



Unplanned Extubations in Neonatal Intensive Care Unit

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Received date: 02 February 2019; **Accepted date:** 08 February 2019; **Published date:** 14 February 2019

Citation: ELMeneza SA, "Unplanned Extubations in Neonatal Intensive Care Unit". *Asp J Pediatrics Child Health*, vol.1, no.1: 5-7, 2019.

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Keywords:

Endotracheal Tube; Unplanned Extubation; Quality Improvement; Lean Methodology

Extubations is the final step in freeing newborn from mechanical ventilation at the proper time. Unplanned extubations (UE) is a state of accidental dislodgment of the endotracheal tube (EET) by chance and involuntary. UE is an unplanned event and occurred accidentally.

UE is defined as premature removal of the ETT by the patient (deliberate UE) or by staff during nursing and medical care (accidental extubation) [1].

UE may be considered as adverse events that lead to probable life-threatening safety incidents. It may trigger short- and long-term adverse effects as subject the patient to reintubation and need for resuscitation. It is the fourth most common adverse event in NICUs in the United States and North America [2,3]. Among these adverse events; cardiopulmonary depreciation, arrhythmias, hypoxemia, hypercarbia, ventilator-associated pneumonia and increase the length of hospital stay. It is also concomitant with prolonged ventilator days, trauma to the upper airways including larynx, pharynx, and trachea, subglottic stenosis and intraventricular hemorrhage [4]. Laryngospasm, dysfunctional laryngeal reflexes, depletion of oxygen stores with compromise in other systems may ensue

too.

Our experience showed that neonatal population is subjected to UE on several occasions. Unplanned extubations may happen during intubation procedure, or at any time during mechanical ventilation. UE can occur due to improper fixation techniques or use of improper adhesive tape. It also occurred during regular care of an infant by staff or inappropriate handling of patients during the performance of procedures [5]. Also, inappropriate positioning of the endotracheal tube may facilitate the UE or fault in intubation technique as the use of improper size, depth of ETT. Sometimes UE ensued by the agitated baby.

Premature and very preterm infants are more susceptible to UE as the process of securing an ETT and avoiding malposition is challenging. The difficulties arise also, from small ETT diameters, the small surface area of the infant's face and delicate skin. Warm and humid environment of the incubator reduces the stickiness of the tape too. Malpositioning can easily occur due to the extremely short length of the trachea and patient movement. The patient movement also includes frequent repositioning and removal of the infant from the Isolette to parent arms for bonding and kangaroo care

[5,6].

Medical staff misjudged the frequency of UE but knew the seriousness of its implications. The incidence of UE is stated as a percentage (the number of UEs divided by the number of ventilated patients) or as the number of UEs per 100 intubation days. The last method merges the perception of days as an exposure factor for event occurrence and considered to be more appropriate, as it permits a comparison between various NICUs. There is no accepted benchmark for the number of unplanned extubations in the NICU. Vermont Oxford Network 2012 suggested between 2 and 4.8 per 100 ventilator days, should be the highest acceptable rate [3]. There are different results between different centers; these variations could be due to various calculation methods, patient characteristics and practice. The frequency of UE varies in neonatal patients between 11.5 and 19.2%, which corresponds to a rate of 1.98 to 3.0 events per 100 days of MV [6,7]. Oliveira et al 2012 reported an incidence of 1.0 event/100 days of mechanical ventilation with a higher rate among newborns with a corrected age of 30 to 36 weeks and weight < 1,000 g [5].

One should have a high index of suspicion for UE when supervising for intubated newborn infants especially when unexpected clinical worsening as decrease in heart rate and oxygen saturation, cyanosis, decrease in movement of the chest, increased respiratory effort / respiratory distress increase in leak noted by ventilator graphic monitoring, loss of end-tidal CO2 detection, decrease or no air entry sounds on auscultation [8].

Recognition of the UE is confirmed if there is any audible patient sound i.e. any sounds at all cry, whimper etc. Also by actual witnessed ETT removal by the infant.

Whenever you suspect UE it is an emergency that necessitates calling for assistant especially if you are not capable for reintubation, also at least two staff are needed to handle this

situation. Management of the UE needs first confirmation of the event by use of CO2 detector or visual inspection with laryngoscope, or connect rebreathe circuit to ETT, manually ventilate patient for 2 breaths, while second staff listens and watches chest movement for equal and bilateral air entry, exclude oesophageal intubation or tube dislodgement and if not sure remove the ETT promptly, stop continuous milk feeds if were running and aspirate gastric contents then remove the gastric tube. Ensure continuous ECG and oxygen saturation monitoring. Maintain airway, breathing and circulation; place the infant flat on back at neutral sniff position, assess ventilation status and provide CPAP, or mask IPPV if required. Re-intubate if required, secure endotracheal tube, replace the gastric tube and decompress the stomach. Then do chest X-ray to confirm endotracheal tube location. Ensure 5-15 minute vital signs have been documented during any clinical deterioration as clinically indicated [8].

As any quality improvement procedures, you need to document the date and time of the event in the patient record as well as the actions that were taken. Knowledge regarding the method of intubation, tube size, tape type, events pre and post UE (baby's clinical status and activities, staff caring, procedures, kangaroo care etc.), last time and situation for check of the ETT strapping, use of resuscitation medication, need to more care as ECMO, airway trauma, increase hospital stay, death, return to the same condition before UE, and update parents.

Endotracheal tube (ETT) bundle or airway bundle for ETT care is standardised methodology for securing ETT that include review and documentation of ETT position according to current weight and age ,hourly monitoring and recording of ETT length and security of attachment of tape or device to the baby's face , prompt securement of ETT when securing methods noted to be loosening or compromised, critical incidence reporting of UE, documentation checklist for UE include two-person handling of intubated babies for cares and procedures with one staff member supporting the ventilator tubing and ETT,

education sessions on the adverse effects of UE and strategies for prevention UE [9].

Quality studies were done to reduce the UE, using PDSA cycles; apply UE bundle, use new commercial tape, use new taping method for ETT securement, unit staff education, standardization of patient care and transfers and positioning during procedures, and radiography and apply lean methodology showed reduction in UE rate as well as a decrease in intubated days [4,10]. NICU staff has to be aware of short and long term consequences of UE. Standardization of safe care in NICU for a ventilated newborn is mandatory. Knowing the prevalence of UE is initial step then use model for improvement to decrease the incidence of the UE in their unit [11].

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