COVID-19 Scientific Advisory Group
Rapid Evidence Report

Key Research Question: What is the safety and effectiveness of video laryngoscopy, compared to direct laryngoscopy, in intubating patients with suspected or confirmed COVID-19 considering both patient outcomes and the risk of transmission of COVID-19 to HCWs?

Context

- There is a world-wide shortage of disposable blades for the Verathon Glidescope that is most commonly used in AHS for intubation
- Video laryngoscopy is widely used in Alberta and the safety/efficacy of its use in non-pandemic periods is excluded from this review.
- Aerosol boxes or other barrier devices used during intubation were excluded from this review

Key Messages

- Video laryngoscopy is widely used in non-pandemic circumstances as it reduces failed intubations and airway trauma and increases visibility. However during a viral pandemic requiring appropriate Personal Protective Equipment (PPE) for HCWs, these benefits may be reduced due to the burden of PPE which appears to reduce intubation efficacy and increase time required regardless of laryngoscopic technique.
- There is no primary evidence that assesses the safety/efficacy of video laryngoscopy vs direct laryngoscopy for patients with suspected or confirmed COVID-19, however numerous guidelines and recommendations advocate for video laryngoscopy use to reduce exposure of HCW to aerosolized viral particles and to possibly improve first attempt success.

Committee Discussion

The committee reached consensus on the recommendations. The committee agreed that video laryngoscopy was not considered 'standard of care' in Alberta, but rather is widely used throughout the province. The committee advocated for an additional recommendation that stated a risk assessment for characteristics of a difficult airway is required for patients with suspected or confirmed COVID-19 to identify the most appropriate laryngoscopic approach for the clinical scenario.

Recommendations

1. Where possible, video laryngoscopy is preferred to direct laryngoscopy for patients with suspect or confirmed COVID-19. However intubation should not be delayed in the event video laryngoscopy is not immediately available as there is no strong evidence that with appropriate PPE the risk of exposure to the HCW is changed by laryngoscopy approach.
   Rationale: Guideline documents advocate for the use of video laryngoscopy for suspected/confirmed COVID-19 patients, however the evidence does not indicate it is superior to direct laryngoscopy.
2. Always have the most experienced operator available intubate, especially in a setting where there may not be access to video laryngoscopy.
   Rationale: Experienced operators are more likely to have a high first-pass success rate with intubation-reducing additional exposures for HCWs, and possibly airway trauma.
3. Direct laryngoscopy is not contraindicated for patients with suspected or confirmed COVID-19. As with all patients, clinicians should assess the characteristics of

the airway and patient to assess for possible risk factors for difficult direct laryngoscopy intubation.
Rationale: All patients requiring intubation should be assessed for risk of difficult airway to determine most appropriate laryngoscopic approach. Suspected or confirmed COVID-19 is not a contraindication for both direct or video laryngoscopy and selection should be based upon the clinical scenario.

Practical Considerations

The AHS document Background and Guidance for Glidescope™ /Video Laryngoscopy Usage in Alberta Health Services (AHS) (https://www.albertahealthservices.ca/assets/info/ppih/if-ppih-covid-19-background-guidance-glidescope.pdf) outlines that despite current shortages, video laryngoscopy is still recommended for intubating patients with suspected or confirmed COVID-19. However efforts to reduce consumption of disposable Glidescope™ VL blades are needed due to shortages. The following recommendations have been implemented by AHS due to the need to conserve the Glidescope blades:

1. Intubations should be performed using direct laryngoscopy wherever possible;
2. Clinicians should maximize use of reusable Glidescope™ devices or other VL devices first wherever possible;
3. While the Glidescope™ is a useful adjunct in an anticipated or encountered difficult airway, consideration should be made for use of other airway devices/adjuncts in managing the anticipated or encountered difficult airway wherever possible.

Strength of Evidence

Information sources were identified through a rapid online search. Two retrospective observational/case series studies, two simulation studies, and three review articles were included. Seven guideline/recommendation documents are included that were produced by local, national and international health organizations and/or authorities in response to managing the COVID-19 pandemic. These sources use a range of information and likely rely on expert consensus. Four recommendation documents and ten commentaries/letters/correspondence were included.

Limitations of this review

- Given the limited research on this topic, the literature available is limited primarily to guideline documents, published letters, and descriptive papers
- No paediatric specific literature was identified in the search, although one simulation study included a paediatric scenario

Summary of Evidence

As stated by the Surviving Sepsis Campaign (Alhazzani et al, 2020) “There is no direct evidence comparing the use of video laryngoscopy with direct laryngoscopy for intubation of patients with COVID-19.” (p. 861).

