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Original Research

Patient Safety Events during Critical Care Transport

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A B S T R A C T

Objective: Patient safety events (PSEs) occurring during interfacility transport have not been studied comprehensively in critical care transport (CCT) teams in the United States. The purpose of this research was to investigate the type and frequency of PSEs during CCT between hospitals; to explore the impact of patient stability, vulnerability, complexity, predictability, and resiliency; and to examine if the nurse factors of licensure or experience and transport factors of duration or mode of transport influence the frequency of PSEs. The study was conducted at a large hospital-based quaternary health care system in the Midwestern United States.

Methods: This was a retrospective, descriptive correlational study using chart review. The study selected 50 sequential qualifying cases with PSEs and randomly selected control cases reviewed at a single site over a 5-month period.

Results: The rate of PSEs was 27.7 events per 1,000 patient contacts. Of 9 reported adverse event types, new or recurrent hypoxia had the greatest frequency. Hypoxia, when present at the time of initial CCT contact, was associated with the PSE occurrence ($P = .046$). Duration of transport was a significant predictor of PSEs ($P = .025$).

Conclusion: Pretransport hypoxia and duration of transport are independent predictors for intratransport PSEs, particularly intratransport hypoxia.

Patient safety events occur at alarming rates in health care.[1-3] Standardized nomenclature now exists to describe patient safety events, but this approach has not consistently been used in critical care transport (CCT) between US hospitals.[4-8] Patient safety events or mitigating harm from adverse events during interfacility CCT in the United States has received little investigation.

There are nearly 1.6 million patients transported from one health care institution to another annually.[9] The regionalization of care, the development of specialized treatment centers, and the continuing evolution of definitive care systems have all contributed to the rapid expansion in interfacility transport in recent years. The majority of CCT is between hospitals, and the trend for increased interhospital transfers using CCT is expected to continue. The volume of CCT patients and the common occurrence of interfacility transport in the United States make it imperative that the risk for and the occurrence of patient safety events be evaluated.

Framework

The model for this project was the American Association of Critical-Care Nurses (AACN) Synergy Model for Patient Care.[10] The dependent variable was the occurrence of patient safety events (PSEs) linked to patient outcomes in the AACN Synergy Model. A total of 14 pretransport patient variables were linked conceptually to the patient characteristics in the AACN Synergy Model, and these relationships are detailed in Figures 1 and 2. There were 4 hypothesized moderator variables. Two moderators, licensure level of lead clinician (registered nurse [RN] and advanced practice registered nurse

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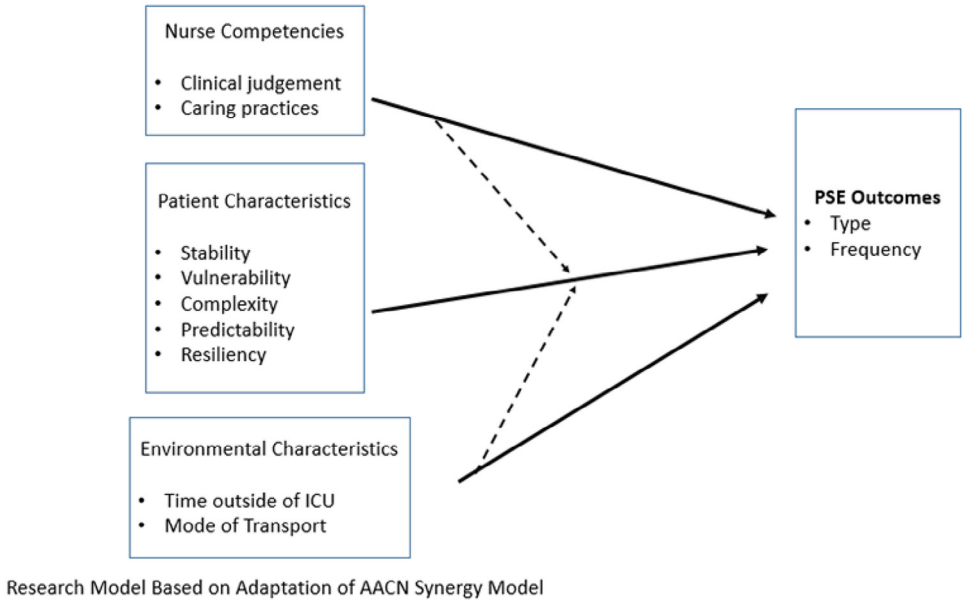

Figure 1. Research model based on the AACN Synergy Model.

[APRN]) and lead clinician experience (ie, years of experience in CCT), were linked conceptually to the nursing competencies in the AACN Synergy Model. The other 2 moderators, duration of transport (ie, time outside the intensive care unit [ICU]) and mode of transport (ie, ground, air/rotor, or air/fixed wing), were linked to environment of care as described in the Synergy Model.

The purpose of this research was to investigate the type and frequency of PSEs during CCT between hospitals and explore the impact of pretransport patient variables on PSEs. Secondary purposes included examining whether the nurse characteristics (ie, lead clinician licensure or experience in CCT) or the environment of care factors (ie, duration of transport or mode of transport) influenced the occurrence of PSEs.

For continuity of terminology between hospitals and CCT teams, there were 5 types of PSEs identified in this study congruent with those used by The Joint Commission: an adverse event, sentinel event, no-harm event, near-miss event, and hazardous condition.[11] The PSEs were defined as follows:

- Adverse event: any patient safety event that actually results in harm to a patient
- Sentinel event: a specific type of adverse event that results in death, permanent harm, or severe temporary harm to the patient
- No-harm event: a patient safety event that affects the patient but does not cause harm to the patient
- Near miss: a patient safety event that occurs but is intercepted before affecting the patient
- Hazardous condition: any circumstance or condition that increases the probability of an adverse event

Methods

This was a descriptive, correlational design using retrospective chart review. All CCT charts with an associated reported PSE during the 5-month study period were included. For comparative purposes, a control sample of CCT charts without PSEs was collected. The control group was randomly sampled from the same time period at a ratio of 8:1 to achieve the a priori target ratio of PSE to controls.

Random Selection of Control Cases

The study received institutional review board approval; patient consent was waived because this was a secondary medical record review (Case Western Reserve University Institutional Review Board #15-1434).

Setting

The setting for this study was a single hospital-based CCT program at a large quaternary, international hospital system in the Midwestern United States. This hospital system provides CCT services for 10 affiliated community hospitals and externally to other local and regional hospitals. Transports occurred in ground mobile ICUs, rotary wing helicopters, and fixed wing jet aircraft. The mix of transport modes in 2015 was 75% mobile ICU, 25% helicopter, and < 1% fixed wing. Approximately 500 critically ill patients were transported each month in 2015, with more than 400 per month who met inclusion criteria, covering a broad range of diagnoses and patient acuity levels.

There were 2 sources of records used for this study. The first was the transport chart completed by the transport team completing the patient transport. The second record was a clinician report of potential or actual patient safety events and other adverse occurrences. Data were collected between October 5, 2015, and March 1, 2016.

Sample Inclusion and Exclusion Criteria

To be included, the CCT record had to be categorized as an interfacility transport. Transports that included prehospital responses (eg, scene trauma), prehospital ST-elevation myocardial infarction rendezvous, medical emergency response team intrafacility responses or services, or mobile stroke treatment unit transports were excluded. Transports led by MDs were excluded because of the small number of these transports. Medical escort transports by a single clinician were excluded. Pediatric transports, defined as those transports of patients less than 14 years of age and/or transported by a specialty pediatric or neonatal team, were excluded from the study.