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5-31-2017

Preventing Isolated Perioperative Reintubation: Who is at highest risk?

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Recommended Citation

Bauer, MD, Tyler M.; Johnson, MD, Adam P.; Wirtalla, MD, Chris; Goldhammer, MD, Jordan E.; Kelz, MD, Rachel R.; and Cowan, MD, Scott W., "Preventing Isolated Perioperative Reintubation: Who is at highest risk?" (2017). *House Staff Quality Improvement and Patient Safety Conference (2016-2019).* Poster 67. https://jdc.jefferson.edu/patientsafetyposters/67

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Background

- Postoperative respiratory complications occur in 1.03% of surgery patients with an average costs of \$62,704 per patient, per event.^{1,2}
- Post-operative respiratory failure is often secondary to a concurrent severe complication, such as cardiac arrest, sepsis, pneumonia, aspiration, or pulmonary embolism.³
- Isolated perioperative reintubation (IPR), defined as unplanned intubation in the first 24 hours of surgery without concurrent complications, has not been well characterized in the literature.
- IPR likely occurs due to one or a combination of the following^{3,4}:
 - Opioid overdose
 - Over-sedation
 - Residual paralysis
 - Fluid overload.
- IPR represents a rare but possibly preventable cause for respiratory failure in the immediate postoperative period.

Objectives

- 1. We aim to characterize IPR nationally through a retrospective review of the National Surgical Quality Improvement Program participant user file (NSQIP PUF).
- 2. Identify risk factors for IPR including analysis of procedure type and preoperative characteristics.

Methods

- The 2014 NSQIP PUF was queried for all observations.
- Study and event exclusions were applied as below (Figure 1A and B)
- Procedures were grouped by Current procedural terminology (CPT) code, as recommended in the NSQIP appendix B file.
- IPR was analyzed with known risk factors and procedure grouping using chi square analysis (p < 0.001)
- Multivariable logistic regression Analysis was used to analyze for independent risk factors (p < 0.05)
 - Inclusion into the multivariable analysis was based on a chi square p value < 0.1.

Figure 1A: Study Exclusions 750,937 Cases in 2014 PUF 73,778 Not under general anesthesia 2,750 On ventilator pre-op 1,398 Pneumonia pre-op 36,833 SIRS/Sepsis pre-op 1,736 SSI Pre-op 706,209 Cases included in analysis



Preventing Isolated Perioperative Reintubation: Who is at highest risk?

Figure 1B: Event Exclusions

UI
ence at any time
7A) day 0, 1, or 2
ac arrest) day 0, 1, or 2
olism day 0, 1, or 2
a day 0, 1, or 2
s day 0, 1, or 2
D 111

Results

- Chi-squared analysis identified 22 patient covariates and 18 CPT procedure groups that were associated with IPR (p<0.1) and included in the multivariable analysis.
- Multivariable logistic regression analysis identified 12 patient factors and 8 operation types significantly associated with an elevated likelihood of IPR (p<0.05).

IPR Covariate	OR	$\mathbf{P} > \mathbf{z} $	95% CI	
Preoperative risk factor				
Age (>60 years)	1.44	<0.001	1.2 - 1.72	
Current smoker	1.25	0.023	1.03 - 1.51	
Report of dyspnea (rest and				
moderate)	1.76	<0.001	1.41 - 2.19	
Ascites (in prev 30days)	2.22	0.039	1.04 - 4.74	
COPD (Severe)	1.88	<0.001	1.49 - 2.37	
CHF(in prev 30 days)	1.89	0.002	1.27 - 2.81	
HTN	1.44	<0.001	1.19 - 1.75	
Transfusion preoperatively in				
last 72 hours	2.87	<0.001	1.94 - 4.26	
Wound classification (>/= 2)	1.32	0.007	1.08 - 1.62	
ASA classification (>/= 3)	3.10	<0.001	2.44 - 3.93	
Operative time (>3 hours)	1.65	<0.001	1.38 - 1.99	
African American	1.34	0.013	1.06 - 1.7	
Procedure				
Colectomy	1.45	0.009	1.1 - 1.92	
Esophagectomy	3.79	<0.001	1.95 - 7.36	
CAS	7.92	0.041	1.08 - 57.89	
EVAR	2.37	<0.001	1.5 - 3.73	
Aorticoilliac (open)	2.36	0.001	1.4 - 3.98	
Spine	0.62	0.046	0.39 - 0.99	
Nephrectomy	1.74	0.026	1.07 - 2.84	
Cystectomy	2.07	0.039	1.04 - 4.12	
TKA	0.31	0.010	0.13 - 0.75	
Hip Fracture	1.79	0.020	1.1 - 2.93	

Discussion

- We identified a national IPR of 0.1% in all eligible patients.
- Ten procedures demonstrate a higher than average likelihood of IPR, and two, spine and knee arthroplasty, demonstrate a lower likelihood.
- TKA and Spine Surgeries had a odds ratio of < 0.01 (protective). We believe this was due to a low amount of onboard anesthetics and enhanced operative management of anesthesia with somatosensory evoked potentials respectively.
- Further chart review and prospective analysis may be required to understand the mechanism for increased likelihood of IPR in other general and vascular procedures.
- Many of the patient comorbidities overlap with risk factors for

Limitations

- in the ACS NSQIP patient registry.
- purpose.

Next Steps

- - Interplay and overlap of underlying etiologies.
- Cost an average IPR event.
- Combining the identified risk factors with physiologic parameters during emergence from anesthesia to help develop a high risk pulmonary pathway in the immediate perioperative period.
- Traditionally, neostigmine has been used to promote anesthesia reversal in high risk patients
- New, novel neuromuscular blockade reversal agents have demonstrated more effective at reversing the neuromuscular blockade than neostigmine, albeit at a higher price.
- As the price for neostigmine rises, and becomes more comparable to these new agents, it may become beneficial to treat high risk groups, such as the ones identified in our study, with the newer agents.
- Develop and validate robust anesthesia and surgery outcomes.
- Many outcomes require appropriate patient selection, preoperative optimization, and intra-operative management by anesthesia.
- specialties

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• Retrospective review of registry data is limited to data collected by the registry and may not have generalizability outside of participants

• Since there is no explicit variable for IPR, it was inferred by exclusions. Further chart review at an institutional level may be necessary to validate the application of the se exclusions for this

• Perform institutional review of IPR events and compare to national trends and benchmarks. This will allow us to better understand:

• Outcomes such as IPR require close coordination and collaboration between anesthesia and surgery. Sharing and benchmarking outcomes like these may help to promote collaboration for improved outcomes in these two