Video laryngoscopy is widely used in Alberta. This is justified by the Cochrane Systematic Review (Lewis et al., 2017) which included 64 studies (7044 participants). Moderate quality evidence demonstrated video laryngoscopy reduced failed intubations (Odds Ratio (OR) 0.35, 95% Confidence Interval (CI) 0.19-0.65), including in participants with expected difficult airways (OR 0.28, 95% CI 0.15-0.55). Video laryngoscopes reduced laryngeal/airway trauma (OR 0.68, 95% CI 0.48-0.96) and hoarseness (OR 0.57, 95% CI 0.36-0.88) and increased visibility (OR 6.77, 95% CI 4.17-10.98) and demonstrated a reduction in intubation difficulty (OR 7.13, 95% CI 3.12-16.31). Unsuccessful intubations were reduced with highly skilled clinicians (OR 0.32, 95% CI 0.13-0.75) however not with

less experienced clinicians. No evidence reviewed indicated a reduction in the number of intubation attempts or time required for intubation, or incidence of hypoxia or respiratory complications.

What is the safety and effectiveness of video laryngoscopy, compared to direct laryngoscopy, for intubating patients with suspected or confirmed COVID-19 for patients?

Consensus guidelines, recommendations and commentaries/letters suggest video laryngoscopy is preferred to increase first attempt success and increase visibility. However, a recent meta-analysis of cadaver and simulation studies (Ludwin, 2020) stated there were not significant benefits of using video for the patient when the HCWs are required to wear PPE consistent with COVID-19 precautions.

Primary Research

Ludwin and colleagues (2020) conducted a meta-analysis of studies that compared intubation with different laryngoscopes with/without personal protective equipment (PPE) (full PPE for aerosol-generating procedures included respiratory protection preferably with an FFP3 filter, goggles, face shield, and gloves). A total of 20 studies were included (dates 2004-2018) including 2 cadaver studies and the remaining 18 being simulation studies. The studies were small in sample size, ranging from n=8-66 total subjects. The study concluded that the use of PPE during intubation compared to intubation without PPE resulted in a reduction in intubation efficacy (90.0% vs. 97.9%; RR = 0.94; 95%CI: 0.90–0.99; $p < 0.001$) additionally it increased the amount of time for the procedure (MD = 7.73; 95%CI: 4.98–10.47; $p < 0.001$). Direct laryngoscopy compared with video laryngoscopy resulted in a similar rate of success for intubation (93.6% vs. 92.3%; RR = 0.99; 95%CI: 0.97–1.02; $p = 0.66$). Direct laryngoscopy compared with video laryngoscopy resulted in a shorter overall intubation time (MD = 63; 95%CI: -0.77–12.03; $p = 0.08$).Lastly, due to training required, video laryngoscopy may be helpful for less experienced personnel.

Secondary Sources-Guidelines & Grey Literature

Numerous sources of grey literature provide guidance of the use of direct vs video laryngoscopy for patients with suspected or confirmed COVID-19. A total of five guideline documents (Alhazzani 2020; Brewster 2020; Brown 2020; Cook 2020 & Yao 2020) and one recommendation document (AHS 2020) address patient safety/efficacy as rationale for use of video laryngoscopy over direct methods. Additionally, four correspondence/letters to the editors/commentaries concur with these recommendations. Rationale for this includes:

1. Video laryngoscopy may contribute to first attempt success
2. Video laryngoscopy also allows better visualization of the airway by the assistants/team so that they can better facilitate the procedure.

Brewster and colleagues (2020) recognized that video laryngoscopy may be a limited resource, however when available it should be utilized for first attempt at intubation.

What is the safety of video laryngoscopy, compared to direct laryngoscopy to reduce the risk of transmission of COVID-19 to HCWs?

The most frequently cited rationale for the use of video laryngoscopy in the literature was the possible reduction in exposure of HCWs to virus expelled during aerosol generating medical procedure (AGMP) such as intubation. While this appears intuitive, there is no evidence to directly confirm the exposure is lessened by an increase in distance of the HCW from the patient's face, especially when the HCWs donned appropriate PPE.

Primary Research

Both direct and video laryngoscopy intubation is accepted internationally as an AGMP. Consistent with this, Feldman and colleagues in March of 2020 conducted a simulation of two intubation scenarios to assess exposure of eight HCWs to aerosols. The simulation resulted in four intubation attempts, three video laryngoscopy and one direct. Four HCWs participated in each scenario wearing appropriate PPE. All participants had fluorescent markers on their hair, seven on their skin and four on their shoes. Zhang and team (2020) conducted a retrospective observational study of 20 patients that were intubated in China by 17 anesthesiologists using video laryngoscopy. None of the clinicians tested positive for COVID-19 and were wearing PPE including a positive pressure ventilation mask.

