

CLINICAL EVIDENCE GUIDE

# IMPROVE INTUBATION SUCCESS<sup>1</sup>

McGRATH™ MAC video laryngoscope

Due to the COVID-19 pandemic, airway management guidelines in many countries have recommended video laryngoscopy (VL) be used as a first line for all patients requiring intubation.<sup>2</sup> Routine use of the McGRATH™ MAC VL improves first attempt success rate,<sup>1</sup> and lessens hemodynamic response,<sup>3,4</sup> while improving economic benefits,<sup>5,6</sup> when compared to the traditional direct visualization (DL) technique. McGRATH™ MAC VL provides greater visualization<sup>7</sup> with a familiar Macintosh blade, preparing you for the unexpected during every intubation.



**Medtronic**

Review the evidence of the benefits associated with the McGRATH™ MAC video laryngoscope

### COVID-19

- ▶ Foley et al.
- ▶ Davies et al.

### INCREASED FIRST PASS SUCCESS RATE

- ▶ Kriege et al.
- ▶ Kleine-Brueggeney et al.

### COST EFFECTIVE

- ▶ Moucharite
- ▶ Zhang

### ADOPTION

- ▶ Samuels et al.

### LESS HEMODYNAMIC INSTABILITY

- ▶ Altun et al.
- ▶ Yokose et al.

### AVOID DIFFICULT INTUBATIONS

- ▶ De Jong et al.

### IMPROVED PERFORMANCE COMPARED TO OTHER VIDEO LARYNGOSCOPES

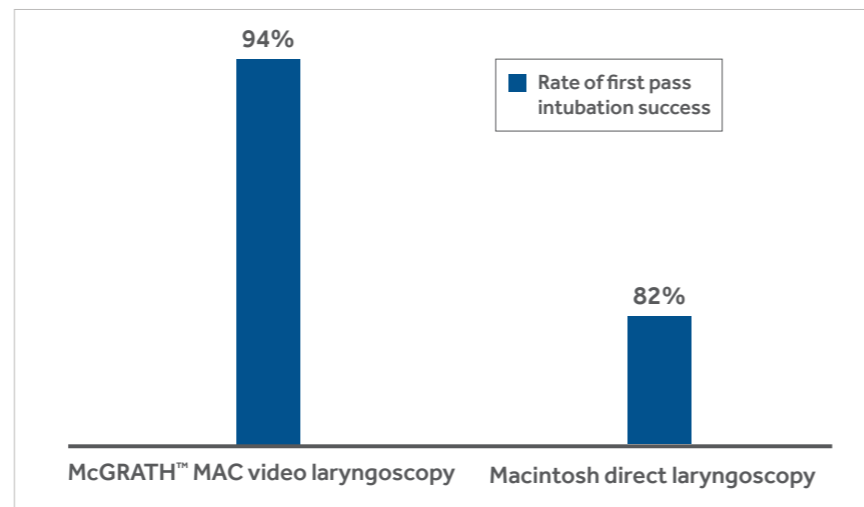
- ▶ De Jong et al.
- ▶ Alvis et al.

# MAKE YOUR FIRST ATTEMPT YOUR BEST ATTEMPT WITH MCGRATH™ MAC VIDEO LARYNGOSCOPY<sup>1</sup>

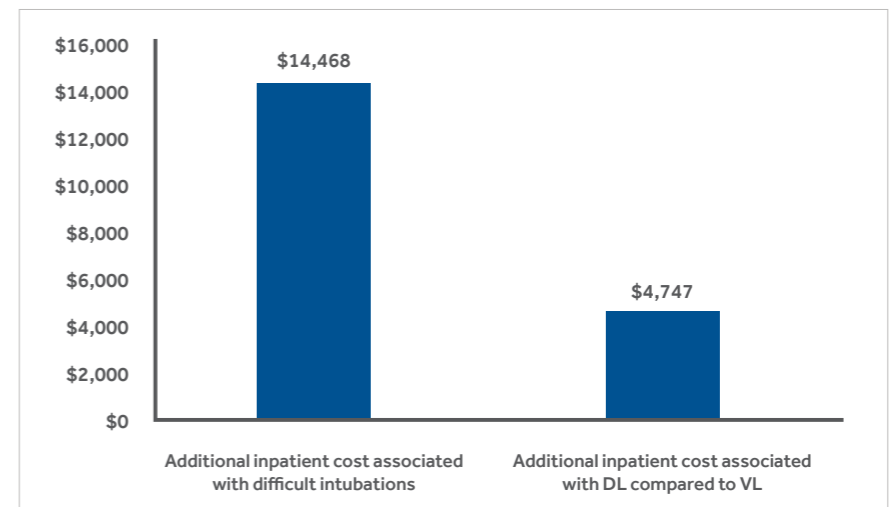
## Improve intubation success with routine use of McGRATH™ MAC video laryngoscopy

