

**The Effectiveness of Cricoid Pressure During Rapid Sequence
Intubation in Reducing Aspiration in Adult Patients:**

A Systematic Review and Meta-analysis

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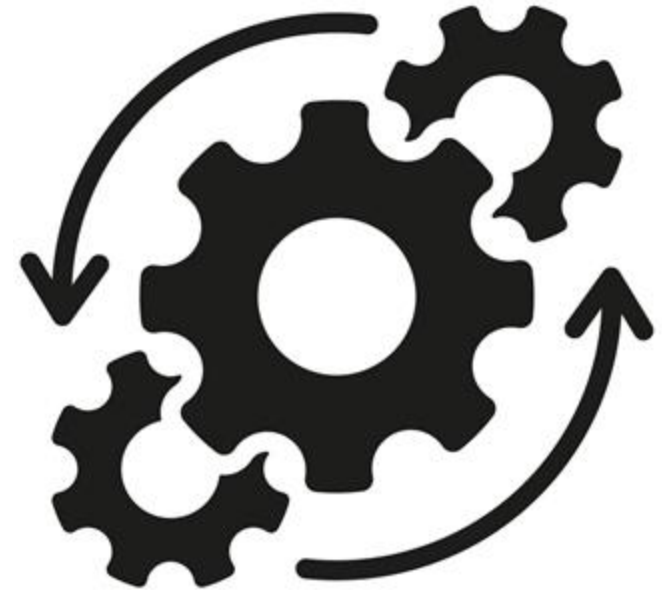
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Nurse Anesthesia Program, Rutgers University

Russell Lynn Memorial Student Lecture Series

A Work in Progress

- This presentation is based on our DNP project at Rutgers University for the Nurse Anesthesia Program
- Currently in the implementation phase of the project
- We would like to thank our committee members for guiding us this far:
 - ANES Faculty: Dr. Maureen McCartney-Anderson
 - NEST Faculty: Dr. Cheryl Holly



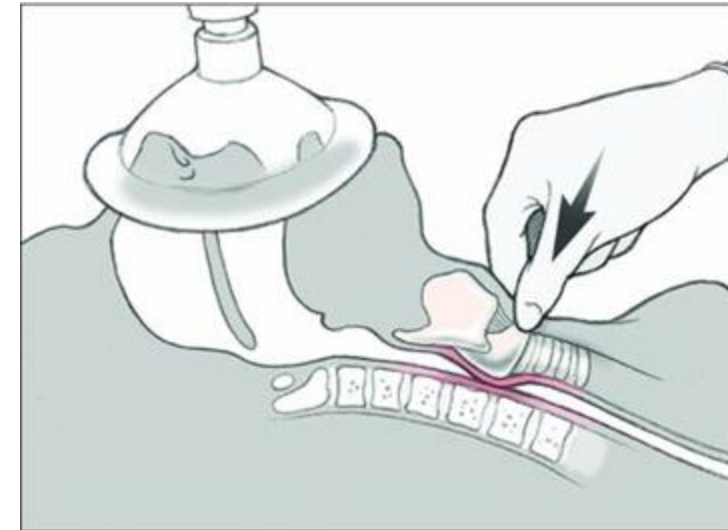
Review Question

In adult patients (P), how does the use of cricoid pressure during rapid sequence intubation (I), compared to the absence of the use of cricoid pressure during rapid sequence intubation (C), affect the rate of aspiration (O)?



Purpose of Review

- The purpose of this review is to examine the best available evidence on the effectiveness of cricoid pressure during rapid sequence intubation in adult patients in reducing the risk of aspiration
- The review aims to explore the correct technique for performing cricoid pressure, identify patient populations where it would be most beneficial, and assess the incidence of cricoid pressure-associated complications

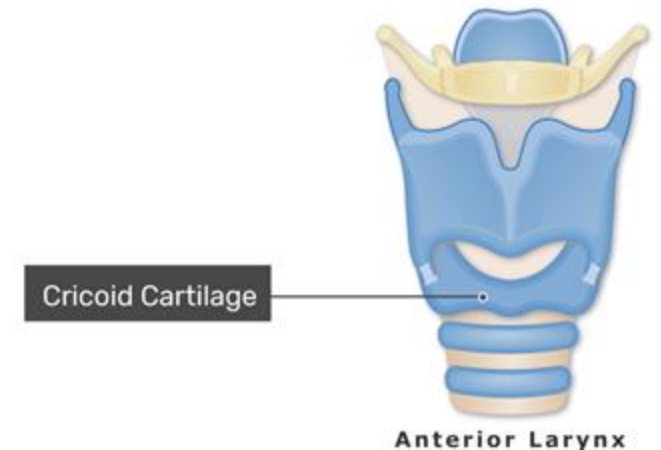


Background

- Endotracheal intubation is a vital procedure in airway management, often performed urgently in critically ill patients
- Carries a risk of complications, including aspiration, which can lead to serious consequences
- Cricoid pressure, introduced by Sellick in 1961, aims to minimize gastric content regurgitation during intubation by compressing the esophagus
 - *While widely used, its effectiveness in reducing aspiration during rapid sequence intubation (RSI) remains debated*

