

Clinical Pearl: Unplanned Extubation

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Unplanned extubation, defined as the unintentional dislodgment of an endotracheal tube from the trachea, has become increasingly recognized as a patient safety and quality control issue in most intensive care units. This adverse event is particularly evident in neonatal intensive care units, where many premature infants require intubation and ventilation for prolonged periods. A study reviewing data from 15 NICUs across North America reported that unplanned extubation requiring reintubation was the fourth most common adverse event following nosocomial infections, catheter infiltrations, and abnormal head imaging (1). The reported unplanned extubation rates range from 49 to 69% in pediatric intensive care units and 66 to 75% in NICUs. Neonates are more prone to unplanned extubations than older children because of several unique factors, including prolonged intubations, shorter tracheas, and possibly less sedation (6).

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The few available single-center studies of unplanned extubations in the pediatric population demonstrate a significant risk associated with these events. Up to 20% of patients experience cardiovascular collapse requiring resuscitation. Other complications include the need for reintubation and increased cost and length of hospital stay (6). One case-control study at a tertiary care pediatric hospital found that pediatric patients that underwent unplanned extubations in both the PICU and cardiac ICU had an increase in hospital stay of up to 6.5 days and a statistically significant increase in total hospital costs compared to age and diagnosis matched control patients (3). Given the significant clinical and financial consequences of unplanned extubations, many institutions have attempted to improve unplanned extubation rates within their hospitals through various quality improvement initiatives.

A large prospective quality improvement study completed at Cincinnati Children’s Hospital implemented shared initiatives across

their pediatric ICUs with an overarching goal to reduce the incidence of unplanned extubations and the serious harm associated with those adverse events (2). The authors found that each intensive care unit (PICU, CICU, NICU) identified different interventions contributing to risk reduction. Interestingly, all ICUs saw an initial increase in rates of unplanned extubations at the beginning of the study, reflective of the implementation of reporting systems that led to additional events being captured. In the NICU specifically, kangaroo care was identified as an inciting activity leading to unplanned extubations. As NICU providers, we appreciate kangaroo care for its many benefits - including temperature and blood glucose regulation, as well as its positive impact on growth, neurodevelopment, and sleep (5). However, it increases the risk of accidental extubation due to potential ETT manipulation associated with infant transfer and repositioning. Some of the interventions suggested by the study include standardization of transfer methods, detailed guidelines, required staff training, and family participation in stimulation (2). With the implementation of the above interventions, this study showed a sustained improvement in unplanned extubation rates within the NICU.

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The first large, multi-institutional national quality improvement intervention included 43 volunteer hospitals with the goal of reducing the absolute rate of unplanned extubations by 40% over two years (4). The initiative assembled a group of ten national experts from 8 centers, including physicians, nurses, and respiratory therapists from PICUs, NICUs, and CICUs, to determine standardized interventions for reducing unplanned extubations in pediatric patients. These interventions involved standardized ana-

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tomic reference points and securement methods and establishing protocols for high-risk situations such as repositioning associated with bedside imaging, kangaroo care, etc. The authors found a 24.1% aggregate reduction in unplanned extubation events overall as well as a reduction of episodes of cardiovascular collapse by 36.6% associated with the episodes of unplanned extubations likely secondary to increased awareness secondary to the quality improvement interventions in place. Specifically pertaining to the NICU, this quality improvement intervention led to a 17.6% absolute reduction of unplanned extubations in the NICUs.

“As demonstrated by the multi-center study above, collaboration on multidisciplinary and multi-institutional levels will be necessary to effectively identify risk factors and establish evidence-based, universal guidelines to reduce the incidence of unplanned extubations. Neonatal ICUs should continuously evaluate their institution’s unplanned extubation rates and potential risk factors.”

As demonstrated by the multi-center study above, collaboration on multidisciplinary and multi-institutional levels will be necessary to effectively identify risk factors and establish evidence-based, universal guidelines to reduce the incidence of unplanned extubations. Neonatal ICUs should continuously evaluate their institution’s unplanned extubation rates and potential risk factors. Based on the available data, areas of improvement include achieving better control during situations associated with excessive endotracheal tube manipulation (i.e., during bedside imaging and routine repositioning). Other suggestions include multidisciplinary extubation readiness discussions and standardization of endotracheal tube securement. An opportunity to explore is how education on the significant risk of harm associated with UE for all neonatal intensive care unit providers (including physicians, nurses, and respiratory therapists) would affect event incidence. Parental involvement in education surrounding the prevention of unplanned extubations may also decrease event incidence. Parents are often involved in kangaroo care which, as noted above, has been identified as an inciting event for unplanned extubations. Involving parents in these quality improvement measures could empower them to actively participate in preventing adverse event proto-

cols, further strengthening a culture of safety surrounding their child’s care. Though institutions should identify their unique risk factors for unplanned extubations within their NICUs, it is abundantly clear that a meaningful and significant decrease in adverse events in this patient population is only achievable through strong multidisciplinary partnerships.

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Disclosures: The author has no disclosures

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