Original Article

Comparison of training in neonatal resuscitation using self inflating bag and T-piece resuscitator

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ABSTRACT

Background: Both the self inflating bag and the T-piece resuscitator are recommended for neonatal resuscitation, but many health care workers are unfamiliar with using the latter. A prospective, comparative, observational study was done to determine the ease and effectiveness of training of health care personnel in the two devices using infant training manikins.

Methods: 100 health care workers, who had no prior formal training in neonatal resuscitation, were divided into small groups and trained in the use of the two devices by qualified trainers. Assessment of cognitive skills was done by pre and post MCQs. Psychomotor skill was assessed post training on manikins using a 10-point objective score. Acceptance by users was ascertained by questionnaire. Assessments were also done after 24 h and 3 months. Comparison was done by Chi square and paired *t*-tests.

Results: Pre-training cognitive tests increased from 3.77 (+1.58) to 6.99 (+1.28) on day of training which was significant. Post training assessment of psychomotor skills showed significantly higher initial scores for the T-piece group (7.07 + 2.57) on day of training. Reassessment after 24 h showed significant improvement in cognitive scores (9.89 + 1.24) and psychomotor scores in both groups (8.86 + 1.42 for self inflating bag and 9.70 + 0.57 for T-piece resuscitator). After 3—6 months the scores in both domains showed some decline which was not statistically significant. User acceptability was the same for both devices.

Conclusion: It is equally easy to train health care workers in both devices. Both groups showed good short term recall and both devices were equally acceptable to the users.

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Introduction

Dr Hilda Roberts was the first person to strongly propose intermittent positive pressure ventilation (PPV) to newborns who did not cry on their own after birth.[1] The most common device used to deliver this is the self-inflating resuscitation bag with mask (BM). Devised in 1954, this has withstood the test of time.[2] Its appeal lies in its ability to use room air for self filling and the minimal skills required for assembly and use.

Its drawbacks are the inability to provide Positive End Expiratory Pressure (PEEP) or to set a specific Peak Inspiratory Pressure (PIP), resulting in inconsistency in the amount of pressure given between breaths. Also, it is ergonomically difficult to keep the device in place during prolonged resuscitation, resulting in a large proportion of delivered breaths being unknowingly lost through leak around the face mask. The T-piece resuscitator (TP) is advantageous in all these aspects but needs a continuous flow of gas for operation and is slightly more complex to setup initially. Despite it being first described as early as 1913, its use, even today, is not widespread.[3] Several studies have shown that for the majority of babies who do not breathe at birth, initial ventilation with a self inflating bag and mask is adequate. However, the use of PEEP from birth in preterm babies requiring resuscitation is well established as it not only keeps the alveoli open but improves surfactant action. Recent guidelines have incorporated the TP resuscitator as an accepted method for delivering positive pressure ventilation to the neonate during resuscitation. It is recommended particularly in preterm neonates.[4] Training of health care personnel coming in contact with newly born babies in the use of this device is therefore crucial and it is essential that inhibitions and misconceptions in the use of the TP resuscitator be removed. This study was undertaken to determine the ease and efficacy of training in the two devices.

Material and methods

This was a prospective, observational, comparative study on 100 health care personnel. The sample size was calculated using the assumption that the overall baseline knowledge on the pretest would be 4/10. This was based on a previous study done in the unit. To achieve a 50% increase (to 6/10) with a power of 80% and an alpha error of 0.05, using a standard statistical package, we reached a figure of 92. For the purpose of convenience (since we were training in batches of 10) we decided on a study population of 100.

The participants included 1st year PG residents in Paediatrics, Obstetrics, Anaesthesia and probationer (trainee) nurses who had no previous, formal exposure to the use of T-piece Resuscitator and Self Inflating bag for neonatal resuscitation. Infant manikins with skill guides (Laerdal Resusci Baby) were used for teaching and evaluation of skills. If chest inflation was adequate a green light blinked on the Skills Guide. If the pressure was inadequate, or too much air got into the stomach, a red light blinked. A continuous blinking of the green light for >75% of the time during resuscitation was taken as delivery of effective PPV. Resuscitation devices used for training purposes were the Self inflating bag (Laerdal, 450 ml) with pop-off valve and correct sized mask and the T-piece Resuscitator (Neopuff by Fisher & Paykel) with appropriate mask. The participants who met the inclusion criteria were divided into groups of 10 each for training. The authors (SSM and KMA), who are qualified national trainers in Neonatal Resuscitation Protocol, carried out the training and assessment of physical skills. Groups of participants were called on a pre-decided date and time. To assess baseline cognitive knowledge they were subjected to a pretest which

consisted of 10 multiple choice questions of 1 mark each which had to be answered in a time span of 03 min (Table 1). This was followed by a lecture with power point presentation on the two devices. This was followed by a post test which consisted of the same 10 multiple choice questions as in the pretest. Practical demonstration was then carried out in which the participants were demonstrated the use of both devices. Participants were then randomly allotted to be trained first on either of the two devices and crossed over to the other on completion. Demonstration of psychomotor skills included assembling the equipment, checking the effectiveness of the equipment before delivering PPV, correct position of the baby, correct mask application, application of

Table 1 – Questionnaire for cognitive skills.
1 Indication for giving (PPV) in LR is:
a Apnoea at 1 min
b Apnoea after 30 s of initial stabilization
c Apnoea at birth
d Apnoea after suctioning of mouth and nose
2 Positive pressure ventilation alone is given @
a 40–60 breaths/min
b >60 breaths/min
c 30 breaths/min
d <40 breaths/min
3 The size of the mask used depends on :
a Size of face
b Gestational age of baby
c Weight of baby
d Head circumference of baby
4 Immediate effectiveness of PPV is checked by:
a Heart rate rise
b Chest rise
c Improvement in oxygenation
d Onset of spontaneous respiration
5 PPV can be given by:
a Mouth to mouth
b Bag and mask
c T-piece resuscitator
d All of the above
6 Free flow oxygen CANNOT be given by
a Self inflating bag and mask
b Anaesthesia bag
c T-piece resuscitator
d Tube and mask
7 PEEP can be given by
a T-piece resuscitator
b Self inflating bag and mask
c Laryngeal mask airway
d Free flow oxygen
8 During cardiac compression (CC) PPV is given in the ratio of
a 1 breath to 3 compressions
b 3 breaths to 1 compression
c 1 breath to 4 compressions
d 4 breaths to 1 compression
9 The number of valves in a self inflating bag are:
a 1
b 2
c 3
d 4
10 FiO_2 can be controlled when using all EXCEPT:
a Self inflating bag
b Anaesthesia bag
c T-piece resuscitator
d LMA to mouth