Unplanned Extubation: Eliminating preventable deaths

Know the risk factors and take steps to prevent harm.

By Alyssa Rojo, MSN, RN; Valentina Lukyanova, PhD; Ewa Greenier, MPH, MBA, CAE; Arthur Kanowitz, MD, FACEP; and Brian D. Berry Jr., MS, MBA, BSN, RN, CRNA

The Society of Critical Care Medicine and Berkow note that 1.65 million adults are intubated and mechanically ventilated in U.S. intensive care units (ICUs) each year. An estimated 121,000 of those patients experience an unplanned extubation (UE), and more than 33,000 associated deaths occur; costs from UE complications exceed $4.9 billion. UE, a preventable adverse event for any ventilated/intubated patient, occurs when the endotracheal (ET) tube is prematurely removed by the patient or a healthcare professional. According to the Airway Safety Movement and McNett and colleagues, approximately 63% of all UEs are the direct result of a patient removing the ET tube (self-extubation) and 37% are accidental and commonly attributed to inexperienced nursing care, inadequate staffing, or inadvertent extubation by an external force (for example, during a procedure or transport).

UE may increase the incidence of ventilator-associated pneumonia (VAP), airway trauma, and cardiovascular collapse, all of which lead to increased healthcare costs. For example, a VAP diagnosis can add an additional $20,000 to a patient’s hospital bill. UE increases the average length of stay from 9 to 18 days, which, according to Berkow, can increase the total cost of care by $41,000.

When nurses and other healthcare providers understand the common complications and factors associated with UE, as well as strategies to reduce risk, they can improve patient safety and healthcare outcomes.

Patients at risk for UE
The incidence and risk factors of UE vary across patient populations, including neonates, children, and adults.

Neonates
According to Berkow and Merkel and colleagues, the UE incidence in U.S. neonatal intensive care units (NICUs) is as high as 80% because even small movements can lead to dislodgment. This represents two to three times the risk compared to children. The variation is likely due to differences in hospitals’ quality im-
improvement methods and how ET tubes are secured. According to Berkow, UE in neonates increases their average length of stay from 9 to 51 days, which costs close to $3 billion annually.

Significant risk factors for UE in neonates include:
- Long intubation duration: As the neonate grows and develops, chances increase that the ET tube may become dislodged.
- Anatomic features: Neonates have shorter tracheas compared to children, so even small movements may lead to dislodgment.
- Use of uncuffed ET tubes: Uncuffed ET tubes, which are commonly used in neonates, are less likely to stay in place than cuffed tubes.
- Increased levels of consciousness: Decreased use of sedation and muscle relaxants in this age group result in increased movement with increased risk of tube dislodgement.
- Increased patient agitation: Patients may become agitated or active, which may result in rapid head movement.
- Increased time out of bed: When neonates are held by parents or undergo procedures such as weighing and suctioning, the risk of UE increases.

**Children**

In children under 18 years old, 1.19 UE events occur per 100 intubation days, according to da Silva and colleagues (compared to the goal of fewer than 1 UE event per 100 intubated days). This can increase pediatric ICU (PICU) costs to over $36,000 per UE event. Significant risk factors for UE in children include:
- Less than 2 years old: Young children have shorter trachea lengths compared to older children.
- Male gender: Males are more likely to have increased tracheal secretions, which lead to increased UE incidence.
- Increased patient agitation: Agitation in the PICU may be caused by pediatric delirium, which frequently is underrecognized. Screening tools such as the Pediatric Confusion Assessment Method for the ICU and the revised Cornell Assessment of Pediatric Delirium may be helpful.
- ET tube fixation methods: Although no one type of ET tube fixation method is recommended, the ideal selection shouldn’t cause pressure injuries and should be easy to use, secure, and cost-effective.

**Adults**

UE is most prevalent in medical and surgical ICUs because of the higher number of intubated patients compared to other hospital units, a longer duration of intubation, and a greater likelihood that patients will experience respiratory comorbidities. UE incidence in the adult population ranges from 0.5% to 35.8%. Significant risk factors for adults include:
- Male gender: Men are more likely to have increased tracheal secretions, which lead to increased UE incidence.
- Diagnosis of chronic obstructive pulmonary disease (COPD): Patients with COPD have increased anxiety, which can contribute to self-extubation.
- Increased level of consciousness with decreased sedation: As sedation is decreased, patients may become anxious and agitated, which makes them more likely to self-extubate.
- Increased patient agitation: Agitated patients are more restless and may move about in a way that results in an accidental UE or they may grab at the ET tube, leading to self-extubation.
- Use of restraints: Restraints are associated with increased agitation.
- Orotracheal intubation: One of the complications of orotracheal intubation is agitation.
- Night shift: According to Berkow, a relationship exists between UE events and higher nursing workloads and patient-nurse ratios. Frequently, fewer nurses are staffed during evening and night shifts, resulting in a higher incidence of UE.

**Recommendations**

Organization-wide airway management safety best practices, policies, and procedures can help reduce UE. In a study by Galiote and colleagues, a level IV NICU used quality improvement methodology to significantly reduce UE over 10 years. Interventions included placing an airway alert card on the ventilator to document the depth of the ET tube insertion and the date of the last chest X-ray. Other measures included reinforcing loose tape instead of replacing it (to avoid additional manipulation of the ET tube) and increasing communication between nurses, respiratory therapists, and providers. During the study, the UE rate dropped 61% (from 1.75 UE/100 intubated days to 0.99 UE/100). An-
Addressing UE risk factors

These recommendations can help nurses address risk factors for unplanned extubation (UE).