- COVID-19 guidelines recommend VL use as a first approach to improve first attempt success.<sup>2,8</sup>
- Compared to direct laryngoscopy, routine use of the McGRATH™ MAC video laryngoscope has been demonstrated to improve first-pass success rate<sup>1</sup> (Figure 1)
- Compared to DL, VL offers economic benefits related to inpatient costs and length of stay<sup>5,6</sup>
- Clinicians should consider the routine use of McGRATH™ MAC VL to reduce the likelihood of difficult intubations regardless of whether a difficult intubation is anticipated<sup>9,10</sup>

**FIGURE 1.** First-pass success (FPS) rate in McGRATH™ MAC VL vs Macintosh DL in a international multicenter, randomized study<sup>1</sup> (n=2,171) [Learn more.](#)



**FIGURE 2.** Additional costs associated with difficult intubation and DL compared with VL<sup>5,6</sup> [Learn More \(Moucharite\).](#) [Learn More \(Zhang\)](#)



## Difficult intubations are often unanticipated

- A recent study of 188,064 intubation attempts found the 93% of difficult intubations (≥ 3 attempts) are unanticipated<sup>11</sup>
- A meta-analysis of studies evaluating the predictive value of tests to difficult airways revealed surprisingly low sensitivity of these tests<sup>12</sup>



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# BENEFITS ASSOCIATED WITH MCGRATH™ MAC VIDEO LARYNGOSCOPY AND RELATED EVIDENCE

BENEFIT	BACKGROUND	RELATED EVIDENCE
COVID-19	Due to the benefits of VL, airway management guidelines recommended VL be used as a first line for patients requiring intubation due to the COVID-19 <sup>2,13</sup>	<ul style="list-style-type: none"> <li>▪ <a href="#">Review Foley et al</a></li> <li>▪ <a href="#">Review Davies et al</a></li> </ul>
Increased first-pass success rate	Compared to both DL and other video laryngoscopes, improved glottic visualization with the McGRATH™ MAC video laryngoscope helps clinicians improve first-pass success rate <sup>1,14</sup>	<ul style="list-style-type: none"> <li>▪ <a href="#">Review Kriege et al.</a></li> <li>▪ <a href="#">Review Kline-Brueneggy et al.</a></li> </ul>
Cost effective	In two recent economic studies, the findings suggest an economic benefit to utilizing VL for elective surgical procedures. <sup>5,6</sup>	<ul style="list-style-type: none"> <li>▪ <a href="#">Review Moucharite et al</a></li> <li>▪ <a href="#">Review Zhang et al</a></li> </ul>
Adoption	The McGRATH™ MAC VL device drove the dramatic rise in VL from 0.2% in 2012 to 36.2% of cases in 2019 <sup>15</sup>	<a href="#">Review Samuels et al</a>
Less hemodynamic instability	McGRATH™ MAC VL may reduce laryngoscopy-induced hemodynamic instability by facilitating glottic visualization while requiring less manipulation of supra-glottic area <sup>3,4</sup>	<ul style="list-style-type: none"> <li>▪ <a href="#">Review Altun et al.</a></li> <li>▪ <a href="#">Review Yokose et al.</a></li> </ul>
Avoid difficult Intubations	A ICU study comparing the rate of difficult intubations (≥ 3 attempts) before and after the implementation of routine use of McGRATH™ MAC VL found a significant decrease in the rate of difficult intubations <sup>16</sup>	<a href="#">Review De Jong et al</a>
Improved performance compared other videolaryngoscopes	<p>Compared to King Vision™* video laryngoscope, McGRATH™ MAC VL is associated with higher first pass success rate and reduced time to intubation<sup>17</sup></p> <p>Utilizes familiar Macintosh blade design unlike hyper-angulated utilized by several other video laryngoscopes<sup>7</sup></p>	<ul style="list-style-type: none"> <li>▪ <a href="#">Review De Jong et al</a></li> <li>▪ <a href="#">Review: Alvis et al.</a></li> </ul>



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▶ [Alvis et al.](#)

Foley LJ, et al

## Difficult Airway Management in Adult COVID-19 Patients: Statement by the Society of Airway Management

*Anesthesia and Analgesia. Mar 12 2021;doi:10.1213/ane.0000000000005554*

The COVID-19 disease, caused by Coronavirus SARS-CoV-2, often results in severe hypoxemia requiring airway management. Because SARS CoV-2 virus is spread via respiratory droplets, bagmask ventilation, intubation, and extubation may place health care workers (HCW) at risk.

Several specialty groups and societies have now addressed intubation approaches for the COVID-19 patient. Taken together, these recommendations uniformly call for **video laryngoscopy as the primary intubation approach for patients with COVID pneumonia.**

Although societies addressed general intubations during COVID-19, no guidance existed for difficult airway management.

To address this issue the Society for Airway Management (SAM) created a task force to review existing literature and current Practice Guidelines for management of the difficult airway. The goal of the task force was to optimize successful airway management while minimizing exposure risk.

