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Hospital to Home: A Quality Improvement Initiative to Implement High-fidelity Simulation Training for Caregivers of Children Requiring Long-term Mechanical Ventilation☆

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ABSTRACT

Background: Preparing families of children requiring long-term mechanical ventilation (LTMV) to manage medical emergencies at home is challenging. Opportunities for family caregivers to rehearse crisis management in a controlled setting before discharge are limited.
Objective: We aimed to create a multimodal discharge preparedness curriculum, incorporating high-fidelity simulation training, to prepare family caregivers of children with complex medical conditions requiring long-term mechanical ventilation. We sought to determine which curricular elements were most helpful and whether this curriculum impacted the rate of readmissions within 7 days of hospital discharge.
Methods: The curriculum included instructional videos, printed handouts, cardiopulmonary resuscitation training, and two mandatory high fidelity simulation scenarios depicting tracheostomy- and ventilator-related emergencies. Teams of one to three family caregivers per patient managed each scenario. A video-based debriefing focused on identifying and closing performance gaps. Participants rated their perceptions regarding each curricular element and its relative impact on their preparedness for discharge.
Results: 87 family caregivers completed the curriculum. Simulation-enhanced curriculum was well-received by participants. Participants reported that post-simulation debriefing was the most beneficial component. We observed a trend toward reduced readmissions within 7 days of discharge since implementation of our revised curriculum.
Conclusion: Simulation training can be incorporated into discharge training for families of children requiring LTMV. Rehearsal of emergency management in a simulated clinical setting increases caregiver confidence to assume care for their ventilator-dependent child.

Background

Family caregivers (parents, extended family/friends, foster family) of a child requiring a tracheostomy and ventilator will face many challenges as they prepare to take their child home from the hospital. Many educational resources including cardiopulmonary resuscitation (CPR) training, educational videos, printed educational handouts, and hands-on training are available to prepare family caregivers to provide routine care and respond to medical emergencies in the home (Sterni et al., 2016). Families may find it difficult to be fully attentive during formal education as they simultaneously contend with the critical diagnosis and necessary medical treatments of the child while they are hospitalized (Solan et al., 2015). The need to learn how to react to an

Abbreviations: CPR, cardiopulmonary resuscitation; CMC, complex medical conditions; CRF, chronic respiratory failure; EMS, Emergency Medical Services; LTMV, long term mechanical ventilation; VCP, ventilator care program.

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emergent situation at home may further add to the family's stress. When a medical emergency occurs in the hospital, healthcare providers often intervene to keep the child safe limiting opportunities for family members to learn important lifesaving skills. Some family caregivers do not experience an emergency with their child during the hospitalization and are unprepared for the emotional response that occurs when their child's life is in danger. Providing family caregivers with the opportunity to practice reacting to emergent situations and subsequent debriefing by clinical experts may further support them as they prepare for their hospital discharge.

The number of complex medical conditions among chronically ill children in the United States increased dramatically between 1991 and 2005 (Burns et al., 2010). Children with complex medical conditions have multisystem disease that requires accessibility to healthcare services, medical technology to support daily functions, and healthcare systems that prioritize high-quality and efficient care (Cohen et al., 2011). These children tend to experience higher 30-day readmission rates (Berry et al., 2011). In this population, the underlying causes of morbidity, mortality, and repeat hospitalization are largely preventable and can often be traced to medical equipment malfunction, inadequate training, improper caregiver response, and lapses in caregiver vigilance (Berry et al., 2011; Boroughs & Dougherty, 2012). Although, advances in technology and supportive care over the past 20 years have led to increased survival among young children (Berry et al., 2011; Burns et al., 2010; Neupane, Mcfeeters, Johnson, Hickey, & Pandya, 2015), those who require long-term mechanical ventilation (LTMV) via tracheostomy remain at significant risk for these preventable complications (Cohen et al., 2011; Edwards, O'Toole, & Wallis, 2004; Neupane et al., 2015).

Family caregivers may leave the hospital with inadequate knowledge or may feel unprepared to manage their child care in the home (Reinhard, Given, Petlick, & Bemis, 2008). In many incidences, they

Educational Rationale: Family proficiency with emergency mucus plugging leading into cardiopulmonary resuscitation of a child who has a tracheostomy.

Learning Objectives:

1. Identify when the child's status is deteriorating based on color change, neurological response, coughing, work of breathing, and ventilator alarm status.
2. Demonstrate correct steps to alleviate a plugged tracheostomy tube by suctioning, changing the trach and increasing oxygen flow utilizing home environment equipment.
3. Demonstrate emergency action steps including calling 911 and providing adequate cardiopulmonary resuscitation.

Case Information

You are doing laundry, and have stepped out of your child's room for 5 minutes to put the clothes in the dryer. You return to the room and hear the ventilator alarm.

Scenario: Plugged Tracheostomy		
	Debrief Questions	**Family response / debriefer notes**
1.	How do you think that went?	
2.	When the trach was plugged what were your thoughts when you were suctioning?	
3.	Tell me about identifying the problem 1. Probe for color change 2. Probe for child responsiveness 3. Probe for coughing 4. Probe for working harder to breathe 5. Probe for ventilator alarms	
4.	Tell me about the trach change	
5.	Tell me about when you had to perform CPR or chest pushes	
6.	Talk me through your thoughts when you called 911 1. If they not call 911-I noticed you did not call 911, what happened?	
7.	Is there anything you would have done differently? 1. Probe for 911 2. Probe for general distractors 3. Probe for going through the emergency steps 4. Probe about caregivers (family teamwork)	
8.	What went well with this scenario? 1. Probe for 911 2. Probe for general distractors 3. Probe for steps 4. Probe about caregivers (family teamwork)	
8.	Do you have any further questions?	

Fig. 1. Debriefing tool.

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