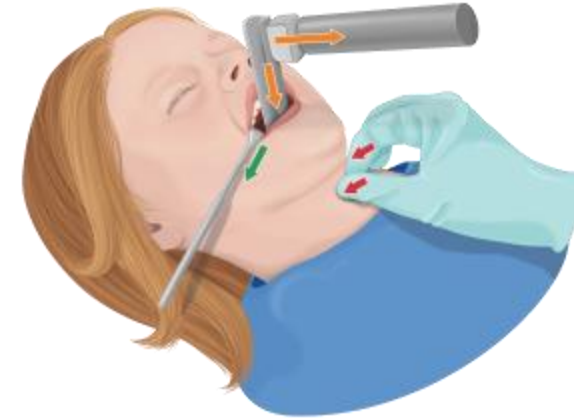


Brian Arthur Sellick
1918 - 1996



Background

- This systematic review focuses on examining the best available evidence on the efficacy of cricoid pressure during RSI in adult patients across various in-hospital settings
- Critically ill patients face an elevated risk of aspiration due to altered consciousness, trauma, or significant comorbidities
- Aspiration during intubation can result in severe complications, emphasizing the importance of effective preventive measures
- The review aims to identify the effectiveness of cricoid pressure, determine optimal patient populations for its use, assess associated complications, and explore the correct technique
- **By synthesizing available evidence, this review will inform clinical practice and guide future research in emergency airway management for critically ill patients**



Significance

Clinical Guidance:

Informing airway management decisions for adult patients during rapid sequence intubation

Risk Reduction:

Minimizing aspiration risk and enhancing patient safety

Complication Assessment:

Evaluating cricoid pressure-related risks for optimized technique

Optimal Technique:

Identifying best practices for effective cricoid pressure application

Population Focus:

Targeting interventions for highest-risk patients

Method

Systematic Review

- A diligently planned and thorough process to minimize bias by methodically identifying, assessing, and assimilating pertinent studies on a particular topic
- Structured approach to searching for, determining, and critically appraising relevant research literature
- Goal is to ascertain a complete and unbiased synthesis of the current evidence on the subject of interest
- Establishes veracity and transparency in the review process

Meta-analysis

- A statistical method designed to produce a quantitative summary or estimate of the effect size by combining and analyzing data from multiple independent studies



Types of Participants



- Must be adults aged 18 years or older
- Patients who received rapid sequence intubation, **except for those with injuries** to the face, neck, or throat, or those with presence of upper airway obstruction or loss of facial or oropharyngeal landmarks
- Participants can be of any gender or ethnicity
- Must have undergone **rapid sequence intubation within an inpatient facility** (prehospital excluded)

Types of Studies

- Studies included will specifically evaluate the effectiveness of cricoid pressure during rapid sequence intubation in adult patients
- Experimental and quasi-experimental methodologies only
 - Randomized controlled trials
 - Non-randomized controlled trials
 - Quasi-experimental studies
- Prospective and retrospective cohort studies will be considered in cases where experimental or quasi-experimental are limited



Intervention and Control

Intervention

- Cricoid Pressure: Manual compression of the cricoid cartilage ring against the fifth cervical vertebrae during rapid sequence intubation
- Compresses the esophagus to prevent regurgitation of gastric contents into the airway while

Control

- Standard treatment (lack of cricoid pressure during rapid sequence intubation)



Search Strategy



Search Strategy:

- Systematic search of PubMed, CINAHL, and EMBASE
- Keywords include "rapid sequence intubation," "cricoid pressure," and "aspiration"
- PRISMA flow diagram to document search process

Inclusion Criteria:

- Full-text English studies
- Adult patients (≥ 18 years)
- RSI in inpatient facility
- Evaluation of cricoid pressure use
- Outcome measure: "aspiration"