The society released a statement that was unanimously approved by all task force members. The statement included several recommendations including the following:

### **Video laryngoscopy is recommended as first-line strategy for airway management**

This statement represents recommendations by SAM task force for the difficult airway management of adults with COVID-19 with the goal to optimize successful airway management while minimizing the risk of clinician exposure.



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▶ Alvis et al.

Davies M, et al.

### Video laryngoscopy post COVID-19

*Trends in Anaesthesia & Critical Care. 2021 Feb; 36: 49–51.*

The benefits of VL become increasingly relevant when dealing with COVID-19 patients, where the intubation procedure poses a higher risk of transmission to healthcare providers.

Advantages:

- Increased first attempts success rate
- Increased mouth to mouth distance
- Ability to use drapes or boxes over the patient
- Improved visibility when wearing personal protective equipment
- Video laryngoscopy may also decrease the incidence of requiring assistance in intubation, meaning fewer people need be exposed to this aerosol generating procedure reducing staff exposure to infection and conserving PPE
- VL eliminates the delay in changing equipment when a difficult intubation occurs

“With the risk of future pandemics in mind, video laryngoscopes are a safer and more efficient device to use in critically ill patients, where timely intubation can be lifesaving. These devices have been the primary intubation devices in many centers during the COVID-19 pandemic.”



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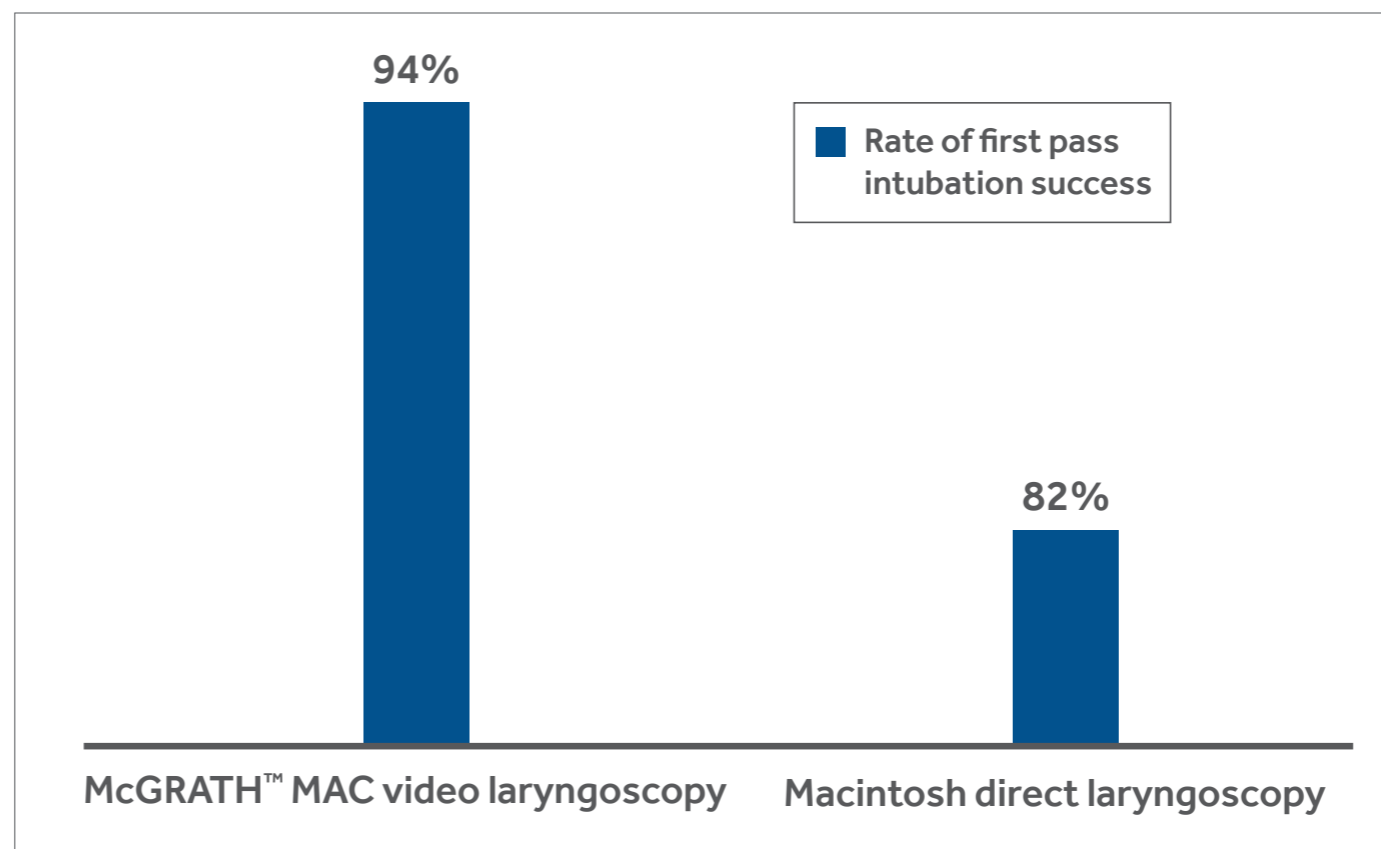
▶ Alvis et al.



