

# Risk of Death Among Children with Complex Chronic Conditions After Anesthesia for Non-operative Procedures and Surgery

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## Background

- Over 400,000 children with complex chronic conditions (CCCs) live in the U.S. due to improvements in care
- Frequent utilizers of anesthesia services, are likely to be at elevated risk of prolonged hospitalization, mechanical ventilation, ICU admission after anesthesia
- Risk of death after “low risk” anesthetics never explored

## Objective

Examine the incidence and risk factors for death after anesthesia in children with complex chronic conditions after surgical and non-surgical anesthetics

## Methods

- Retrospective cohort study using Pediatric Health Inpatient Sample Database, 4/1/2016 – 10/31/2018
- Validated definitions of 12 pediatric CCCs
- Excluded anesthetics occurring after >30 days of hospitalization, neonates <28 days old
- Non-operative anesthetics identified on days with anesthesia charge, but no operating room charge with same-day billing codes for studies commonly requiring anesthesia
- Grouped non-surgical anesthetics into categories: (1) imaging, (2) interventional radiology, (3) endoscopy, (4) cardiac procedures, (5) oncology procedures
- Surgical risk stratified by (1) cardiac surgery, (2, 3, 4) high, medium, low risk non-cardiac surgery
- Demographic, hospital utilization variables available for risk adjustment

## Results

- 141,168 patients had 320,844 anesthetics within 30 days of admission during 242,183 hospitalizations
- 81% of hospitalizations involved at least one anesthetic, 122,305 (38.1%) anesthetics for non-surgical procedures
- Among first anesthetics during each hospitalization, 78,468 were for non-operative procedures; 163,715 were for surgery.

### Percent of patients dying within 3, 7, and 30 days of anesthesia after first anesthetic of hospitalization

Procedure Group	Elective Admissions			
	N	3 days	7 days	30 days
Cardiac Procedures	3,333	0.33	0.42	0.96
Imaging	5,029	0.2	0.32	0.76
Interventional Radiology	9,006	0.17	0.23	0.68
Endoscopy	3,072	0.07	0.13	0.52
Oncology	5,882	0.03	0.09	0.31
Cardiac Surgery	14,975	0.13	0.23	0.47
High Risk Non-Cardiac Surgery	46,130	0.06	0.09	0.16
Mid Risk Non-Cardiac Surgery	32,228	0.05	0.05	0.07
Low Risk Non-Cardiac Surgery	9,038	0.02	0.08	0.17

Procedure Group	Urgent/Emergent Admissions			
	N	3 days	7 days	30 days
Cardiac Procedures	5,628	1.6	2.08	3.29
Imaging	19,134	0.97	1.42	2.16
Interventional Radiology	21,982	0.75	1.11	2.07
Endoscopy	9,654	0.36	0.5	1.13
Oncology	11,260	0.31	0.52	1.33
Cardiac Surgery	2,967	1.04	1.31	2.63
High Risk Non-Cardiac Surgery	24,463	1.03	1.47	2.13
Mid Risk Non-Cardiac Surgery	19,233	0.15	0.22	0.43
Low Risk Non-Cardiac Surgery	9,296	0.12	0.2	0.51

### 7-day death after hospitalization's first anesthetic<sup>1</sup>

Complex Chronic Condition	Anesthetic Type OR (95%CI)	
	Non-Operative	Surgery
Neuromuscular	9.1 (7.6, 10.9)	4.1 (3.3, 5.0)
Metabolic	3.2 (2.8, 3.8)	3.4 (2.8, 4.1)
Cardiovascular	1.5 (1.2, 1.8)	2.6 (2.1, 3.1)
Neonatal	1.2 (0.8, 1.7)	1.3 (0.9, 1.9)
Malignancy	1.1 (0.9, 1.4)	1.0 (0.8, 1.3)
Hematologic / Immunologic	1.0 (0.7, 1.2)	2.0 (1.5, 2.6)
Gastrointestinal	0.8 (0.6, 1.0)	1.1 (0.9, 1.4)
Congenital	0.8 (0.6, 1.0)	1.0 (0.8, 1.4)
Respiratory	0.6 (0.5, 0.9)	0.9 (0.6, 1.2)
Renal	0.6 (0.4, 0.8)	0.6 (0.4, 0.8)
Transplant	0.5 (0.3, 1.1)	0.6 (0.4, 1.1)
Technology Dependent	0.4 (0.3, 0.5)	0.5 (0.4, 0.7)

<sup>1</sup> Multivariable logistic regression, covariates: hospital, urgency, day of anesthetic, presentation from ICU, hospitalization, anesthetic, hospitalization >1 week within past 6 months

## Conclusions

- Imaging or interventional radiology were associated with a higher risk of death than low or medium risk surgery
- Number needed for adverse outcome (3-day-death) is 1/500 for imaging during an elective admission; 1/588 patients presenting for interventional radiology procedures
- Risk even higher for urgent/emergent hospitalizations, anesthetics occurring days 2-30 of hospitalization
- Frame of reference: 30-day mortality after pediatric tonsillectomy is 0.01% - 0.0025%**
- Patient risk factors include neuromuscular, metabolic, and cardiovascular disease, presentation from ICU