F&P Neopuff™

Frequently Asked Questions

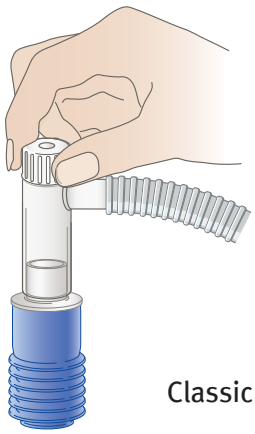
Fisher & Paykel HEALTHCARE

Q: Why is PEEP important in neonatal resuscitation?

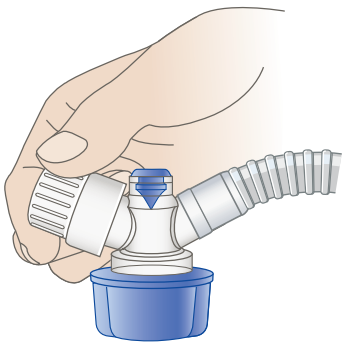
A: Positive End Expiratory Pressure (PEEP) is the residual pressure in the lungs at the end of expiration. Application of constant PEEP increases the transpulmonary pressure at end-expiration, thereby increasing functional residual capacity (FRC). Functional Residual Capacity is the volume of air in the respiratory system at the resting level or at the end of tidal volume expiration. By increasing the FRC, intrapulmonary shunting is reduced and arterial oxygenation increases.

Further, PEEP expands collapsed alveoli consequently increasing lung volume which may lead to an increase in lung compliance.

The Neopuff Infant Resuscitator is a simple device that can effectively deliver target PIP and PEEP. The PEEP is provided by a valve on the T-piece and is given automatically. It can be set prior to resuscitation and is displayed on the integrated manometer. PEEP level is constant and is maintained automatically for every breath.



Classic T-Piece

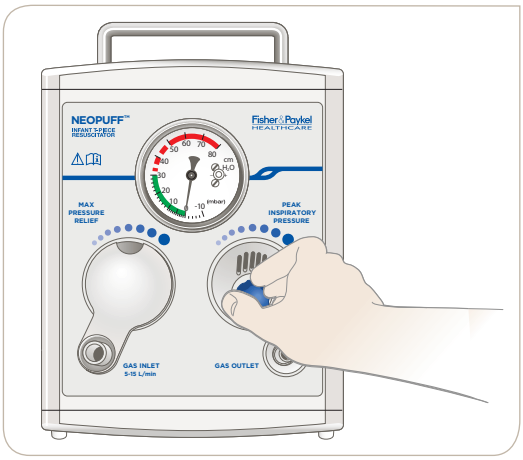


Ergonomic T-Piece

Q: How important is controlled PIP in neonatal resuscitation?

A: Peak inspiratory pressure (PIP) is the maximum inspiratory pressure required to open the lungs during resuscitation. However, too high pressure breaths or delivering very large tidal volumes may lead to over distension[1] resulting in barotrauma. With barotrauma, the free air from ruptured alveoli may leak into the interstitial space, leading to pulmonary interstitial emphysema. Air may also leak into the pleural space, peritoneum, mediastenum and pericardium, causing pneumothorax, penumoperitoneum, pneumomediastenum or pneumopericardium. As a result, the areas available for gas exchange will be further limited in the already compromised premature lungs. The associated morbidity and mortality rates are high: ranging between 50-70%[2]. In those that do survive, the risk of chronic lung disease is further increased[3]. To reduce these life threatening complications, barotrauma must be avoided. This can be achieved by utilizing the lowest possible peak inspiratory pressure (PIP) required to adequately oxygenate the neonate[2]. In the same manner, inadequate pressures or under inflation can cause asphyxia that may lead to either death or brain damage[4].

Considering the possible complications of over or under inflation, a controlled inspiratory pressure (PIP) is essential in neonatal resuscitation.



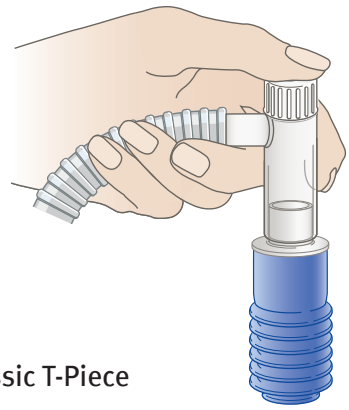
The Neopuff Infant Resiscitator is designed to provide safe and controlled PIP. As the pressure is set by the user before resuscitation, every breath has the same PIP regardless of the skill or experience of the operator. PIP is displayed on the intergrated manometer.