Kriege et al.

### Evaluation of the McGRATH™ MAC and Macintosh laryngoscope for tracheal intubation

*Br J Anaesth. 2020; 125(1): e209*



## STUDY INFORMATION

STUDY DESIGN	International, multicenter, randomized, controlled trial
METHODS	<ul style="list-style-type: none"> <li>2,171 elective surgical patients at two institutions were randomized to be intubated with either McGRATH™ MAC video laryngoscopy or Macintosh direct laryngoscopy</li> <li>The primary endpoint was first pass intubation success</li> <li>Secondary endpoints included Cormack and Lehane classification, number of attempts and intubation difficulty score (IDS)</li> </ul>
RESULTS	<ul style="list-style-type: none"> <li>The McGRATH™ MAC VL groups had improved first-pass success rate (See Figure 1)</li> <li>The McGRATH™ MAC VL group had significantly less procedures (1.2%) with a intubation difficulty score of &gt;5 than the DL group (5.6%)</li> <li>Soft tissue lesions were more frequent with DL (25/1026, 0.2%) than McGRATH™ MAC VL (12/1021, 0.1%; p=0.03).</li> </ul>

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**Kleine-Brueggene y M, et al.**  
**Evaluation of six video laryngoscopes in 720 patients with a simulated difficult airway: a multicenter randomized controlled trial**

*Br J Anaesth. 2016; 116 (5):670-679*

Out of the six instruments that were evaluated, the McGRATH™ MAC VL with Macintosh blade was the only one that met the author's primary hypothesis of a 95% confidence interval for first attempt success rate greater than 90%.

STUDY INFORMATION								
STUDY DESIGN	Prospective, multi-center, patient-blinded, randomized controlled trial.							
METHODS	<ul style="list-style-type: none"> <li>▪ <b>Participants:</b> 720 adults with ASA I-III# undergoing elective surgery, n=120 per instrument</li> <li>▪ <b>End Points:</b> Primary: First attempt success with a lower limit 95% CI of at least 90%. Secondary: Overall success within two attempts, time to intubation, Cormack-Lehane grade, POGO score, intubation difficulty, adverse events, side effects</li> <li>▪ <b>Methods:</b> Experts with each device performed intubation on patients wearing a size adjustable cervical collar.</li> <li>▪ <b>Instruments (VL):</b> McGRATH™ MAC VL (#3 Macintosh blade), C-MAC™* (Hyperangulated D-blade), Glidescope™* (Hyperangulated #3 blade), Airtraq™* (Hyperangulated #2&amp;#3 Blade), AP Advance™** (Hyperangulated difficult airway blade), and King Vision™** (Hyperangulated #3 blade)</li> </ul>							
RESULTS	<b>Key findings</b>	McGRATH™ MAC VL (n = 120)	C-MAC™* (n = 120)	Glidescope™* (n = 120)	Airtraq™* (n = 120)	AP Advance™** (n = 120)	King Vision™** (n = 120)	P Value
	<b>First- attempt success [95%CI]</b>	98% (n = 117) [92-99]	95% (n = 114) [89-98]	85% (n = 102) [77-90]	85% (n = 102) [77-90]	37% (n = 44) [28-46]	87% (n = 104) [79-92]	<0.01
	<b>Intubation time† (median)</b>	53 sec	56 sec	60 sec	47 sec	93 sec	59 sec	<0.01
	<b>Soft-tissue injury (n)</b>	6	9	27	19	43	14	<0.01

†Of successful attempts

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▶ Alvis et al.

Moucharite MA, et al.

## Factors and Economic Outcomes Associated with Documented Difficult Intubation in the United States.

*Clinicoecon Outcomes Res. 2021;13:227–239*

Difficult intubation (DI), which increases the number of laryngoscopic attempts during tracheal intubation, has been associated with a variety of complications. Up to 93% of difficult intubations are unanticipated.

Before the advent of the ICD-10-CM coding system (International Classification of Diseases, Tenth Revision, Clinical Modification), there was no mechanism to quantify the cost burden of failed or difficult intubation (DI) from medical claims data. The implementation of ICD-10 introduced codes specific to DI.

To our knowledge, there is no study currently available that examines the cost and healthcare utilization outcomes associated with difficult intubation in the hospital operating room setting.

A retrospective observational cohort study was conducted using data from the Premier Healthcare Database. Adult patients with inpatient surgical admissions between January 1, 2016 and December 31, 2018 were selected.

### Results:

- Patients with difficult intubations have mean inpatient costs and intensive care unit costs that are substantially higher than patients without difficult intubations (\$14,468 and \$4,029 higher, respectively).
- Patients with difficult intubations have mean hospital length of stay and ICU length of stay that are substantially higher than patients without difficult intubations (3.8 days and 2.0 days longer, respectively).
- Obesity, other chronic conditions, and larger hospital size were significantly associated with difficult intubations.
- Difficult intubation is associated with higher average cost and longer average length of stay.