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<th>Recommendations</th>
<th>Risk factors</th>
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<td>Integrate sedation protocols.</td>
<td>Physical restraints      Decreased level of sedation Absence of IV sedation Duration of intubation Nurses with &lt;4 years of experience Inappropriate nurse-to-patient ratio UE event frequency increasing at night Agitation Fluids and secretion accumulation</td>
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<td>Incorporate nurse presence as alternative to restraints.</td>
<td>Physical restraints      Decreased level of sedation Absence of IV sedation Duration of intubation Nurses with &lt;4 years of experience Inappropriate nurse-to-patient ratio UE event frequency increasing at night Agitation Fluids and secretion accumulation</td>
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<td>Implement quality improvement programs for data tracking and staff education.</td>
<td>Physical restraints      Decreased level of sedation Absence of IV sedation Duration of intubation Nurses with &lt;4 years of experience Inappropriate nurse-to-patient ratio UE event frequency increasing at night Agitation Fluids and secretion accumulation</td>
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<td>Develop standardized procedures.</td>
<td>Physical restraints      Decreased level of sedation Absence of IV sedation Duration of intubation Nurses with &lt;4 years of experience Inappropriate nurse-to-patient ratio UE event frequency increasing at night Agitation Fluids and secretion accumulation</td>
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<td>Implement bedside report.</td>
<td>Physical restraints      Decreased level of sedation Absence of IV sedation Duration of intubation Nurses with &lt;4 years of experience Inappropriate nurse-to-patient ratio UE event frequency increasing at night Agitation Fluids and secretion accumulation</td>
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<td>Offer continuing education.</td>
<td>Physical restraints      Decreased level of sedation Absence of IV sedation Duration of intubation Nurses with &lt;4 years of experience Inappropriate nurse-to-patient ratio UE event frequency increasing at night Agitation Fluids and secretion accumulation</td>
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<td>Provide two licensed professionals for any procedure with an intubated patient.</td>
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<td>Implement appropriate nurse-to-patient ratio (1:2).</td>
<td>Physical restraints      Decreased level of sedation Absence of IV sedation Duration of intubation Nurses with &lt;4 years of experience Inappropriate nurse-to-patient ratio UE event frequency increasing at night Agitation Fluids and secretion accumulation</td>
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<td>Integrate regular endotracheal tube suctioning.</td>
<td>Physical restraints      Decreased level of sedation Absence of IV sedation Duration of intubation Nurses with &lt;4 years of experience Inappropriate nurse-to-patient ratio UE event frequency increasing at night Agitation Fluids and secretion accumulation</td>
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<td>Increase the number of nurses and amount of surveillance during night shift.</td>
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<td>Perform early and frequent screening for delirium in adults.</td>
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<td>Perform daily evaluations to determine readiness for weaning/extubation.</td>
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other study, by Kandil and colleagues, showed a UE decrease by using a standardized tape for ET tube securement when moving patients within a level IV NICU/PICU. This facility emphasized promoting a culture of safety and developed a steering committee that specialized in UE. In over 1 year, the UE rate decreased by 75% (from 1.2 UE/100 intubated days to 0.3 UE/100).

**Nursing implications for practice change**

Assessment, communication, and training are key to reducing UE risk. Patients should be regularly assessed for appropriate sedation to reduce agitation. Nurses can use the Ramsay sedation scale or Richmond Agitation Sedation Scale to assess sedation and the Self-Extubation Risk Assessment Tool (SERAT) to identify patients as high risk for self-extubation. All at-risk patients should be closely monitored.

Open communication with all members of the patient care team, including nurses, the provider, and the respiratory therapist, can help reduce UE risk. For example, if restraints are ordered for a patient, the nurse can speak with the provider about the link between restraints and UE. Nurses also can advocate for including UE risk factor, prevention, and intervention training for all new nurses to the unit and speak with charge nurses about pairing more experienced nurses with patients who have a high SERAT score. Because the frequency of self-extubations increases during shift changes, handoff reports should be performed in the patient’s room or close enough outside the room to observe the patient. (See Addressing UE risk factors.)
Building a coalition
The need to increase awareness and prevention of UE stemmed from the preventable death of 13-year-old Drew Hughes, who died from a UE after an accident on his skateboard in 2013. Drew’s story inspired a movement to increase awareness and prevention of this potentially tragic airway management complication. (Read more about Drew’s story at airway safetymovement.org/blog/drews-story.)

The Coalition for Unplanned Extubation Awareness and Prevention—led by the Society for Airway Management, Airway Safety Movement, and the Patient Safety Movement Foundation and composed of 20 multispecialty professional medical societies and patient safety and quality improvement organizations—launched a national campaign to reduce the incidence of preventable death from UE. The coalition focuses its efforts on increasing awareness, implementing best practices, and supporting research and innovation. A few of the 20 participating organizations are the American Academy of Pediatrics, the American Association of Nurse Anesthetists, and the American Association for Respiratory Care.

Ensure patient safety
UE is common and costly, but the seriousness of this problem is underrecognized. Nurses should be aware of the risk factors relevant to various patient populations and know the steps they can take to ensure patient safety. National awareness of the need to prevent airway complications is spreading rapidly, and the Coalition for Unplanned Extubation Awareness and Prevention is developing recommendations healthcare organizations can implement to reduce UE.

Visit myamericanurse.com/?p=66385 for resources from members of the Coalition for Unplanned Extubation Awareness and Prevention and a list of references.

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