Respiratory and Critical Care Medicine*, 202 (1), pp 1-21, [Online]. Available from: <https://www.atsjournals.org/doi/full/10.1164/rccm.202004-1385ED#aff1> (Accessed: 2 January 2022).