Ref:

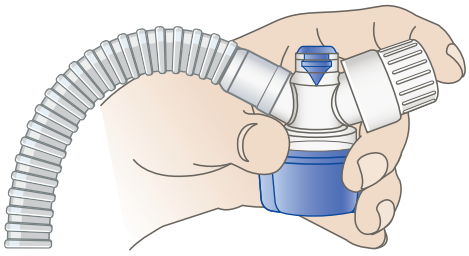
[1]Carrol, P (1991). Pneumothorax in the newborn. Neonatal Network, 10 (2), 27-34
[2]Cunningham, K.,Paes,B.A.,Symington, A (1992). Pulmonary Interstitial Emphysema: A review. Neonatal Network, 11. (5), 7-15
[3]Givhan, M. (1993). Respiratory distress. In Beachy, P.& Deacon,J. (Eds), Core Curriculum for Neonatal Intensive Care Nursing (pp.117-119). Phildephia: W.B. Saunders.
[4] Milner, A D. Resuscitation of the newborn. Arch Dis Child (1991)

Q: Is it possible to deliver longer or higher initial breaths with Neopuff?

A: Yes, with the Neopuff, longer initial breaths can be given if required by holding the finger over the T-piece for a longer period of time.

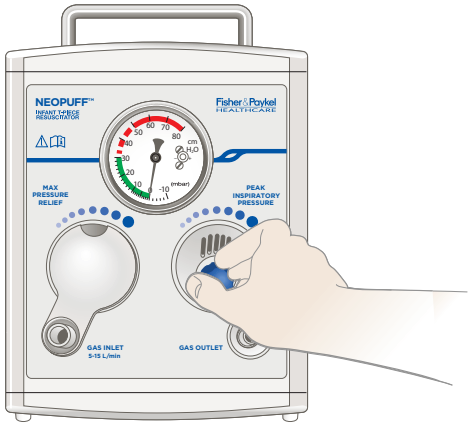


Classic T-Piece



Ergonomic T-Piece

If a higher pressure breath is needed, adjusting the PIP valve allows a safe and accurate increase in the pressure to be supplied. The pressure is displayed on the integrated manometer and can be changed while resuscitating.



Q: What are the advantages of Neopuff compared to conventional bags?

A: The Neopuff Infant Resuscitator offers a number of benefits for both the neonate and the user:

- The Neopuff Infant Resuscitator can effectively deliver target PIP and PEEP better than current devices even in the hands of experienced resuscitators. It is not possible to give PEEP with some resuscitation devices and even experienced resuscitators find it difficult to maintain consistent PEEP levels with self-inflating bags or anesthetic bags[1].

- With the simplicity in operation, operators could use both hands to affix the mask to the face and achieve better seal between the mask and the airway[1].

- Neopuff can be used with a mask or ET tube, thus allowing it to be utilized in many clinical settings, e.g. initial resuscitation of the neonate in delivery suites, to oxygenate the neonate prior to reintubation or ET change, as means of manual ventilation in remote hospitals while awaiting specialist assistance or transport to level three center, etc.[2].

- Any concentration of O_2 can be delivered from room air (21%) to 100%. By connecting the Neopuff to an oxygen supply, 100% oxygen can be supplied. This is difficult to achieve with the bag as oxygen gets diluted with room air. Alternatively, room air or blended mixture can also be used.

- In using the Neopuff, every breath has the same PIP regardless of the skill or experience of the operator. This means experience, training, concentration and fatigue level have minimal effect on the pressures being delivered. Results from a study done by Howard-Glen L and Koniak-Griffin D on the use of self-inflating resuscitation bag showed that without the use of manometers, 60% of the PIPs delivered were outside the prescribed range. Even using the manometer, 20% of the breaths were still outside the range as it is impossible to look at the manometer and the baby at the same time. It was noted that delivered PIP were as high as double or triple the prescribed range for some of the nurses[3].

Ref:

[1]Neil Finer.M.D., Wade Rich. RCP, Alissa Craft D.O., Christopher Henderson. RCP (2001); Dept. of Neonatology, University of California, San Diego Medical Center; Comparison of Methods of Bag and Mask Ventilation for Neonatal Resuscitation

[2]Rosemarie A Boland, Royal North Shore Hospital, Neonatal Intensive Care Unit. Minimizing the riskof barotrauma using the Neopuff Infant Resuscitator (1995).

[3]Howard-Glen L, Koniak-Griffin D. Evaluation of Manometer use in manual ventilation of infants in neonatal intensive care units. Heart and Lung. 1990, 19(6):620-7

Q: What is the benefit of the pressure relief valve?

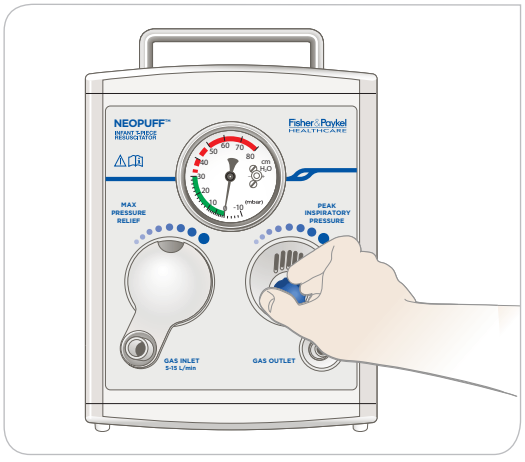
A: The pressure relief valve is a safety feature of the Neopuff Infant Resuscitator. The maximum pressure can be set to the nearest 2cm H_2O.

