Root Cause Analysis: Hypoxic Respiratory Arrest During Transport

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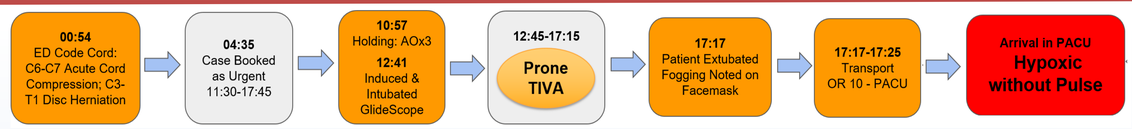
Case Presentation

- 61 M transferred from OSH after falling, hitting head on toilet, with possible loss of consciousness
- C6, T1 fracture, bilateral lower extremity weakness; T8 sensory level
- Consumes an average of 15 beers per night
- History of progressive weakness for the previous 4 years with "bad disc at C4-C5" (baseline difficulty getting out of chair, difficulty with holding 5lb bag of flour)
- Code cord called at 01:09, patient admitted to Ortho service, case booked as urgent to be done within 8-24 hours
- After a 5 hour prone surgery finishing at 5pm, patient arrived in PACU cyanotic without a palpable radial pulse

Event Story Map



Dissecting the Case

Pre-Operative Presentation

Vitals: T 97.9 HR 96 BP 160/90 RR 16 O2 97

PE: C-Collar; bilateral LE weakness, AAOx3

CT Spine: Acute compression at C6 and extensive disc herniations from C3-T1 as well as a T1 compression fracture

Plan: Admit to Ortho, plan for OR

Code cord called after ED Physicians noted T8 sensory level on exam

Airway Exam: In C-Collar, Mallampati 3, Marginal mouth opening, limited mandibular prognathism, edentulous, long moustache

Intra-operative Course

Intraoperative Time: 12:41-17:20

- **Intubation:** Glide-Scope 4 used **Narcotic Plan:** dosed based on BP and RR
  - 2 mg Midazolam preop, 250 mcg of Fentanyl on induction
  - 4 mg of Hydromorphone 15:30 – 17:00, 2 mg of Remi infusion 12:56-17:00
- **Potential ICU Admission** — No beds available
- **Potential Delayed Extubation** — Decided against post-flip
- **Extubation Criteria:** Opening eyes, following simple commands, bucking, made eye contact, fogging in mask after extubation

BIS in 90s, EtDes 0.4, EtCO2 47, SpO2 100% until off of monitors

- **Equipment Malfunction:** RSCOM1 fail, missing tidal volumes, RR from 15:50 on

Transport

Travel Monitoring

- No formal monitors employed
- Fogging in mask noted in OR
- Patient was moving eyes and not cyanotic while passing OR Front desk

Obstacle Course

- OR 10 to PACU 7 – long transit
- Heavy and old bed
- Unable to visualize patient during transport
- Clutter in hallways
- Surgery colleague on phone, minimal help with directing bed

Respiratory Arrest in PACU

Arrival

Patient arrived in PACU cyanotic and minimally responsive. Hooked up to pulse ox with SaO in 70s

- Resident starts ambubag to assist breathing

- No O2 attached to AMBU while masking
- No cone for supplemental O2, connection fell off screw nozzle

