

A Survey of Nurse Anesthetists Regarding Modified Rapid Sequence Induction and Intubation

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GY25

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Learning Objectives

- Describe at least three differences in Rapid Sequence Induction and Intubation (RSII) practice in Wisconsin among Certified Registered Nurse Anesthetists/Anesthesiologists-(CRNAs).
- Recognize patient scenarios likely to preclude certain elements in the employment of RSII.
- Compare the pharmacokinetics of paralytic medications used during the rapid sequence induction, including polarizing and non-depolarizing drugs.

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Background & Significance

- Significance: RSI was originally conceived in the 1970s to reduce pulmonary aspiration of gastric contents in non-fasted patients (Sept & Safar, 1970).
- Still prevalent in modern anesthesia, however, heavily modified. Can lead to miscommunications and unclear expectations in the operating room (Avery et al., 2021).
- Population: CRNAs performing rapid sequence induction on adult patients in the hospital setting.
- Purpose: Gain greater understanding of how RSI is being performed and modified by CRNAs.
- Aims: Determine how often anesthesia providers are utilizing cricoid pressure, positive pressure mask ventilation and whether providers prefer rocuronium or succinylcholine.
- Significance:
 - Micro: Identify variances in individual practices
 - Meso: Identify any gaps in communication or any unclear expectations surrounding the procedure
 - Macro: Regional awareness of practices

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Design, Implementation

- Design: multi-center survey of RSI practices among CRNAs in Wisconsin.
- Implementation, Recruitment, Data Collection: Utilize WIANA to aid in distributing a Qualtrics survey to CRNAs in the State.



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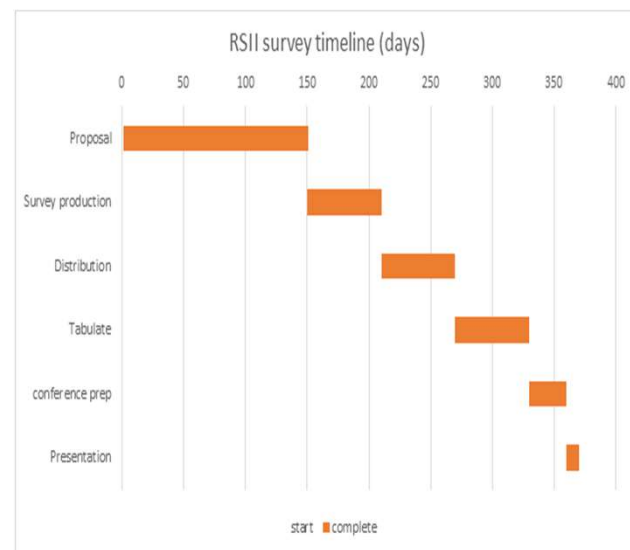
Implications

- SWOT analysis
 - Strengths: Facilitate better communication in the operating room. Is generalizable to multiple areas outside of the OR environment.
 - Weaknesses: Incomplete data collection. Limited high-quality evidence on many practices makes sweeping recommendation impractical.
 - Opportunities: Can expand survey beyond Wisconsin and can also be explored with other providers performing RSI, discover differences in regional practices
 - Threats: Low response rates or incomplete responses.

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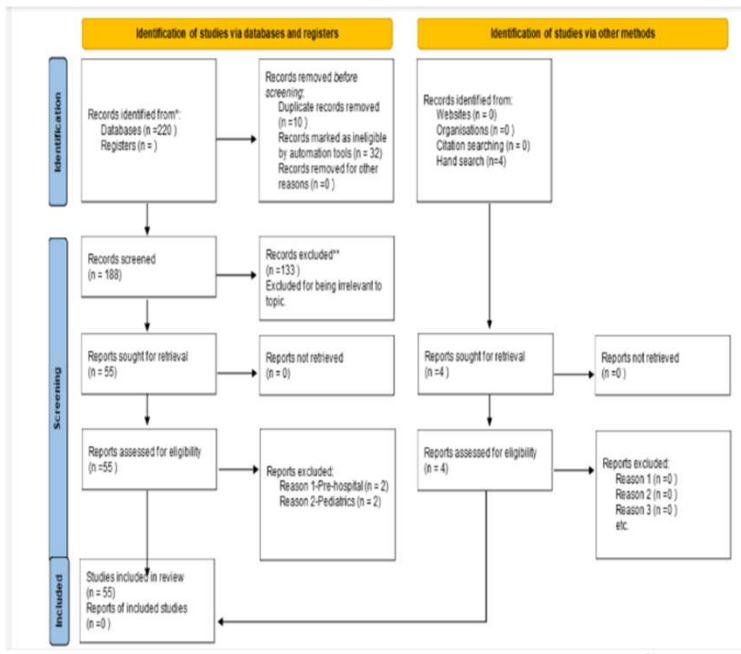
PICOT Question