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Zhang J, et al.

### Economic analysis of the use of video laryngoscopy versus direct laryngoscopy in the surgical setting.

*J Comp Eff Res. Jul 2021;10(10):831-844.*

Compared with direct laryngoscopy (DL), video laryngoscopy (VL) offers clinical benefits in both routine and difficult airways. Prior to this publication the health economic benefit of VL versus DL for routine tracheal intubation was unknown.

A retrospective observational cohort study was conducted that used 3 years of data (2016–2018) from the Premier Healthcare Database.

Adult patients who underwent elective surgery in the inpatient setting with at least one hour of general anesthesia and tracheal intubation were included.

#### Results:

- Inpatient cost for VL was significantly lower than DL in eight out of 10 MDC groups, with a cost difference between \$1,144 to \$5,891 between VL and DL groups.
- Compared to the DL group, the average length of stay (LOS) was significantly lower in the VL group in eight of 10 MDC groups.
- The likelihood of postoperative ICU admission was significantly lower across all 10 MDC groups, for the VL group vs. the DL group.
- Complication rates for pulmonary infection, cardiovascular complications, and respiratory complications, were lower in the VL group vs. the DL group in multiple MDC groups.

Health economic outcomes appear improved in patients receiving video laryngoscopy vs. direct laryngoscopy in the inpatient surgical setting. These findings suggest an economic benefit to utilizing video laryngoscopy for elective surgical procedures.



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▶ Alvis et al.

**Samuels JD, et al.**

### **Adoption of video laryngoscopy by a major academic anesthesia department**

*Journal of Comparative Effectiveness Research 10.2 (2021): 101-108.*

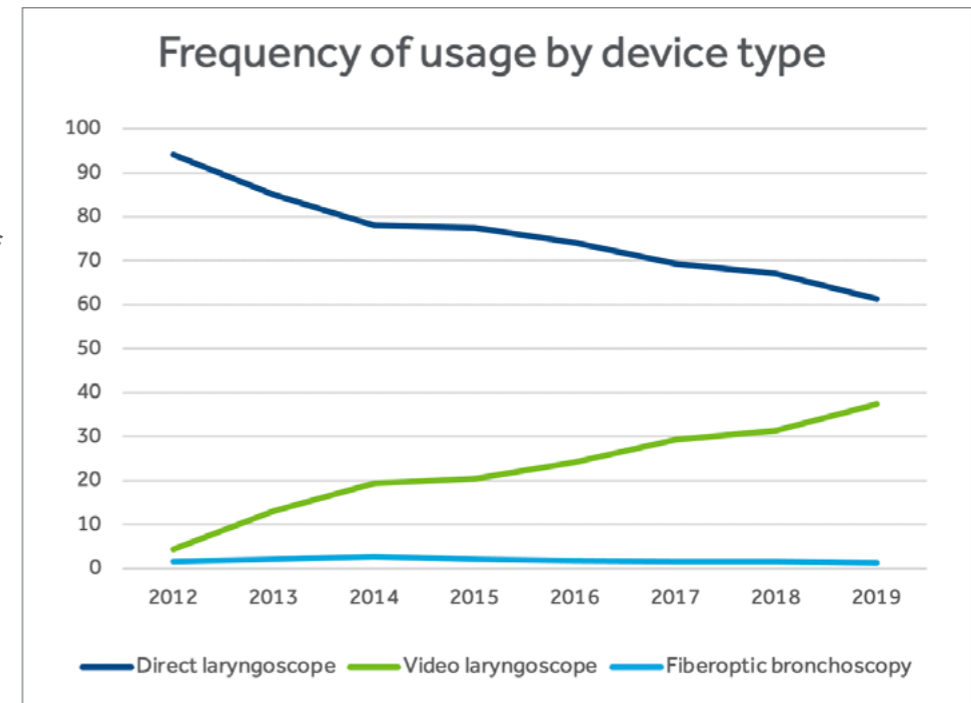
A single center retrospective analysis was conducted from 2012–2019 at Cornell in New York. They reviewed data on frequency and trends in airway management devices collected from their anesthesia information management system.

During the 8-year study period, there were a total of 159,447 cases where a laryngoscope was used.

The percentage of cases where the Macintosh device was used steadily dropped from 85.6% in 2012 to 55.1% in 2019. The McGRATH™ MAC VL device drove the dramatic rise in VL from 0.2% in 2012 to 36.2% of cases in 2019.

#### **Summary Points:**

- Video laryngoscopy (VL) presented many benefits including a shorter learning curve, better retention rates and superior performance characteristics.
- Use of DL was more frequent throughout the study interval, but there was a downward trend in use over time ( $p < 0.008$ ) in favor of VL, which increased significantly ( $p < 0.008$ ).
- VL usage nearly doubled in the operating rooms and increased 2.8-times in the nonoperating room anesthesia sites.
- The largest growth among devices and the driver for VL growth, was the McGRATH™ MAC VL device, which increased from 0.2% in 2012 to 36.2% of cases in 2019.
- Increased utilization of VL has implications in quality of care and medical education.



