RUTGERS HEALTH

School of Nursing

Nurse Anesthesiology Program

Effectiveness of Video Laryngoscopy vs. Direct Laryngoscopy in Patients with Difficult Airways Undergoing General Anesthesia: A Systematic Review Protocol

Russell Lynn Memorial Resident Lecture Series

Matthew Antonioni, BSN, RN, CCRN-CMC-CSC, RRNA

Kayla Anzalone, BSN, RN, CCRN, RRNA

Natalie Dabrowski, BSN, RN, CCRN, RRNA

Jessica Stewart, BSN, RN, CCRN, RRNA

Project Chairpersons:

Dr. Irina Benenson, DNP, FNP

Dr. Philip Huang, DNP, APN, CRNA

Introduction

- A difficult airway is a clinical situation in which anatomical or other clinical factors make ventilation and/or intubation challenging.
- Difficulty with airway management for anesthesia has potentially serious implications
  - airway edema
  - hypoxia
  - cardiovascular instability
  - death (Klabusayová et al., 2021)
- Failed intubation and repeated attempts increase financial burden for healthcare institutions
  - $14,468 in additional costs by prolonged hospital stays of approximately 3.8 days (Moucharite et al., 2021)

Introduction

- **Direct laryngoscopy** (MAC/Miller)
  - provides glottic visualization
  - may be limited in difficult airway cases
  - Challenges: poor positioning or large body habitus can lead to failed or repeated intubation attempts

- **Video laryngoscopy** (e.g., McGrath, Glidescope)
  - improves glottic view
  - may provide advantage for first-attempt success in difficult airways
  - Challenges: accessibility

- **Choice of laryngoscope varies**
  - Provider experience and setting, though use of video laryngoscopy is increasingly common.

Introduction

Video vs. Direct Laryngoscopy in Airway Management

- **Key findings from previously published literature**
  - **Steffen et al. (2023):** 100% success (27.5s) vs. 67.8% (30s)
    - On manikins
  - **Macke et al. (2020):** 95% vs. 79% first-pass success
    - Pre-hospital setting
  - **Ruderman et al. (2022):** 89.1% vs. 77.7% (18,123 intubations)
    - Esophageal intubation: 0.4% (VL) vs. 1.5% (DL)
    - In Emergency Department

Introduction

- No comprehensive systematic evaluation of literature focused specifically **on patients with known difficult airways undergoing general anesthesia for surgical procedures.**

- Purpose of this systematic review:
  - to assess the effectiveness of video laryngoscopy compared to direct laryngoscopy in patients with known difficult airways undergoing general anesthesia for surgical procedures.

- The findings from this review will help anesthesia providers make evidence-based decisions about the choice of intubation method, aiming to improve first-attempt success rates and decrease complications.

Review Question

- In adult patients with a known difficult airway who undergo general anesthesia for surgical procedures, does the use of video versus direct laryngoscopy improve intubation outcomes?

Methodology: inclusion criteria

Participants:

- Adults aged 18 and older
- Both sexes
- Difficult airways undergoing general anesthesia for surgical procedures

Intervention:

- Video vs. direct laryngoscopy
  - Video
    - Including, but not limited to Glidescope, McGrath, and CMAC laryngoscopy
  - Direct
    - Mac, Miller, or other direct laryngoscopes

Methodology: inclusion criteria

Outcome:

- First-time success rates of endotracheal intubation
- Studies that do not include this outcome will be excluded

Type of studies:

- Experimental study designs
  - randomized control trials
  - non-randomized studies

Search strategy:

- Three-step search strategy utilized

Search strategy: steps

First step:

- Limited search of MEDLINE followed by analysis of text words and of index terms used to describe the article

Second step:

- Using all identified keywords and index terms, search was undertaken across all included databases
- Databases searched:
  - Embase
  - CINAHL (EBSCO)
  - SCOPUS
  - PubMed
  - Web of Science
  - ProQuest Dissertation (unpublished research)

Third step:

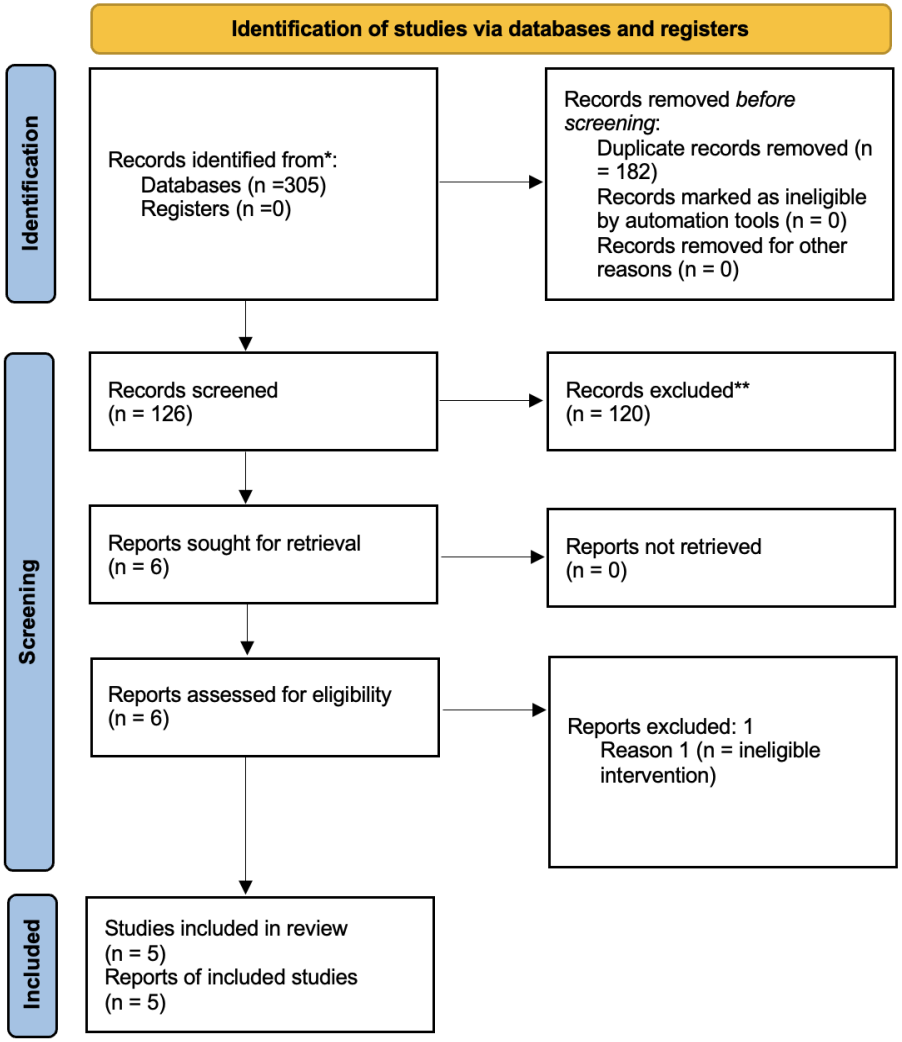
- The reference list of all identified reports and articles was searched for additional studies of interest

Study selection

- Following the search, all identified citations were uploaded into EndNote X9 (Clarivate Analytics, PA, USA)
- Duplicates were removed.
- Titles and abstracts were screened by four independent reviewers.
- Potentially relevant studies were retrieved in full and were assessed against the inclusion criteria by four independent reviewers.
- The search results were reported and presented as a PRISMA diagram.

PRISMA diagram (search results)

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only



Assessment for methodological quality

- Use of standardized critical appraisal instruments from the Joanna Briggs Institute.
- Four independent reviewers
- Assessment of methodological quality contributed to an evaluation of the quality of the evidence.
- No studies were excluded based on methodological quality.

Risk of bias in included studies

Risk of Bias in the Included Studies

Randomized Control Trials (RCT)

Author, Year	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Quality
Ankitha, 2018	Y	U	Y	U	N/A	N/A	Y	U	Y	Y	Y	Y	Y	GOOD
Aziz, 2012	Y	Y	Y	Y	N/A	N/A	Y	N	Y	Y	Y	Y	Y	GOOD
Jungbauer, 2009	Y	U	Y	N	N/A	N/A	Y	Y	Y	Y	Y	Y	Y	GOOD
Malik, 2009	Y	Y	Y	Y	N/A	N/A	Y	Y	Y	Y	Y	Y	Y	GOOD
Serocki, 2010	U	Y	Y	U	N/A	N/A	Y	U	Y	Y	Y	Y	Y	GOOD

Questions: 1) Was true randomization used for assignment of participants to treatment groups? 2) Was allocation to treatment groups concealed? 3)Were treatment groups similar at the baseline? 4) Were participants blind to treatment assignment? 5) Were those delivering the treatment blind to treatment assignment? 6) Were outcome assessors blind to treatment assignment? 7) Were treatment groups treated identically other than the intervention of interest? 8) Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed 9) Were participants analyzed in the groups to which they were randomized? 10) Were outcomes measured in the same way for treatment groups? 11) Were outcomes measured in a reliable way? 12) Was appropriate statistical analysis used? 13) Was the trial design appropriate and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial?

Quality measurement - good <4 No and unclear, moderate 4-6 No and unclear, Poor >6 No and unclear.

Data extraction

- Data will be extracted using the modified standardized data extraction tools in JBI SUMARI

- Four independent reviewers will extract data.

- The data extracted will include:
  - Characteristics of study participants
  - Settings
  - Interventions
  - Comparators
  - Outcome measures
  - Study design
  - Statistical analysis
  - Results
  - All other relevant data (funding and conflict of interest)

Data synthesis

- Quantitative data will, where possible, be pooled in a statistical meta-analysis.
- SPSS version 28.0 software (IBM Statistics for Windows. Armonk, NY: IBM Crop) will be used for statistical analysis.
- The random effect model will be utilized for meta-analysis.
- For categorical data, effect sizes expressed as odds ratio will be calculated for analysis.
- The presence of heterogeneity will be tested statistically using the chi-squared and I-squared tests.
- If statistical pooling will not be possible, data will be synthesized in a narrative form.