- Population: Participating members of WIANA
- Intervention: Survey CRNAs regarding induction & intubation practices.
- Comparator: Traditional, modified, or standard induction
- Outcome: 182 surveyed responses
- Timeline: →



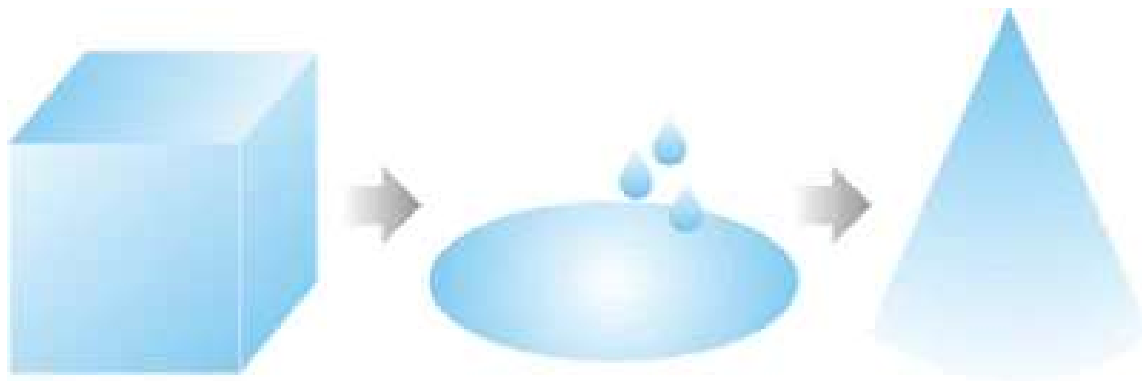
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Literature Review



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Theoretical Model—Lewin's change model



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Survey questionnaire

- 1. How many years have you practiced anesthesia?
- 2. How would you describe your organizations practice model?
- 3. For each of the following patient attributes how would you approach anesthetic induction/airway management?
 Traditional RSI must include all of the following: Preoxygenation prior to anesthetic induction, application of cricoid pressure (Sellick's Maneuver), and avoidance of positive pressure mask ventilation. Modified RSI is an alteration to any of these practices.

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Survey Questionnaire cont...

- 4. For the clinical scenarios above in which you've indicated a modified RSI, how often are you utilizing Sellick's Maneuver (Cricoid Pressure)?
- 5. For the clinical scenarios above in which you've indicated a modified RSI, how often do you mask ventilate (1 or more breaths)?
- 6. Assuming no contraindications to either, which neuromuscular blocking agent do you prefer to use for your standard inductions
- Assuming no contraindications to either, which neuromuscular blocking agent do you prefer to use for your RSIs?

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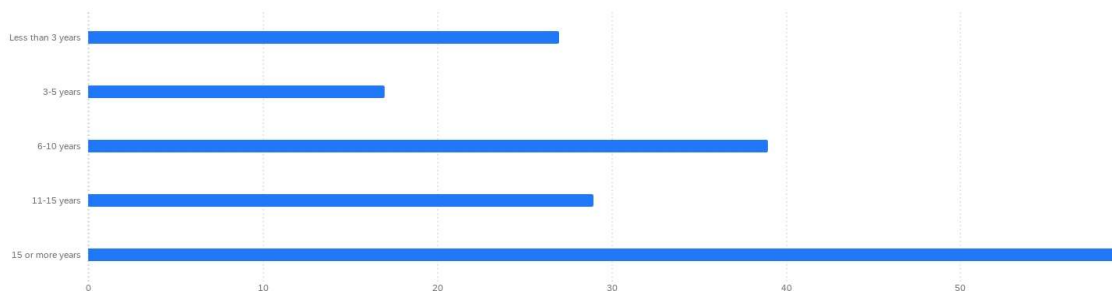
WI CRNA RSI survey results