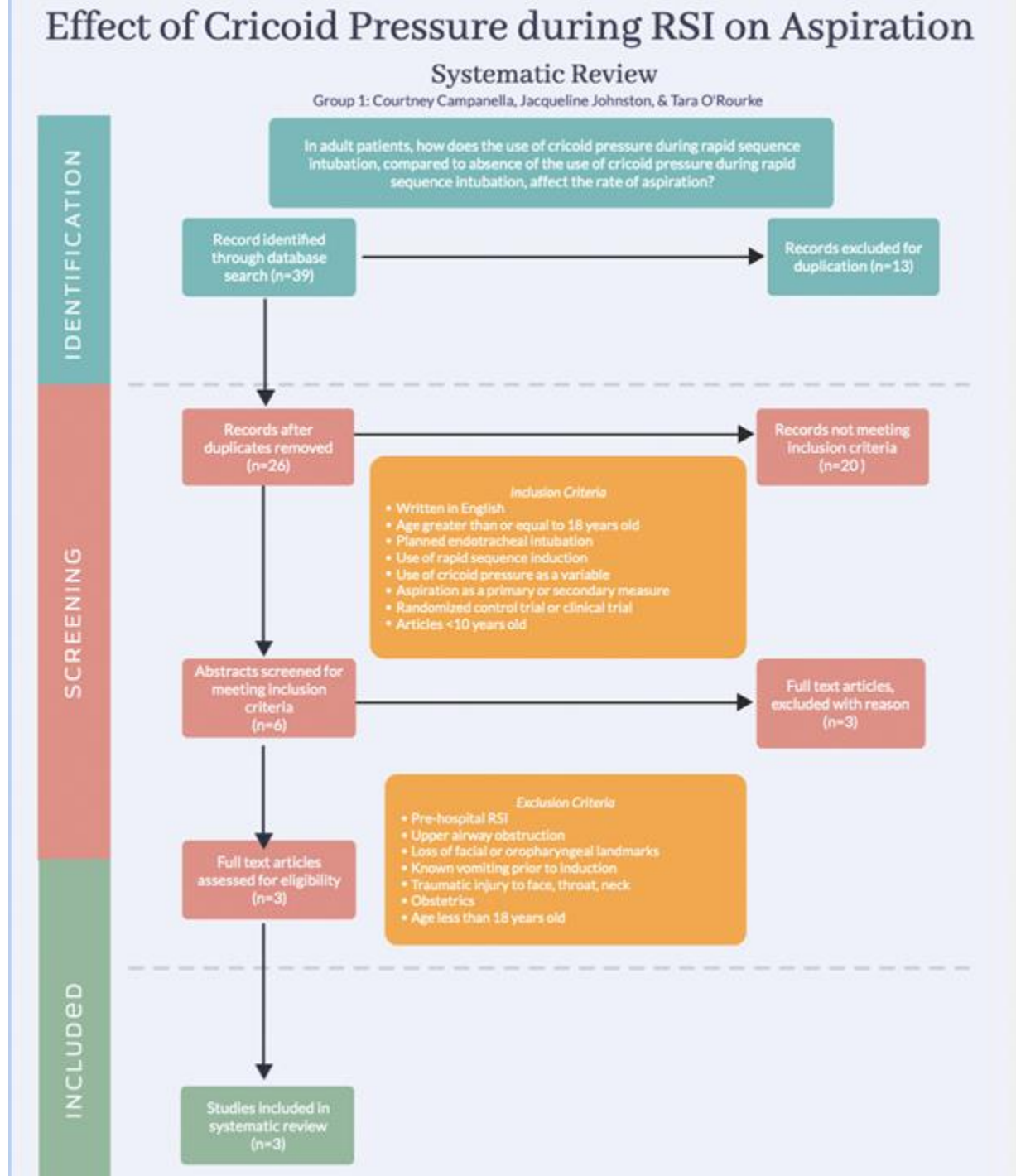
Exclusion Criteria:

- Studies in prehospital settings
- Patients with pre-induction vomiting
- Specific traumatic injuries or obstructions
- Studies lacking relevant outcomes or not meeting study design criteria
- Non-English studies or those published >10 years ago

Concept Map (Used to determine keywords for searching)

	Concepts (“AND”)	Key Words (“OR”)	MeSH Terms
1	Rapid Sequence Intubation	<ul style="list-style-type: none"> • “RSI” [tw] • “Airway management” [tw] • Endotracheal intubation” [tw] • “Emergency intubation” [tw] • “Direct laryngoscopy” [tw] • “Rapid sequence induction” [tw] 	<ul style="list-style-type: none"> • “Rapid sequence induction and intubation” [MeSH] • “Airway management” [MeSH] • “Laryngoscopy” [MeSH]
2	Cricoid Pressure	<ul style="list-style-type: none"> • “Sellick maneuver” [tw] • “Cricoid compression” [tw] • “Suprahyoid pressure” [tw] • “Cricoid cartilage pressure” [tw] • “Cricoid manipulation” [tw] • “Cricoid cartilage” [tw] 	<ul style="list-style-type: none"> • Cricoid cartilage” [MeSH]
3	Adult	<ul style="list-style-type: none"> • “Over the age of 18” [tw] • “Senior” [tw] • “Adulthood” [tw] • “Mature individual” [tw] • “Self sufficiency” [tw] • “Cognitive maturity” [tw] 	<ul style="list-style-type: none"> • “Adult” [MeSH] • “Middle Aged” [MeSH] • “Young Adult” [MeSH] • “Adulthood” [MeSH]
4	Aspiration	<ul style="list-style-type: none"> • “Intubation complications” [tw] • “Pulmonary aspiration” [tw] • “Aspiration pneumonitis” [tw] • “Aspirate” [tw] • “Lung injury” [tw] • “Respiratory aspiration” [tw] 	<ul style="list-style-type: none"> • “Aspiration pneumonia” [MeSH] • “Respiratory aspiration” [MeSH]

