

Implementation of a Pre-Intubation Airway Checklist in the Emergency Department: A retrospective study looking at peri-intubation complications

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Background

In the Emergency Department (ED), successful endotracheal intubation (ETI) is paramount for the resuscitation of the critically ill patient. ETI is often a high-risk event and is associated with peri-intubation complications such as hypotension, hypoxia, and cardiac arrest^{1,2}. Proper airway management, and clear interdisciplinary communication, is thus a vital skill for practicing emergency physicians. Various studies have shown that using pre-intubation checklists for guidance and specific reminders during ETI's, can reduce the risk of adverse effects, improve first-pass success rates, and ultimately improve patient outcomes²⁻⁷. We sought to evaluate the impact of a pre-intubation airway checklist, SOLID Plan (Summarize, Optimize, Location, Identify, Drugs, and back-up Plan), on complications related to intubation in the ED.

Methods

A retrospective chart review of all patients requiring intubation in the emergency department at a level 1 trauma center from January 2020- December 2021 was conducted. A pre-intubation airway checklist was implemented in January 2021. The rate of intubation complications before and after the implementation of the SOLID Plan checklist was evaluated along with multiple other indicators. Data was analyzed using chi-square or fisher’s exact test.

AIRWAY PREINTUBATION CHECKLIST
“SOLID PLAN”

SUMMARIZE

Case details relevant to induction & intubation

OPTIMIZE

A: Ramp, Position

B: Apneic O₂, chest tube

C: Blood, Fluids

D: GCS/neuro exam

E: Major injuries identified?

LOCATION

Consider OR/IR for immediate surgery, vs ED for imaging & procedures

IDENTIFY

Roles, C-Spine Stabilization, Proceduralist

DRUGS

None / Paralytic only / Reduced / Divided doses? Sedation & vasopressors / Post-intubation sedation

BACKUP PLAN

LMA, bougie, other equipment or surgical airway, call anesthesia (if applicable)

All team members agree?

Record/START

Questions & Comments: Contact Anesthesiology

Results

A total of 1090 intubations were captured during the study period with 559 and 531 occurring in 2020 and 2021, respectively. Overall rate of complications was found to be 14.1% in 2020 compared to 10.7% in 2021 (p-value = 0.024). Complications evaluated included major complications (i.e. esophageal intubation with late recognition, PEA arrest, failed airway and death due to failed airway) and minor complications (i.e. direct airway injury, aspiration, dental trauma, esophageal intubation with immediate recognition, hypotension, laryngospasm, hypoxia, mainstem intubation). Rate of major complications was found to be 0.89% in 2020 and 1.51% in 2021 (p-value = 0.41). Rate of minor complications was found to be 13.06% in 2020 and 9.23% in 2021 (p-value = 0.008).

Overall rate of complication in relation to SOLID PLAN Airway Checklist compliance was found to be 10.9% vs 10.7% in cases where the checklist was not used (p-value = 0.9). When stratifying complications that occurred with SOLID Plan use by level of intubator, PGY4 residents had the least percentage of complications at 7.2% (p-value = 0.3). Hypotension within 60 minutes of intubation requiring fluid bolus or pressors was the most common complication occurring in 9.2% of intubations. 52% of patients who experienced hypotension requiring intervention after intubation did have induction medication adjustments to aid in preventing such a complication, a recommendation of the checklist.

Peri-Intubation Complication Rates							
By Year	N Intubations	N Successful	N Complicated	Percent Success (%)	Complication Rate (%)	Major Complication Rate (%)	Minor Complication Rate (%)
2020	559	519	79	92.8	14.1	0.89	13.06
2021	531	445	57	83.8	10.7	1.51	9.23
By SOLID Plan Use	N Intubations	N Successful	N Complicated	Percent Success (%)	Complication Rate (%)	Major Complication Rate (%)	Minor Complication Rate (%)
No	205	120	22	58.54	10.7	0.98	9.76
Yes	293	293	32	100	10.9	1.37	9.56
Not Recorded	592	551	82	93.1	14.9	1.18	12.5

Conclusion

Our analysis shows that the overall rate of airway complications decreased from 2020 to 2021 by a statistically significant amount. Stratification based on checklist compliance, however, did not show significant change, suggesting a multifactorial cause for the decrease in complications seen. Although results are still unclear, the checklist may aid in lowering rates of complications in ED airways. Further studies are needed to see the true impact of the implementation of the SOLID plan.



References

- Conroy: Conroy MJ, Weingart GS, Carlson JN. Impact of checklists on peri-intubation care in ED trauma patients. The American journal of emergency medicine. 2014 Jun 1;32(6):541-4.
- Kerrey: Kerrey BT, Mittiga MR, Rinderknecht AS, Varadarajan KR, Dyas JR, Geis GL, Luria JW, Frey ME, Jablonski TE, Iyer SB. Reducing the incidence of oxyhaemoglobin desaturation during rapid sequence intubation in a paediatric emergency department. BMJ quality & safety. 2015 Nov 1;24(11):709-17.
- Hardy: Hardy G, Horner D. BET 2: Should real resuscitationists use airway checklists?. Emergency Medicine Journal. 2016 Jun 1;33(6):439-41.
- Newkirk: Newkirk M, Pamplin JC, Kuwamoto R, Allen DA, Chung KK. Checklists change communication about key elements of patient care. Journal of Trauma and Acute Care Surgery. 2012 Aug 1;73(2):S75-82.
- Tobin: Tobin JM, Grabinsky A, McCunn M, Pittet JF, Smith CE, Murray MJ, Varon AJ. A checklist for trauma and emergency anesthesia. Anesthesia & Analgesia. 2013 Nov 1;117(5):1178-84.
- Klingberg: Klingberg C, Kornhall D, Gryth D, Krüger AJ, Lossius HM, Gellerfors M. Checklists in pre-hospital advanced airway management. Acta Anaesthesiologica Scandinavica. 2020 Jan;64(1):124-30.\
- Lewis: Lewis CT, Brown J, Inglis AC, Naumann DN, Crombie N. Emergency intubation in trauma in KwaZulu-Natal Province, South Africa. South African Medical Journal. 2018 Oct 12;108(8).