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Using failure mode and effects analysis to improve the safety of patients transported to a critical care unit following cardiac surgery

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Hospital races to learn lessons of Ferrari crew

Tuesday, November 14, 2006

By Gautam Naik

The Wall Street Journal

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Problems with Patient Transport

Time of transport 28 minutes
Frequency of problems 42%

Patient factors

- Hypotension*
- Hypertension
- Tachycardia
- Bradycardia
- Bleeding and tamponade*
- Cardiac arrest


Equipment failures

- IV infusion pump failure
- Pacemaker failure
- Oxygen tank failure

Communication failure

- Unpreparedness in CSICU**

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Goal of Project

Failure Mode and Effects Analysis

- Cardiac surgical patient
- Transport from operating room to cardiac surgical intensive care unit

Steps

- Identify the steps and sub-steps during transfer
- Identify high-risk processes during transfer

Actions

- Make changes to processes to reduce the risk of transfer

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Interdisciplinary Team

- Cardiac anesthesiologist
- Cardiac surgeon
- Operating room nurse
- CSICU nurse
- Quality administrator
- Patient care attendant
- Biomedical engineer
- Anesthesia technician
- Respiratory therapist

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Hazard Rating

Catastrophic Event - Hazard rating 4
Patient Outcome: Death or major permanent loss of function

Major Event – Hazard Rating 3
Patient Outcome: Permanent lessening of bodily functioning

Moderate Event – Hazard Rating 2
Patient Outcome: Increased length of stay

Minor Event – Hazard rating 1
Patients Outcome: No injury, nor increased length of stay nor increased level of care

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Probability Rating

Frequent – Probability Rating 4
 Likely to occur immediately or within a short period (may happen several times in one year)

Occasional – Probability Rating 3
 Probably will occur (may happen several times in 1 to 2 years)

Uncommon – Probability Rating 2
 Possible to occur (may happen sometime in 2 to 5 years)

Remote – Probability Rating 1
 Unlikely to occur (may happen sometime in 5 to 30 years)

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Hazard Matrix

Hazard Ratio X Probability Ratio

Probability	Severity of Effect			
	Catastrophic	Major	Moderate	Minor
Frequent	16	12	8	4
Occasional	12	9	6	3
Uncommon	8	6	4	2
Remote	4	3	2	1

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Basic Steps

Patient Transfer from COR to CSICU

Basic Steps

- 1 Prepare for Transfer
- 2 Transfer
- 3 Receive Patient in CSICU

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Sub-steps

Patient Transfer from COR to CSICU

Sub-steps

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    graph LR
      A[Equipment Prep] --> B[Communicate readiness to transfer]
      B --> C[Transfer to portable equipment]
      C --> D[Move to stretcher]
      D --> E[Transport to CSICU]
      E --> F[Prep CSICU equipment]
      F --> G[Communicate to receiving personnel]
      G --> H[Transfer from portable equipment to CSICU monitoring]
      H --> A
    
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High Risk Processes

Communication – Hazard Ratio 16

Pacemakers – Hazard Ratio 16

Oxygen Tanks – Hazard Ratio 12

CSICU Beds – Hazard Ratio 12

Moveable Equipment – Hazard Ratio 12

IV Poles, IV infusion pumps - all cases
 IABPs, Ventilators, Oscillating ventilators, LVADs, impellas, NO inhalation devices – special cases

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