PRISMA Diagram



JBI Critical Appraisal Checklist for Randomised Control / Pseudo-randomised Trial

Reviewer Date

Author Year Record Number

	Yes	No	Unclear	Not Applicable
1. Was the assignment to treatment groups truly random?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Were participants blinded to treatment allocation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Was allocation to treatment groups concealed from the allocator?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Were the outcomes of people who withdrew described and included in the analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Were those assessing outcomes blind to the treatment allocation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Were the control and treatment groups comparable at entry?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were groups treated identically other than for the named interventions?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in the same way for all groups?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal: Include Exclude Seek further info.

Comments (Including reason for exclusion)

Quality Appraisal

- Studies reviewed against inclusion and exclusion criteria
- Eligible studies
 - Compiled into table of evidence
 - Reviewed by at least two independent reviewers
 - Methodological quality assessed using the standard JBI critical appraisal checklist
 - Included studies will have an 80% response as “met” on appraisal checklist
 - Appraisal presented as both a narrative format and a table
- Non-eligible studies will be included in the Table of Evidence with rationale for exclusion

Data Extraction

Patient Demographics

- Age
 - Adults >18 years of age
- Gender
 - Female or male
- Population
 - Critically ill patients requiring RSI except for those with trauma to face, throat, or neck or injury that results in upper airway obstruction or loss of facial or oropharyngeal landmarks
- Setting
 - Inpatient hospital units include intensive care unit, emergency room, and operating room
- Intervention
 - Use of rapid sequence intubation in-hospital



Data Extraction

Outcomes

- Aspiration Events
 - Presence of gastric substance in the respiratory tract
 - Positive pepsin immunoassay of tracheal or oropharyngeal secretions
 - Chest x-ray with pneumonitis
 - Treatment for aspiration pneumonitis
 - Diagnosis on discharge
 - Prescribed antibiotics
- Cricoid pressure-associated complications
 - Subjective reports of airway obstruction
 - Difficulty with manual ventilation
 - Poor visualization of the larynx
 - Difficulty with intubation
 - Severe complications
 - Severe hypotension
 - Severe hypoxemia
 - Cardiac arrest
 - Death
- Vulnerable populations
 - Previously defined as high-risk for aspiration including:
 - Neurologic impairment
 - Decreased cough reflex
 - Anatomic airway deformity
 - Inferior dental hygiene
 - Known achalasia or dysphagia
 - Position changes
 - Prolific emesis
 - Mechanically ventilated patients
 - Procedures involving the mouth, esophagus, or airway
 - Nasogastric tube
 - Tracheostomy
 - Proton pump inhibitors
 - Trauma



Data Synthesis & Analysis

- Following identification and screening, three studies were included for systematic review
 - Table of evidence utilized to further examine articles for relevance of data including population, size, setting, measures, and findings
- Projected Plan:
 - Statistical meta-analysis using a random effects model
 - Effect sizes expressed as an odds ratio or risk ratio and weighted mean differences
 - Calculation of 95% confidence interval
 - Chi-square utilization to assess for heterogeneity among findings
 - Analysis using Cochrane's SWiM method



Preliminary Findings



- Three RCTs representing 3,729 patients (range 54-3,472) are included
- **Preliminary review reveals results are equivocal**
 - **Study #1**
 - Found no difference in rate of aspiration
 - **Study #2**
 - CP could not be properly maintained
 - 11 patients had pepsin detected in oropharyngeal sample, 7 of 11 were treated for aspiration
 - Trial was ended due to rate of aspiration
 - **Study #3**
 - Used an anesthesia management bundle that included RSI and concluded it can reduce immediate severe life-threatening complications associated with intubation of ICU patients, including aspiration

Challenges

Limited Data

- Only 3 studies were found with equivocal results
- *The lack of sufficient research may stem from the complexities and ethical considerations inherent in conducting studies involving critically ill patients, as well as the challenges in standardizing RSI protocols across different healthcare settings*



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Thank You!



Questions?