This means that the person-in-charge can pre-set this valve so that accidental delivery of an excessively high PIP can be avoided. The valve is provided with a cover that can be pushed to one side if necessary to adjust the maximum pressure. Generally, the setting can be done once and checked in accordance with the hospital protocol.

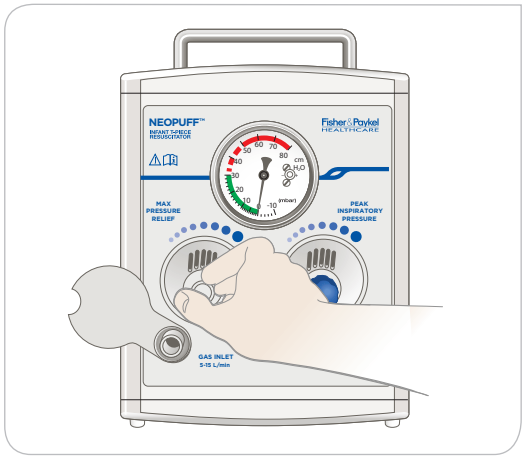
Resuscitation bags can be equipped with a maximum pressure relief valve but these are pre-set to a single pressure only and cannot be adjusted.

In the study done by Neil Finer, et. al. on self-inflating resuscitators, results showed that the pop-off valves of the 3 bags used were activated between the pressure range of 41 and 72 cm H_2O for the Laerdal, 51 and 97 cm H_2O for PMR-2 and between 38 and 106 cm H_2O for Ohio which are well above their recommended limits of 35 – 40 cm H_2O.

The Neopuff Infant Resuscitator is designed to ensure safe and accurate pressures are delivered to the neonate without exceeding the limit set at the pressure relief valve.



To adjust, occlude the PEEP cap and turn PIP control valve fully clockwise



Then turn the pressure relief valve clockwise or counter-clockwise to set maximum pressure

Ref:

Neil Finer, MD, FRCP(C), Keith J. Barrington, MB, ChB, MRCP(UK), Fadel Al-Fadley, MD, and Katherine L. Peters, RN, MN. Limitations of Self-Inflating Resuscitators. Pediatrics (1986) Vol 77 No. 3, 417-420.

Q: How can we achieve optimal resuscitation?

A: Optimal resuscitation requires safe inflation of the lungs and providing oxygenation without the risks associated with under or over inflation at uncontrolled pressures.

The following factors are essential to attain optimal resuscitation:

- Safe, controlled, precise PIP
- Consistent, precise PEEP
- Good breath rate
- Supply of 100% O_2 (where indicated)
- Good seal

The Neopuff Infant Resuscitator is designed to provide safe, controlled and accurate resuscitation of newborn babies. PIP and PEEP can be set by the user before resuscitation and are displayed on the integrated manometer. PIP and PEEP levels are constant and are maintained automatically for every breath (see Fig.1). Good breath rate refers not only to the number of breaths per minute but also to the I/E ratio which can be controlled by the frequency and length of time in occluding the T-piece (Fig.2). An oxygen supply or a blender can be used to provide the O_2 concentration required (from room air of 21% to 100%).

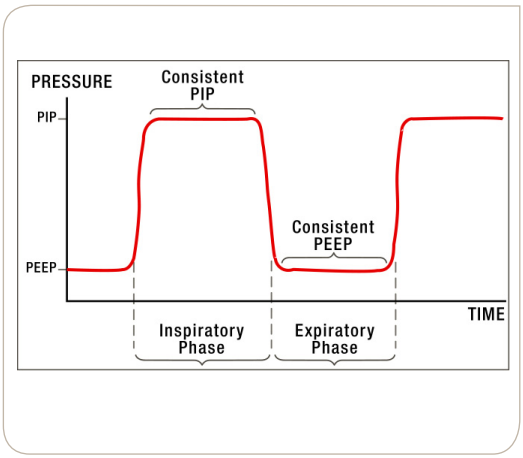


Fig.1

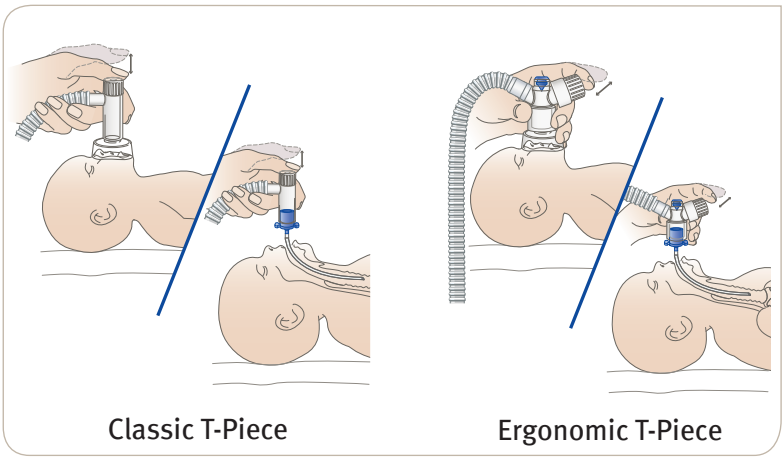


Fig.2

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