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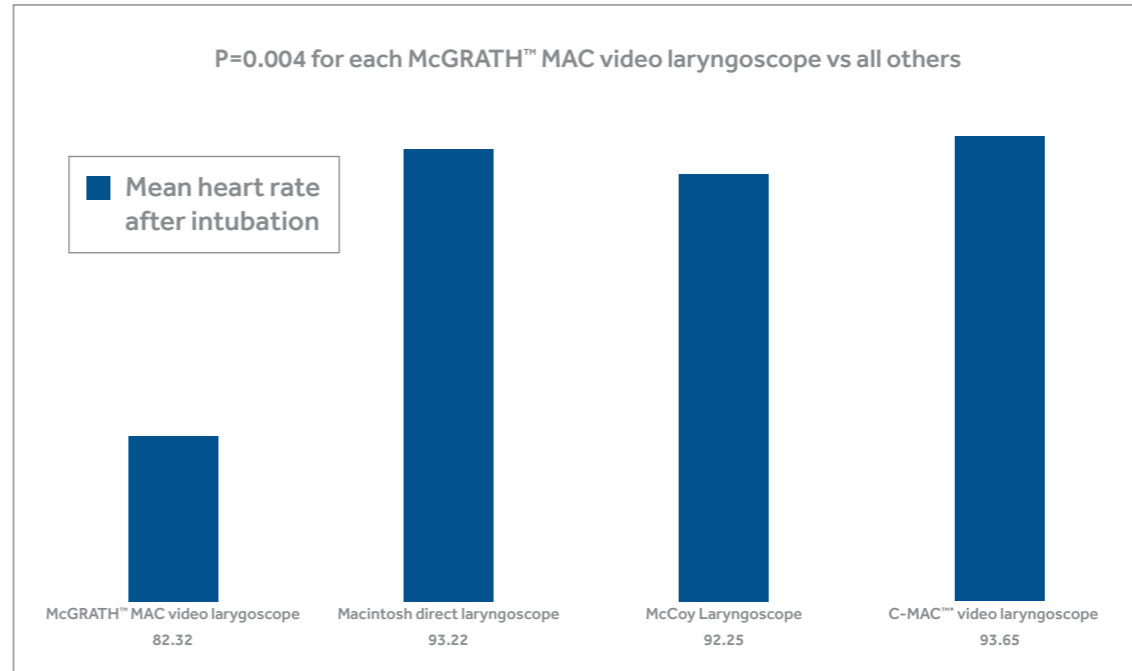
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Altun D et al.  
**Haemodynamic Response to Four Different Laryngoscopes.**  
*Turk J Anaesthesiol Reanim. 2018;46(6):434-440.*



STUDY INFORMATION

STUDY DESIGN	Prospective, randomized controlled trials
METHODS	<p>160 ASA status I-II otologic and rhinologic surgery patients were randomized to be intubated with one of following devices:</p> <ul style="list-style-type: none"> <li>▪ Macintosh direct laryngoscope</li> <li>▪ McCoy indirect laryngoscope</li> <li>▪ C-MAC™ video laryngoscope</li> <li>▪ McGRATH™ MAC video laryngoscope</li> <li>▪ Patients with features associated with difficult airway were excluded.</li> </ul>
RESULTS	<ul style="list-style-type: none"> <li>▪ Fluctuations in heart rate and systolic blood pressure associated with laryngoscopy and intubation were less in McGRATH™ MAC VL group than the other three device groups</li> <li>▪ Patients in the McCoy and McGRATH™ MAC VL group had fewer moderate and severe sore throats than the other two groups</li> <li>▪ Time to intubation was shorter in the McGRATH™ MAC VL group compared to the other three groups</li> </ul>



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Yokose M et al.

### McGRATH™ MAC Video Laryngoscope on Hemodynamic Response during Tracheal Intubation: A Retrospective Study.

*PLoS One. 2016;11(5):e0155566.*

Patients intubated with the McGRATH™ MAC video laryngoscope were 57% less likely to suffer hypertension than patients intubated with a Macintosh direct laryngoscope.

#### STUDY INFORMATION

STUDY DESIGN	Retrospective trial
METHODS	<ul style="list-style-type: none"><li>▪ 360 patients who were intubated with either McGRATH™ MAC video laryngoscopy or Macintosh direct laryngoscopy were retrospectively identified.</li><li>▪ Patients requiring multiple intubation attempts were excluded.</li><li>▪ Because patients intubated with McGRATH™ MAC VL were higher risk patients, the likelihood of patients treated with each laryngoscope to suffer hypertension was adjusted according to 16 variables that could potentially influence the incidence of hypertension.</li></ul>
RESULTS	<ul style="list-style-type: none"><li>▪ Change in mean blood pressure after intubation was significantly less in the McGRATH™ MAC video laryngoscope group</li><li>▪ The odds of hypertension was significantly reduced in the McGRATH™ MAC video laryngoscope group</li><li>▪ 18% of patients were intubated with the McGRATH™ MAC video laryngoscope</li></ul>