Hall and team (2020) recently published a simulation study of 25 clinicians with vary experience in intubation comparing direct and video laryngoscopy with a primary outcome of distance from the mouth of the patient to the mouth of the clinician. They determined there was a statistically significant difference in the 'mouth to mouth distance'- with a mean (SD)'mouth-to-mouth 'distance for video laryngoscopy being 35.6 (9.9) cm and for direct laryngoscopy being16.4(11.4) cm.

During the MERS outbreak in Saudi Arabia video laryngoscope was used as one of the 15 heightened measures for reducing risk of HCWs (Butt, 2016). During the 2 years of implementation 180 HCWs were tested for MERS, with no positive results (a total of 16 positive cases in all populations), the retrospective observational study determined the heightened measures reduced the risk of transmission.

Secondary Sources-Guidelines & Grey Literature

A total of seven guideline documents (Alhazzani 2020; Brewster 2020; Brown 2020; Cook 2020; Department of Emergency Medicine, University of Ottawa; 2020; Yao 2020 & Zuo 2020), four recommendation based documents (AHS 2020; Orser 2020; Sullivan 2020 & Wax 2020) and nine correspondence/letters to the editors/commentaries (Asenjo 2020; Balg 2020; Duggan 2020; Jong 2020; Lopez 2020; Luo 2020; Meng 2020; Zeidan 2020) were reviewed that provided some guidance regarding video vs direct laryngoscopy for the suspected or confirmed patient with COVID-19. All 20 of these grey literature sources indicated that video laryngoscopy was preferred over direct laryngoscopy for the following reasons related to HCW safety:

1. Maximizes the distance of the HCWs face and the patient to potentially reduce the risk of viral transmission
2. It may also assist with visualization, mitigating the difficulty caused by wearing PPE.

In the AHS document Care of the Adult Critically Ill COVID-19 Patient, it states to consider use of video laryngoscope for the initial attempts at intubation to reduce the risk of aerosol contact by reducing the need to look directly down the airway.

In response to advocates for video laryngoscopy for intubation Singh and colleagues (2020) in a letter suggest flexible bronchoscopic intubation with anesthesia with deep muscle relaxation as an alternative.

Evolving Evidence

Evidence related to the safety and efficacy of video vs direct laryngoscopy for COVID-19 patients and HCWs is evolving. The existing literature is primary composed of opinion/commentary and guideline documents. Further research is required to effectively address this important question.

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Date report submitted to committee: June 16, 2020

Date of first assessment: June 17, 2020

(If applicable) Date of re-assessment:

Authorship and Committee Members

This report was written by Heather Sharpe and scientifically reviewed by Shelley Duggan, Brandie Walker and Joseph Kim with final review by Lynora Saxinger (co-chair), Braden Manns (co-chair). The full Scientific Advisory Group was involved in discussion and revision of the document: Lynora Saxinger (co-chair), Braden Manns (co-chair), John Conly, Alexander Doroshenko, Shelley Duggan, Nelson Lee, Elizabeth MacKay, Andrew McRae, Jeremy Slobodan, James Talbot, Brandie Walker, and Nathan Zelyas.

Appendix

List of Abbreviations

AHS: Alberta Health Services

COVID-19: Coronavirus Disease-2019

SAG: Scientific Advisory Group

KRS: Knowledge Resource Services

HCW: Heath Care Worker

PPE: Personal Protective Equipment

Methods

Literature Search

A literature search was conducted on June 8, 2020, by a librarian from Knowledge Resources Services (KRS) within the Knowledge Management Department of Alberta Health Services. Searches were in OVID MEDLINE, LitCovid, TRIP Database PRO, PubMed, WHO COVID-19 Database, BMJ Best Practice, Centers for Disease Control and prevention, Cambridge Coronavirus Free Access Collection, Oxford CEBM COVID-19 Evidence Search, National Collaborating Centre for Methods and Tools, COVID-19 Primer, COVID-19 Evidence Reviews, medRxiv and bioRxiv, Google, and Google Scholar. Citation tracking was conducted in Google Scholar

Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Daily and Versions(R) 1946 to June 05, 2020