Project significance

- Synthesize knowledge of intubation methods:
  - The knowledge will inform anesthesia providers on evidence-based airway management for patients with predicted difficult airways.

- Direct application of evidence:
  - When presented with a predicted difficult airway, anesthesia providers may be more likely to reach for the most effective laryngoscopy method first.

- Improved outcomes:
  - intubation success
  - reduce number of attempts
  - shorter time to intubation
  - ultimately reduce complications from prolonged intubation time/multiple attempts

References

Abna P K, Muhamed, L., & Parapurath, D. (2024). Comparative analysis of direct laryngoscopy and video laryngoscopy performance by medical students in simulated airway management scenarios. *Indian Journal of Clinical Anaesthesia*, *11*(1), 53–61. https://doi.org/10.18231/j.ijca.2024.010

Ankitha, S. (2018). Comparative Effectiveness of the Video Laryngoscope Versus Direct Laryngoscopy in the Predicted Difficult Airway (Order No. 30588081). Available from ProQuest One Academic. (2866352150). https://login.proxy.libraries.rutgers.edu/login?qurl=https%3A%2F%2Fwww.proquest.com%2Fdissertations-theses%2Fcomparative-effectiveness-video-laryngoscope%2Fdocview%2F2866352150%2Fse-2%3Faccountid%3D13626

Aziz, M. F., Dillman, D., Fu, R., & Brambrink, A. M. (2012). Comparative Effectiveness of the C-MAC Video Laryngoscope versus Direct Laryngoscopy in the Setting of the Predicted Difficult Airway. Anesthesiology (Philadelphia), 116(3), 629–636. https://doi.org/10.1097/ALN.0b013e318246ea34

Jungbauer, A., Schumann, M., Brunkhorst, V., Börgers, A., & Groeben, H. (2009). Expected difficult tracheal intubation: a prospective comparison of direct laryngoscopy and video laryngoscopy in 200 patients. British Journal of Anaesthesia : BJA, 102(4), 546–550. https://doi.org/10.1093/bja/aep013

Klabusayová, E., Klučka, J., Kosinová, M., Ťoukálková, M., Štoudek, R., Kratochvíl, M., Mareček, L., Svoboda, M., Jabandžiev, P., Urík, M., & Štourač, P. (2021). Video laryngoscopy vs. direct laryngoscopy for elective airway management in paediatric anaesthesia. *European Journal of Anaesthesiology*, *38*(11), 1187–1193. https://doi.org/10.1097/eja.0000000000001595

Macke, C., Gralla, F., Winkelmann, M., Clausen, J.-D., Haertle, M., Krettek, C., & Omar, M. (2020). Increased first pass success with C-Mac video laryngoscopy in pre-hospital endotracheal intubation—a randomized controlled trial. *Journal of Clinical Medicine*, *9*(9), 1-10.https://doi.org/10.3390/jcm9092719

References

Malik, M. A., Subramaniam, R., Maharaj, C. H., Harte, B. H., & Laffey, J. G. (2009). Randomized controlled trial of the Pentax AWS®, Glidescope®, and Macintosh laryngoscopes in predicted difficult intubation. British Journal of Anaesthesia : BJA, 103(5), 761–768. https://doi.org/10.1093/bja/aep266

Moucharite, M. A., Zhang, J., & Griffin, R. (2021). Factors and economic outcomes associated with documented difficult intubation in the United States. *Clinicoeconomics and Outcomes Research, 13*, 227-239. https://doi.org/10.2147/ceor.s304037

Pieters, B. M., Maas, E. H., Knape, J. T., & van Zundert, A. A. (2017). Videolaryngoscopy vs. direct laryngoscopy use by experienced anaesthetists in patients with known difficult airways: A systematic review and meta-analysis. *Anaesthesia*, *72*(12), 1532–1541. https://doi.org/10.1111/anae.14057

Ruderman, B., Mali, M., Kaji, A., Kilgo, R., Watts, S., Wells, R., Limkakeng, A., Borawski, J., Fantegrossi, A., Walls, R., & Brown, C. (2022). Direct vs video laryngoscopy for difficult airway patients in the emergency department: A national emergency airway registry study. *Western Journal of Emergency Medicine*, *23*(5), 706–715. https://doi.org/10.5811/westjem.2022.6.55551

Russell, T.-M., & Hormis, A. (2018). Should the Glidescope video laryngoscope be used first line for all oral intubations or only in those with a difficult airway? A review of current literature. *Journal of Perioperative Practice*, *28*(12), 322–333. https://doi.org/10.1177/1750458918788985

Steffen, R., Hischier, S., Roten, F.-M., Huber, M., & Knapp, J. (2023). Airway management during ongoing chest compressions–direct vs. video laryngoscopy: A randomised manikin study. *PLOS ONE*, *18*(2), 1–8. https://doi.org/10.1371/journal.pone.0281186

Serocki, G., Bein, B., Scholz, J., & Dörges, V. (2010). Management of the predicted difficult airway: a comparison of conventional blade laryngoscopy with video-assisted blade laryngoscopy and the GlideScope. European Journal of Anaesthesiology, 27(1), 24–30. https://doi.org/10.1097/EJA.0b013e32832d328d