Incidence and causes of adverse events in diagnostic radiological studies requiring anesthesia in the Wake-Up Safe registry

Uffman JC[1,3], Khawaja AA[1,4],Tumin D[1,2],Tobias JD[1,2,3]

Department of Anesthesiology & Pain Medicine, Nationwide Children's Hospital, Columbus, Ohio, USA[1], Department of Pediatrics, The Ohio State University College of Medicine, Columbus, Ohio, USA[2], Department of Anesthesiology & Pain Medicine, The Ohio State University College of Medicine, Columbus, Ohio, USA[3], Joan C Edwards School of Medicine, Marshall University, Huntington, WV, USA[4]

INTRODUCTION

- The need for sedation and anesthesia to complete diagnostic imaging in children consumes a large portion of many anesthesia departments' daily resources.
- Risk associated with sedation and anesthesia may outweigh those associated with the diagnostic imaging procedure.
- Wake-Up Safe (WUS) is a patient safety organization that maintains a multi-center registry of adverse events (AE) for member institutions.
- The WUS registry was used to evaluate the incidence, predictors, and causes of AEs when general anesthesia was provided for diagnostic radiological imaging.

METHODS

- De-identified data were obtained from 24 pediatric, tertiary care, WUS member institutions from 2010-2015.
- Demographic information available: ASA, age, year of service, gender, CPT code(s), and emergency status.
- Children ≤ 18 years of age receiving anesthesia services with CPT for diagnostic radiology or codes for specific radiological services (e.g. MRI brain) were used for analysis
- AE analysis was limited to events reported to occur in a location designated as "MRI" or "CT" in the WUS AE report.
- Logistic regression was used to determine predictors of AE occurrence in cases with complete covariate data.

AEs associated with anesthesia at MRI or CT locations

	N (%)[a]
Respiratory event or injury	30 (36%)
Cardiac arrest	20 (24%)
Medication event or reaction	15 (18%)
Perioperative death	6 (7%)
Need for cardiovascular support	6 (7%)
Need for airway management	4 (5%)
Cutaneous, musculoskeletal, or burn injury	5 (6%)
Airway injury	2 (2%)
Eye injury	2 (2%)
Nervous system injury	2 (2%)
Other complications	6 (7%)

[a] Outcomes of AEs were not mutually exclusive. AE = Adverse Event

AE causes, by extent of harm

Cause[a]	Extent of residual harm, N			
	No harm (N=14)	Additional treatment or intervention (N=41)	Temporary bodily or psychological harm (N=17)	Death (N=6)
Anesthetic issues[b]	10	24	12	2
Bradycardia	2	4	3	0
Hypoxia	1	3	3	0
Laryngospasm	0	6	2	0
Vomiting	1	0	3	0
Hypotension	1	2	2	0
Medication error	2	6	0	0
Perioperative team issues	1	2	2	0
Patient disease[c]	4	26	8	6
Congenital Defects	2	6	5	3
Cardiac problems	1	5	2	0
Breathing Difficulty	0	6	2	0
Other issues[d]	3	2	1	0

[a] Primary or secondary cause as reported to WUS. AEs may have had multiple causes
[b] Select issues listed based on review of free-text registry entries.
[c] Select comorbidities listed based on review of diagnosis codes
N=3 records with unknown residual harm

RESULTS

- 175,486 anesthetics for radiological procedures were identified
- 83 AEs in "MRI" and "CT" were reported (incidence of 0.05%)
- AEs were more likely in ASA IV vs ASA I patients (aOR=8.9)
- Age, gender or year of service were not independent risks for AEs
- 23 AEs resulted in patient harm
- 32 AEs resulted in escalation of care (unplanned hospitalization or unplanned ICU admission)
  - 75% were reportedly due to "underlying patient disease"
- 52 AEs were reported as "anesthetic" related
  - Leading "anesthetic related" AEs: bradycardia, hypoxia, laryngospasm, vomiting, hypotension, provider error

CONCLUSIONS

- Anesthesia provided for pediatric radiological procedures (CT & MRI) is very safe.
- ASA IV patients are at significantly greater risk of experiencing AEs compared to ASA I patients when undergoing diagnostic imaging.

REFERENCES

1. Uffman JC, Tumin D, Raman V, Thung A, Adler B, Tobias JD. MRI Utilization and the Associated Use of Sedation and Anesthesia in a Pediatric ACO. J Am Coll Radiol. 2017;14:924-30.
2. Malviya S, Voepel-Lewis T, Eldevik OP, Rockwell DT, Wong JH, Tait AR. Sedation and general anaesthesia in children undergoing MRI and CT: adverse events and outcomes. Br J Anaesth 2000;84:743-8.