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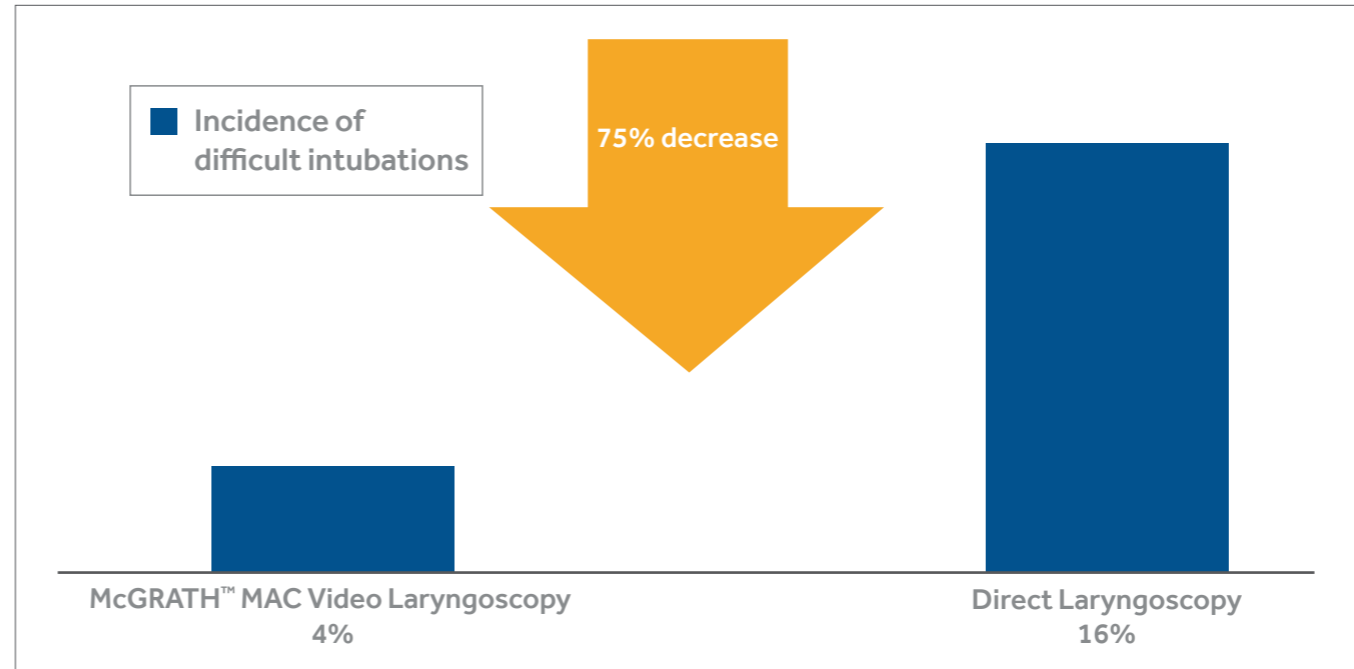
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De Jong A, et al.  
**Implementation of a combo video laryngoscope for intubation in critically ill patients: a before-after comparative study**  
*Intensive Care Med. 2013; 39:2144-2152*



STUDY INFORMATION

STUDY DESIGN	Prospective, single center, before-after study
METHODS	<ul style="list-style-type: none"> <li>▪ <b>Participants:</b> 210 adults in the ICU</li> <li>▪ <b>End Points:</b> Primary: Incidence of difficult intubation; Secondary: 1st attempt success, number of intubation attempts, Cormack grade, and complications related to the intubation</li> <li>▪ <b>Methods:</b> 140 consecutive intubations were performed with a traditional direct laryngoscopy approach and then 70 consecutive intubations were performed with the McGRATH™ MAC VL. Intubations were performed by operators with a range of experience.</li> </ul>
RESULTS	<ul style="list-style-type: none"> <li>▪ The video technology decreased the incidence of difficult intubations compared to a traditional approach.</li> <li>▪ No significant difference in the secondary end points or the experience of the operators. A significant improvement in the Cormack grade was observed when the video technology was used.</li> </ul>



