Safety Events for Children with Invasive Mechanical Ventilation Reported by Home Healthcare Nurses

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Introduction

- The number of children living at home assisted by invasive mechanical ventilation (IMV) is growing[1-2]
- Children assisted by IMV receive complex respiratory support via a tracheostomy and ventilator
- Comprehensive, ongoing, and competency-based training is recommended for family and professional caregivers[3]

[1]Akangire et al., 2021; [2]Amin et al., 2023; [3]Sterni et al., 2016

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Introduction

- Children assisted by IMV are known to be at high risk for morbidity and mortality[1,4]
- Lack of knowledge about the rate and types of safety events occurring in the home for children assisted by IMV remains a critical gap
- This information is needed to develop targeted interventions to improve patient safety and prevent harm

[1]Akangire et al., 2021; [4]Amin et al., 2023

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Objective

We aimed to identify:

1. Types of incident reports for children assisted by IMV within a national pediatric home healthcare sample

1. Potential gaps in family or professional caregiver training contributing to safety risks

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Methods

Study Design

- Secondary analysis of a longitudinal retrospective cohort study
  - 2,901 pediatric enrollees < 21 years old
  - ≥1 Billed claim for HHC
  - One-year study period
- Sub-group analysis of 153 children assisted by IMV

Data Sources

- Electronic health record data
- Billing data
- Incident reports

Team Select Home Care provided pediatric home health at 38 branch locations in 11 states during the study period

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Methods

Data Analysis Plan

Characteristics of children with IMV receiving HHC

Characterization of incident reports
Frequency and types of safety events reported

Identification of potential training gaps contributing to safety risks

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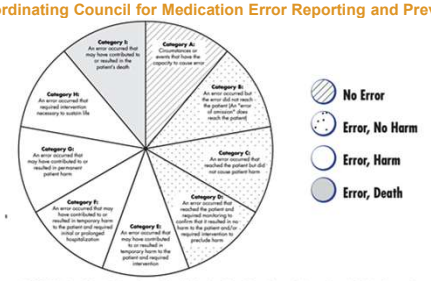
National Coordinating Council for Medication Error Reporting and Prevention Index[5]



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Results

Characteristics of children assisted by IMV receiving HHC (N = 153)

Characteristic	n (%)	Mean (SD)
Age (years)		7 (5.5)
Biological Sex		
Male	80 (52.3)	
Female	72 (47.1)	
Family Language		
English	109 (71.2)	
Language other than English	26 (17)	
No language documented	18 (11.8)	
Payor Type		
Medicaid only	88 (57.3)	
Medicaid with other combination	62 (40.5)	
Private/commercial only	2 (1.3)	
Days receiving HHC over study year		172 (127.8)

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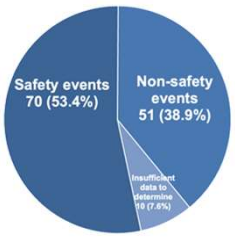
Characterization of incident reports

- 56 (36.6%) of children assisted by IMV had ≥1 incident reported by a HHC nurse
  - Number of incidents ranged from 0-11 per patient
  - Median number of incidents per patient was 2 among those with reports

Incident Categorization (N = 131)



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Results

Patient safety events reported, types of harm involved

Incident Report Categorization	Frequency among all 153 children with IMV	Per 1000- patient HHC days
Medical hazards	8 (6.1%)	0.30
Medical errors		
Non-harmful medical errors	20 (13.1%)	0.76
Harmful medical errors	40 (26.1%)	1.52
Harmful medical event not from error	2 (1.5%)	0.08

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Results

Medical Hazards: Frequency and illustrative example

Safety Event Categorization	Frequency (N = 153)	Event description example
Category A – condition that could lead to a safety event	8 (6.1%)	The mother of a patient heard the feeding pump alarm and found the **patient's nurse asleep**.

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Results

Non-harmful Medical Errors: Frequency and illustrative examples

Safety Event Categorization	Frequency (N = 153)	Event description example
Category B – error occurred but did not reach patient	4 (2.6%)	The nurse **spilled half the supply** of the patient's seizure medication. The patient did not miss a dose.
Category C – error reached patient but no harm or monitoring occurred	10 (6.5%)	A prescribed **medication was started a day late**.
Category D – error reached patient requiring monitoring but no harm	5 (3.9%)	The mother of a patient **administered a rescue medication for seizures to the patient when he was not seizing**. The mother was instructed to continue monitoring the child.

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Harmful Medical Errors: Frequency and illustrative examples

Safety Event Categorization	Frequency (N = 153)	Event description example
Category E – error caused harm that required intervention	27 (17.6%)	The nurse identified **skin breakdown near the child's tracheostomy tube**. Nurse then sought topical medications to treat the skin breakdown.
Category F – error caused harm that required hospitalization	1 (0.7%)	The patient was jumping in his bed, fell over the side rails, and his **gastrostomy-jejunostomy tube was dislodged**. The patient **required hospitalization to have his tube replaced**.
Category G – error caused permanent patient harm	0	None identified in sample

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Results

Harmful Medical Errors: Frequency and illustrative examples

Safety Event Categorization	Frequency (N = 153)	Event description example
Category H – error required intervention to sustain life	11 (7.2%)	Nurse reported that the patient had a **life-threatening aspiration event** from ventilator tubing condensation. The patient **required suctioning, manual ventilation with a resuscitation bag, and the ventilator circuits were changed** immediately.
Category I – error caused death	1 (0.7%)	The home nurse arrived and found the **patient decannulated and unresponsive**. The ventilator was running but pulse oximetry was off. Emergency medical personnel was called to the home and determined that the patient had died.

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Potential training gaps identified among all safety events

Training gaps	Frequency (N = 70)	Examples of training opportunities
Medications and supply management	23 (32.9%)	Safe medication administration practices

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Professional standards of care	6 (8.6%)	Ethical and legal accountability for sleeping

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Conclusions

- More than 1 in 3 children assisted by IMV receiving HHC had an incident reported and more than half were safety related
- Pediatric home health nurses are essential to identifying and addressing safety challenges in the home
- Ongoing evaluation of safety events is critical to inform continuous improvement in HHC
- Improving safety in the home for children assisted by IMV requires investment in training, support, and system-level solutions

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Limitations

Secondary analysis

Passive reporting

Documentation variability

Recall and social desirability bias

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Implications

- Children assisted by IMV experience healthcare-related harms at home
- Root causes of safety challenges in the home are multifactorial but targeted training may improve patient safety
- High quality training programs that address identified safety challenges are needed

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References

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