The Work of Claudio Castillón Lévano's Neonatal Artificial Bubble in Latin America

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Introduction

Medical devices are continuously being updated and newly invented as our paradigm on health and various cultures influence the way we view the natural world. In the book "Science in Latin America" by Juan Jose Saldano, we learn about how the development of science led to new types of discoveries, ideas, and resources as this exchange was derived from the influence of various cultures coming together. One of the most important scientific developments in Latin America was in the early 21st century as the neonatal artificial bubble was created by a Peruvian engineer Claudio Castillón Lévano (Itif, 2018). For all developing countries, the mortality and morbidity rates of new born babies are a major worldwide concern, especially in places with less resources, hospitals, and healthcare where rates tend to be higher (Levine et al., 2015). Some countries that are still developing with lack of resources, less hospitals available, and fewer healthcare providers tend to have higher mortality preterm birth rates (Levine et al., 2015). In Peru where residents constantly live at high altitudes, it has caused some implications not only for symptoms, such as fatigue, nausea, and headaches, but as well as birth rates (Levine et al., 2015).

In the mid-late 1800s, the incubator was first invented with the purpose of reducing premature mortality rates in baby infants, especially for high-risk newborns (Baker, J. P., 2000). The medical device would prevent any type of external contamination from entering the capsule.

Figure 1. Peruvian engineer, Claudio Castillón Lévano, with the neonatal artificial bubble (Itif, 2018).

Methodology

The neonatal artificial bubble is a medical device acting as a sterilized environment for newborn babies. The neonatal capsule is connected to an air feeding tube that filters any unwanted particles for sterilized air to enter the capsule, which acts as a closed circuit system. The neonatal capsule is composed of two concentric half cylindrical layers for optimal circulation of sterilized airflow. The double concentric layers are transparent allowing physicians to monitor the medical conditions of newborns without interfering or opening the capsule. For placing or removing the newborns from the neonatal capsule, it is designed with one front and back door. Connected to the capsule, the thermal base container contains a fan and electric heater to circulate the sterilized air and maintain constant temperature between the neonatal capsule and closed air circuit system. Also, the thermal base container minimizes the amount of noise that is generated from the continuous circulation of airflow by using acoustic filters. The continuous

airflow enters the neonatal capsule through an air and oxygen line merged into a gas collector line allowing for filtered, oxygenated, temperature controlled, and humidified air for the newborn babies. Both the air and oxygen line contains a generator collecting air from the environment while filtering out harmful microbes, check and flow valve, and a flow sensor for proper air intake to the gas lines. The gas collector line regulates the sterilized air along with a humidifier that uses distilled water. A ventilation circuit allows for gas to leave the neonatal capsule.

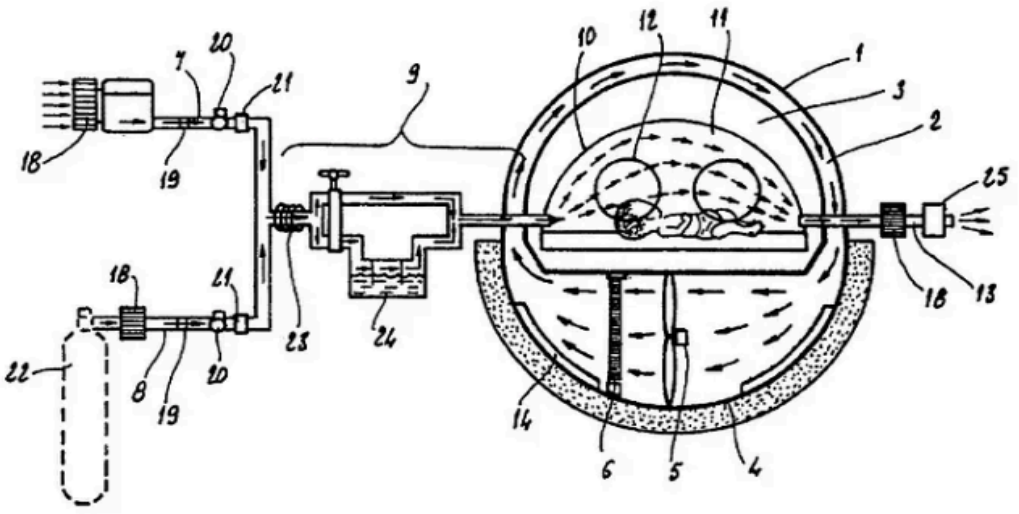

Figure 2. A diagram of the neonatal artificial bubble (Lévano, C. B. C., & Lam, E. A., 2005).

Results

Through Lévano and his team's innovation of the baby incubator, their work being the neonatal artificial bubble, played an important role in reducing mortality preterm birth rate problems in Latin America (Itif., 2018). Previous models of the baby incubator did not account for regulated temperature, noises, and sterilized environment which greatly reduced the risk of infection, hypothermia, and hypoxia to newborn babies (Itif., 2018). A challenge that physicians or those in the healthcare field face when using the incubator could be mainly the lack of

knowledge from the operator (Ribeiro Custódio et al., 2019). Although, this challenge would be regarded as a low level of severity and the incubator's design would be upgraded as we make new breakthroughs in science, medicine, and health fields.

Conclusion

The design of the neonatal artificial bubble pioneered the way for current baby incubator technology to reduce the mortality of preterm birth rates worldwide.

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