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Respondent Demographics

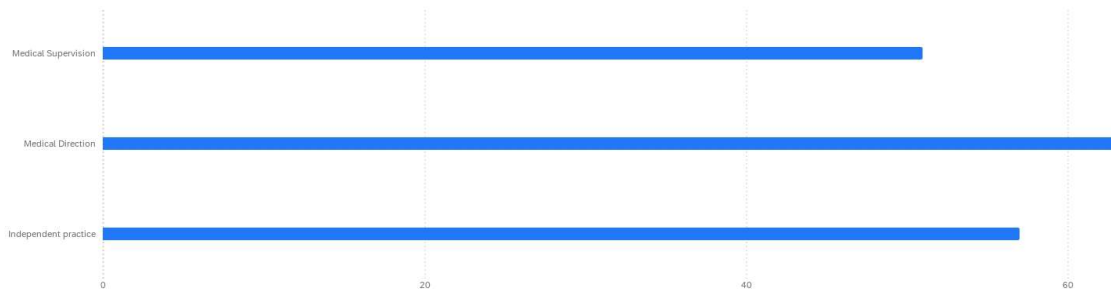
1. How many years have you practiced anesthesia? 171 ⓘ



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Respondent Demographics

2. How would you describe your organizations practice model 171 ①



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Survey Results: breakdown of induction scenarios



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Types of induction scenarios

Patient scenario	Traditional RSI	Modified RSI	Standard Induction
BMI 40+	57%	11%	32%
BMI 30-40	2%	8%	90%
Uncontrolled GERD	58%	34%	8%
Controlled GERD	2%	16%	82%
Hiatal hernia	22%	37%	42%
Controlled diabetic	1%	11%	88%
Poorly controlled diabetic	18%	50%	32%
Urgent/emergent case where patient is NPO >8hrs	15%	31%	54%
Urgent/Emergent Case where patient is NPO 4-8 hours	69%	30%	1%

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Types of induction scenarios

Patient Scenario	Traditional RSI	Modified RSI	Standard Induction
Emergent Case where patient is NPO <4hours	88%	12%	0%
Patient with a known bowel obstruction	87%	13%	0%
Patient with pneumonia/ARDS	10%	31%	58%
Pregnant >18 weeks' gestation or <24hrs postpartum	70%	26%	4%
Patient who is a suspected difficult mask ventilation	31%	44%	25%
Taking GLP-1 agonists (Ozempic, etc.)	50%	33%	17%

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Diversity of
choice among
induction types
(approximate
percentage
splits—
tRSI/mRSI/SI)

Uncontrolled GERD (60/30/10)

BMI40+ (60/10/30)

PNA/ARDS (10/30/60)

Poorly controlled diabetics, urgent &
>8hrs NPO, GLP-agonist (3/50/20)

Hiatal hernia (40/40/20)

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Consistency
among others...
(approximate
percentage
splits—
tRSI/mRSI/SI)

Pregnant >18 wks gestation or <24hrs
PP (70% tRSI)

Urgent 4-8hrs NPO (70% tRSI)

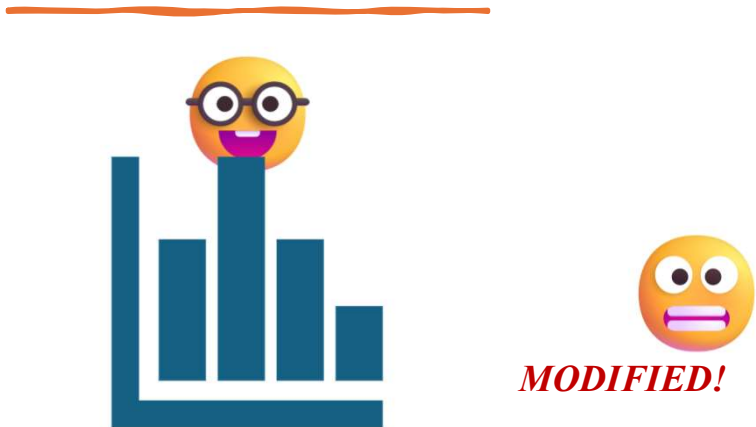
Controlled GERD (80% SI)

Urgent <4hrs NPO (90% tRSI)

BMI30-40, controlled diabetic (90% SI)