- Able to procure equipment easily

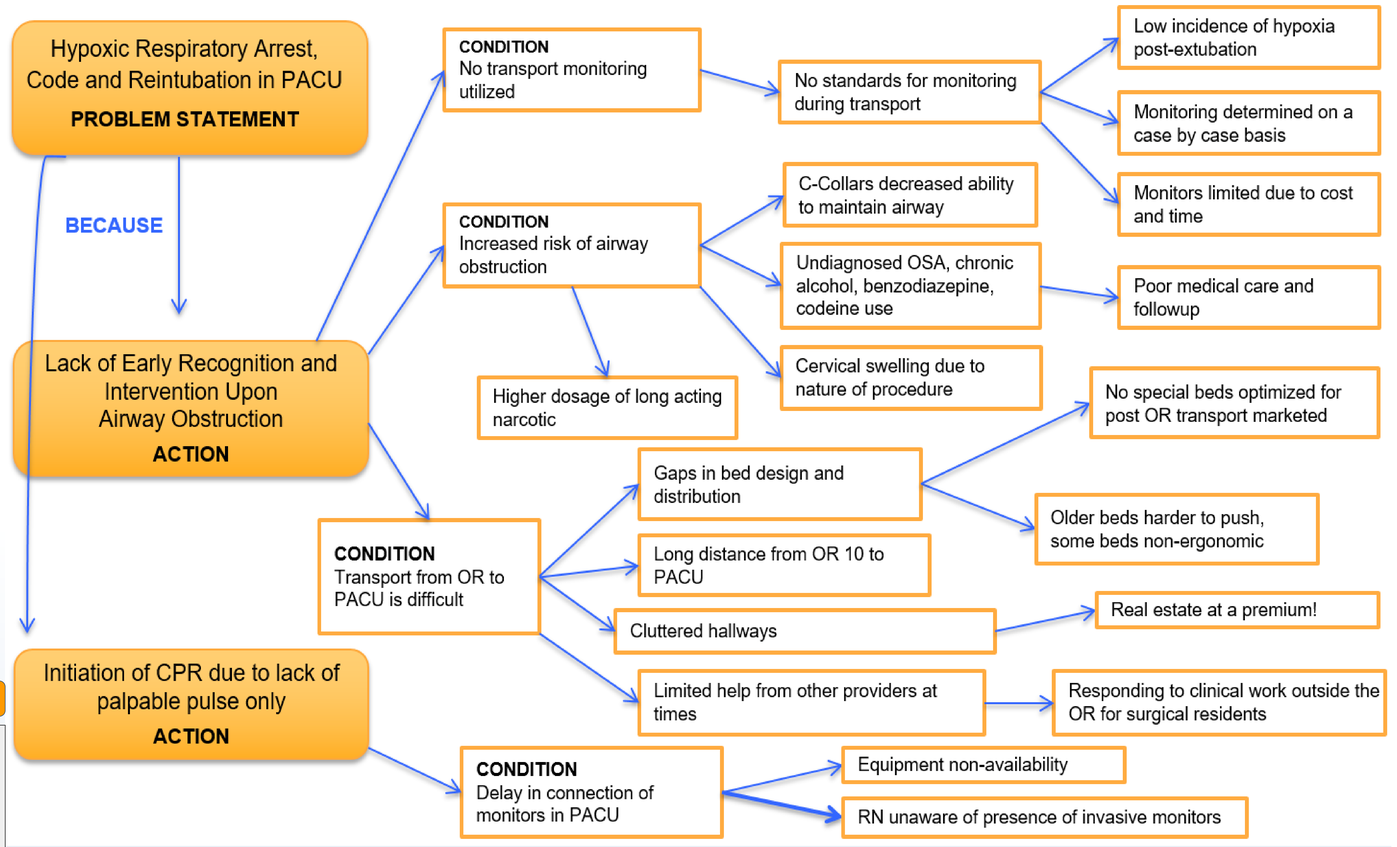
Code Called in PACU

- No palpable pulse. Pulse ox with good wave form despite sats in 70s, Arterial line not yet connected; unclear if the patient was truly pulseless
- Per RN, no clear team leader identified during code response

Airway Management

- Overnight attending arrives → 3 hand ventilation (assisting chin lift), no chest rise
- First intubation attempt with Glide fails, iGel placed, still no chest rise, but Sats improve to 100
- Second attempt with Glide successful

Cause and Effect Analysis



Root Cause Contributing Factors

Statement	Lack of transport monitoring guidelines regarding special circumstances leads to under utilization of monitoring in cases where it is clearly needed or justifiable
Suggestion: Intermediate Action	If an ICU bed or ventilator is requested at any point during pre-operative or intra-operative period; consider monitoring even if the condition is deemed stable enough to no longer require it
Outcome Measure	Audit of AIMS records for post-op monitoring of patients for whom ICU bed/ventilator was requested

Statement	Higher narcotic doses lead to increased risk of sedation and obstruction during transport.
Suggestion: Intermediate Action	If greater than 2mg opiate equivalents of hydromorphone are used during a case, consider transporting with a minimum of a pulse oximeter, and preferably with CapnoCheck
Outcome Measure	Audit of AIMS records for patients receiving greater than or equal to 2mg of Hydromorphone over 3 month period

Statement	Excessive clutter, lack of help from other providers, older/bulkier beds and long transit times can distract anesthesia provider from paying attention to patients when overt monitoring is not in use
Suggestion: Weak Action	Policies to minimize clutter in hallways; grand rounds teaching and guidelines for surgical residents to not use personal devices during transport to catch adverse events early
Outcome Measure	Once weekly random inspection of hallways to assess change in clutter levels pre- and post-intervention

Statement	Delay in connecting monitors in the PACU may lead to delay in accurate detection of clinical deterioration, or lack thereof, in real time
Suggestion: Intermediate Action	Incorporate verbal report of invasive monitoring requirements from circulating RN to PACU to set expectation and allow for procurement of required equipment
Outcome Measure	Audit of verbal reports compared to number of patients with invasive monitors over a one day period, assessed at 3 different randomly selected points over a year