#	Searches	Results
1	exp Coronavirus/ or exp Coronavirus Infections/ or coronaviru*.mp. or "corona virus*".mp. or ncov*.mp. or n-cov*.mp. or "novel cov".mp. or COVID-19.mp. or COVID19.mp. or COVID-2019.mp. or COVID2019.mp. or SARS-COV-2.mp. or SARSCOV-2.mp. or SARSCOV2.mp. or SARSCOV19.mp. or Sars-Cov-19.mp. or SarsCov-19.mp. or SARSCOV2019.mp. or Sars-Cov-2019.mp. or SarsCov-2019.mp. or "severe acute respiratory syndrome cov 2".mp. or "2019 ncov".mp. or "2019ncov".mp.	39290
2	Middle East Respiratory Syndrome Coronavirus/ or SARS Virus/ or Severe Acute Respiratory Syndrome/ or middle east respiratory syndrome.mp. or mers.mp. or mers-cov.mp. or severe acute respiratory syndrome.mp. or sars.mp. or sars-cov.mp.	23382
3	1 or 2	45070
4	Laryngoscopy/	12624
5	(laryngoscop* or videolaryngoscop*).mp.	22192
6	4 or 5	22192
7	3 and 6	24

TRIP Database Pro

(laryngoscop* OR videolaryngoscop* OR video-laryngoscop*) AND (coronaviru* OR "corona virus" OR ncov* OR n-cov* OR COVID-19 OR COVID19 OR COVID-2019 OR COVID2019 OR SARS-COV-2 OR SARSCOV-2 OR

SARSCOV2 OR SARSCOV19 OR SARS-COV-19 OR SARSCOV-19 OR SARSCOV2019 OR SARS-COV-2019 OR SARSCOV-2019 OR "severe acute respiratory syndrome cov 2" OR "severe acute respiratory syndrome coronavirus*" OR "2019 ncov" OR 2019ncov OR Hcov* OR “middle east respiratory syndrome” OR mers OR “mers-cov” OR “severe acute respiratory syndrome” OR sars OR “sars-cov”) from:2020

PubMed

Query	Results
((wuhan[tw] AND (coronavirus[tw] OR corona virus[tw])) OR coronavirus*[ti] OR COVID*[tw] OR nCov[tw] OR 2019 ncov[tw] OR novel coronavirus[tw] OR novel corona virus[tw] OR covid-19[tw] OR SARS-COV-2[tw] OR Severe Acute Respiratory Syndrome Coronavirus 2[tw] OR coronavirus disease 2019[tw] OR corona virus disease 2019[tw] OR new coronavirus[tw] OR new corona virus[tw] OR new coronaviruses[all] OR novel coronaviruses[all] OR "Severe Acute Respiratory Syndrome Coronavirus 2"[nm] OR 2019 ncov[tw] OR nCov 2019[tw] OR SARS Coronavirus 2[all]) AND (2019/12[dp]:2020[dp]) OR ((Middle East Respiratory Syndrome Coronavirus[MeSH Terms] OR (SARS Virus[MeSH Terms]) OR (Severe Acute Respiratory Syndrome[MeSH Terms]) OR (middle east respiratory syndrome[tw]) OR (mers[tw]) OR (mers-cov[tw]) OR (severe acute respiratory syndrome[tw]) OR (sars[tw]) OR (sars-cov[tw]))) AND ((laryngoscopy[MeSH Terms]) OR (laryngoscop*[Title/Abstract] OR videolaryngoscop*[Title/Abstract] OR video-laryngoscop*[Title/Abstract]))	26

((Middle East Respiratory Syndrome Coronavirus[MeSH Terms] OR (SARS Virus[MeSH Terms]) OR (Severe Acute Respiratory Syndrome[MeSH Terms]) OR (middle east respiratory syndrome[tw]) OR (mers[tw]) OR (mers-cov[tw]) OR (severe acute respiratory syndrome[tw]) OR (sars[tw]) OR (sars-cov[tw])) AND ((laryngoscopy[MeSH Terms]) OR (laryngoscop*[Title/Abstract] OR videolaryngoscop*[Title/Abstract] OR video-laryngoscop*[Title/Abstract]))

WHO COVID-19 Database

laryngoscop*OR videolaryngoscop* OR video-laryngoscop*

Google / Google Scholar

Search string 1: COVID-19 laryngoscopy OR videolaryngoscopy OR video-laryngoscopy

Search string 2: MERS laryngoscopy OR videolaryngoscopy OR video-laryngoscopy

Search string 3: SARS laryngoscopy OR videolaryngoscopy OR video-laryngoscopy

Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *Preferred Reporting Items for Systematic Reviews and Meta-Analyses:* The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

Table 1. Inclusion and exclusion criteria for results of the literature search

Inclusion Criteria	Exclusion Criteria
- Guidelines and credible academic writing on discharge/follow-up criteria for COVID-19 patients. - Systematic reviews of Covid-19 clinical characteristics, imaging and outcomes. - Individual studies reporting on application of discharge criteria or follow-up studies	- News articles. - Opinion pieces. - Studies of unique populations (e.g. patients with cancer diagnoses, populations with high HIV rates, asymptomatic patients, seniors, low income settings). - Sources focused on pregnant persons. - Animal studies.

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