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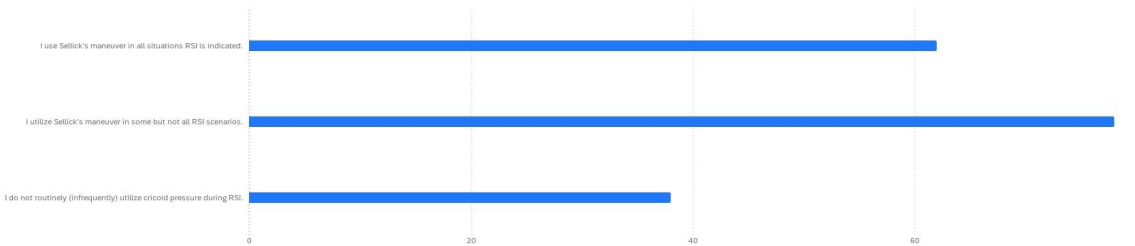
Statistical analysis of modified RSI components



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mRSI Components: Cricoid Pressure

4. For the clinical scenarios above in which you've indicated a modified RSI how often are you utilizing Sellick's maneuver (cricoid pressure)? 378

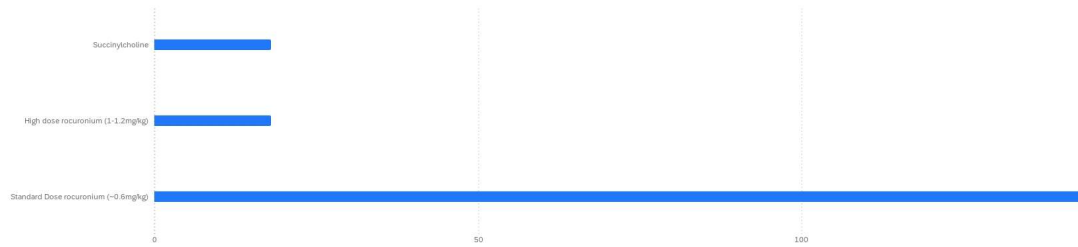


I use Sellick's Maneuver for all RSI Scenarios	35%
I use Sellick's Maneuver for some RSI scenarios	44%
I seldom use Sellick's Maneuver for RSI scenarios	21%

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RSI Components: Choice in Muscle Relaxant for Standard Induction.

Assuming no contraindications to either, which neuromuscular-blocking agent do you prefer to use for your standard anesthetic inductions 180 ⓘ

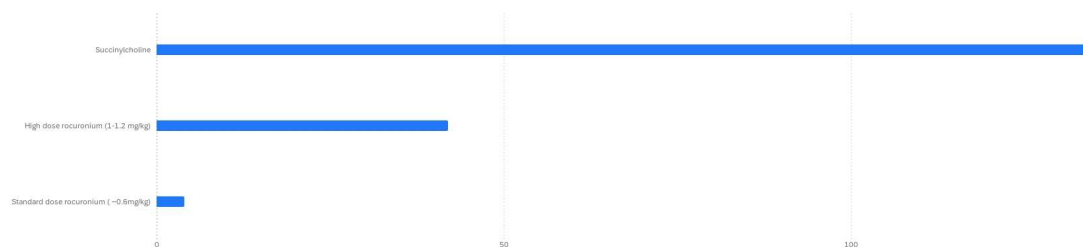


Succinylcholine	10%
High Dose Rocuronium (~1-1.2 mg/kg)	10%
Standard Dose Rocuronium (~0.6 mg/kg)	80%

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RSI Components: Choice in Muscle Relaxant for RSI

7. Assuming no contraindications to either, which neuromuscular-blocking agent do you prefer to use for RSI? 180 ⓘ

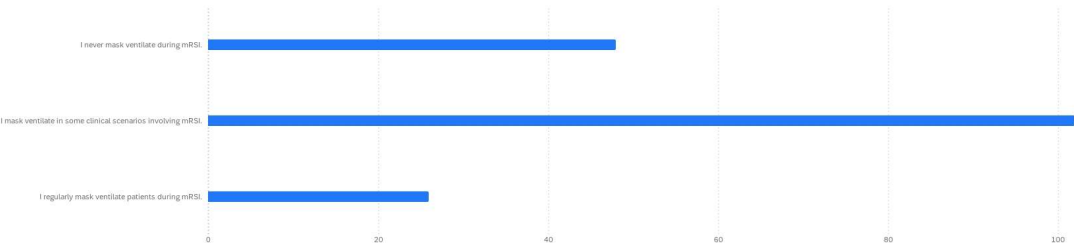


Succinylcholine	74%
High Dose Rocuronium (1-1.2 mg/kg)	23%
Standard Dose Rocuronium (~0.6 mg/kg)	2%

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mRSI Components: Mask Ventilation

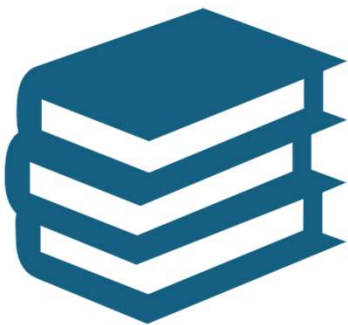
5. For the clinical scenarios above in which you've indicated mRSI how often are you mask ventilating (1 or more breaths)? 17% ⓘ



I never mask ventilate in RSI scenarios	27%
I mask ventilate in some RSI scenarios	58%
I regularly mask ventilate in RSI scenarios	15%

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Current Literature Review



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Cricoid Pressure Questions

How often is it being utilized?

Is it effective at preventing gastric regurgitation?

What are potential risks associated with the procedure?(First pass success rates, patient injury etc...)

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Current Literature: Cricoid Pressure

- Similar survey results
 - Ehrenfeld, et al (2012)--Modified Rapid Sequence Induction and Intubation: A Survey of United States Current Practice
 - 91% applied CP
 - Schlesinger et al (2001)--Modified Rapid-sequence induction of anesthesia: a survey of current clinical practice
 - 95% report CP necessity
 - Mistry et al (2022) A survey of self-reported use of cricoid pressure amongst Australian and New Zealand anaesthetists: Attitudes and practice
 - 76% of respondents indicated that they use cricoid pressure in patients they deem high aspiration risks. 40% of respondents believe cricoid pressure effectively reduces regurgitation. 60% perform the procedure for medicolegal protection. 16% believe it should be included in current airway guidelines.

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Cricoid Pressure Review

Hung, et al. (2021)--The effect of cricoid pressure on tracheal intubation in adult patients: a systematic review and meta-analysis (meta-analysis)

- CP did not have negative impact on successful first-attempt intubation rate or glottic visualization
 - Slight prolongation of time to intubation (4.4sec)
- Birenbaum, et al. (2019), Effect of Cricoid Pressure Compared With a Sham Procedure in the Rapid Sequence Induction of Anesthesia (large RCT)
 - failed demonstration of noninferiority of sham procedure in preventing pulmonary aspiration (CP not superior)
- Tessarolo, et al. (2022)--Effectiveness and risks of cricoid pressure during rapid sequence induction for endotracheal intubation in the emergency department: A systematic review
 - Limited evidence that cricoid pressure affected first-pass success or reduced rates of complication
- Trethewy et al. (2017)-- Ideal Cricoid Pressure is Biomechanically Impossible during Laryngoscopy
 - 30 to 40 newtons of force may be adequate to occlude the esophagus in cadavers, but this is impossible to achieve with the countering force of laryngoscopy.

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Rocuronium vs.
Succinylcholine
Questions

Differences between the two?

First pass intubation
success rates?

Rates of regurgitation?

Time to desaturation?

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Choice in Rocuronium vs. Succinylcholine Review

- Tang, et. al (2022)--Impact of Succinylcholine vs. Rocuronium on Apnea Duration for Rapid Sequence Induction: A Prospective Cohort Study
 - High-dose Roc non-hypoxic apnea time was significantly longer than succinylcholine (1.5mg/kg) suggesting O2 demand/supply imbalance with succinylcholine.
 - Advantage to use rocuronium for RSI
- Carvahlo et al. (2021)--Comparison between rocuronium and succinylcholine for rapid sequence induction: A systematic review and network meta-analysis of randomized clinical trials
 - No significant difference between high dose rocuronium and succinylcholine (1-1.5mg/kg) for any adverse outcomes
- Li et al (2020)--Comparison of Rocuronium with Succinylcholine for Rapid Sequence Induction Intubation in the Emergency Department: A Retrospective Study at a Single Center in China
 - Rocuronium was statistically equivalent to succinylcholine for the successful first-attempt orotracheal intubation
 - # of attempts by DL was RM > SY group (1.52 ± 0.87 per patient vs. 1.27 ± 0.60 per patient)

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Mask Ventilation Questions

Is it being done in RSI scenarios?

Does it potentially increase the risk of regurgitation?

What are potential advantages?

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Mask Ventilation Review

- Brown et al, (2015)--bag-mask ventilation in rapid sequence induction survey
 - 25% “never” used BVM as part of RSI but later considered clinical scenario presented
 - 46% healthy 50-year-old, with pneumonia and hypoxic respiratory failure
 - 5% stat 3% severe head injury
 - 33% six-year-old, emergency laparotomy
- Ehrenfeld et al, (2012)--Survey of Modified RSI Practice in the US
 - 77% of surveyed providers attempt to mask ventilate (1-5 breaths) during mRSI
- Vasudevan, et al (2018)--Assessment of effectiveness of cricoid pressure in preventing gastric insufflation during bag and mask ventilation: A randomized controlled trial
 - CP effective to prevent gastric insufflation during facemask ventilation at mean airway pressure < 20 cmH₂O.
 - Gastric antral CSA feasible and reliable method to detect gastric insufflation
- Freck, et al (2015) Difficult Airway Society Guidelines
 - Gentle Mask Ventilation with concurrent use of cricoid pressure does not cause gastric insufflation and may reduce hypoxia in patients with poor respiratory reserve, sepsis, or high metabolic requirements.

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Discussion

- Avery et al., (2021)--Rapid sequence induction: where did consensus go?
 - High performing systems: high quality RSI is not a solo activity and requires an effective team approach
 - Checklists key component to emergency intubations
 - Must consider length, content, design to maximize benefit, uptake
- Chen et al, (2020)--The end of rapid-sequence induction?
 - term ‘rapid sequence induction’ represents an opportunity for a shared mental model for induction of anesthesia.

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Discussion, continued

- Introduction of a rapid sequence induction checklist and its effect on compliance to guidelines and complications –Zeuchner, et al 2021
 - The introduction of a structured RSI checklist significantly increased compliance to RSI guidelines
- Rapid sequence induction An international survey –Klucka, et al, (2020)
 - Significant heterogeneity in daily clinical practice of RSI
 - Emphasize need for international RSI guidelines
- Project for Universal Management of Airways
 - Multinational group formed in 2020 with goal to standardize the approach to airway management.
 - Universal Airway Guidelines
 - Recommend removal of term “modified RSI”

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Universal Airway Guidelines
Components of Rapid Sequence Intubation

RECOMMENDED COMPONENTS

- Preoxygenation
- Suction turned on & under pillow
- Confirmed, reliable intravenous access
- Tracheal introducer* prepared
- Predetermined dose of induction agent
- No latency between giving induction agent & NMBA†
- Rapid onset NMBA†
- Apnoeic oxygenation between attempts at laryngoscopy‡
- Confidence in complete paralysis before instrumenting airway
- Tracheal tube cuff inflation before positive pressure ventilation‡

SUGGESTED COMPONENTS

- Apnoeic oxygenation during attempts at laryngoscopy
- Ability to adopt Trendelenburg position if regurgitation occurs
- Suction & leave open to air an in situ nasogastric tube

OPTIONAL COMPONENTS

- Prokinetic drugs
- Non-particulate or intravenous antacids
- Insertion of nasogastric tube & suction
- Removal of nasogastric tube before induction of unconsciousness
- Head elevation or Trendelenburg tilt
- Avoiding agents with potential sedative/hypnotic effects before induction
- Cricoid pressure‡
- Avoiding facemask ventilation before laryngoscopy‡

*Bougie or other stylet should be preinserted into tube. Bougie may be preinserted or simply ready for 'roll-in' use as required (with subsequent 'roll-backing').
†Rocuronium/Vecuronium.
‡If facemask ventilation is not used between attempts, apnoeic oxygenation may be achieved via maintaining tight facemask seal and jaw support.
§Ifuffed tracheal tube used.
¶In accordance with local policies.
‡In the absence of desaturation, Desaturation warrants initiation of facemask ventilation.
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Conclusion

- Rapid sequence induction and intubation was introduced in the 1970's as means to prevent pulmonary aspiration of gastric contents (Sept & Safar, 1970).
- More than 50 years have passed, and the technique have become heavily modified, and practice can vary widely between providers. The lack of uniformity stems from insufficient data to support the techniques most common elements (Avery et al., 2021).
- Variabilities in practice have the potential to cause confusion among practitioners, leaving patients susceptible to airway compromise and mismanaged care.
- RSII is performed by multiple healthcare professionals working congruently. The ability of the anesthesia team to seamlessly secure the patient's airway is of utmost importance when the patient is at high risk of aspiration. Failure of the team to function in unison could significantly increase patient morbidity and mortality (Avery, et al., 2021).

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