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IMPROVED PERFORMANCE COMPARED TO OTHER VIDEO LARYNGOSCOPES

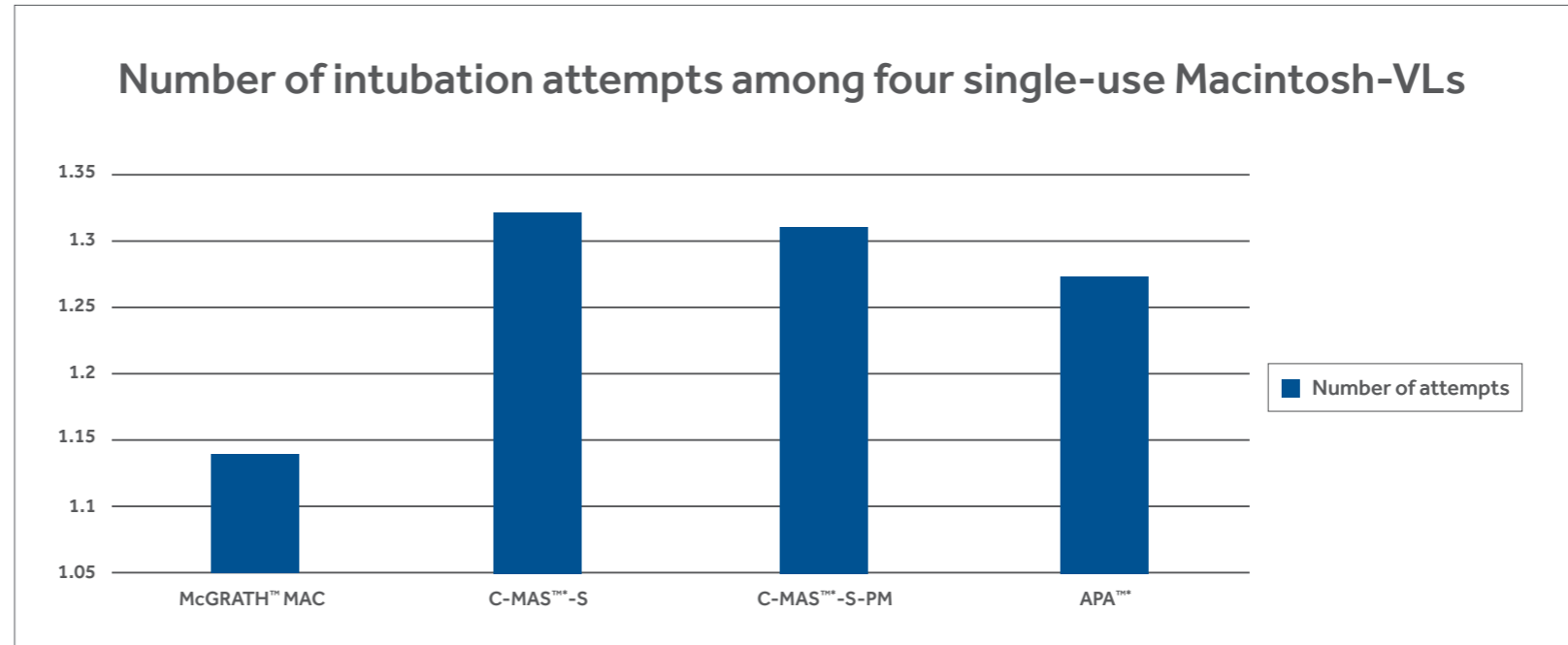
- ▶ De Jong et al.
- ▶ Alvis et al.



De Jong A, et al.

**Macintosh videolaryngoscope for intubation in the operating room: a comparative quality improvement project.**

*Anesthesia & Analgesia 132.2 (2021): 524-535.*



STUDY INFORMATION

STUDY DESIGN	Four anesthesia departments assessed each VL device for 1 month each in a randomized order
METHODS	<p>A quality improvement project was conducted in France from May 2017–Sep 2017 at Montpellier Teaching Hospital.</p> <p>The aim of the project was to implement Macintosh-VL for all intubation procedures in the operating room.</p> <p>4 Macintosh-VLs were assessed:</p> <ul style="list-style-type: none"> <li>▪ APA™ (Advanced Airway Management Healthcare, Venner Medical International, Jersey, UK),</li> <li>▪ C-MAC™-S (Karl Storz, Tuttlingen, Germany; single-use),</li> <li>▪ C-MAC™-S-PM (pocket and single-use),</li> <li>▪ McGRATH™ MAC VL (Medtronic Covidien, Minneapolis, MN)</li> </ul>
RESULTS	<p>Overall, the number of intubation attempts was significantly lower using the McGRATH™ MAC VL than the C-MAC™-S, APA™, or the C-MAC™-S-PM VLs.</p> <p>Difficulty of intubations were lower with McGRATH™ MAC VL.</p> <p>User friendliness of devices was higher for the McGRATH™ MAC VL device compared to the other devices.</p>

Review the evidence of the benefits associated with the McGRATH™ MAC video laryngoscope

COVID-19

▶ Foley et al.

▶ Davies et al.

INCREASED FIRST PASS SUCCESS RATE

▶ Kriege et al.

▶ Kleine-Brueggeney et al.

COST EFFECTIVE

▶ Moucharite

▶ Zhang

ADOPTION

▶ Samuels et al.

LESS HEMODYNAMIC INSTABILITY

▶ Altun et al.

▶ Yokose et al.

AVOID DIFFICULT INTUBATIONS

▶ De Jong et al.

IMPROVED PERFORMANCE COMPARED TO OTHER VIDEO LARYNGOSCOPES

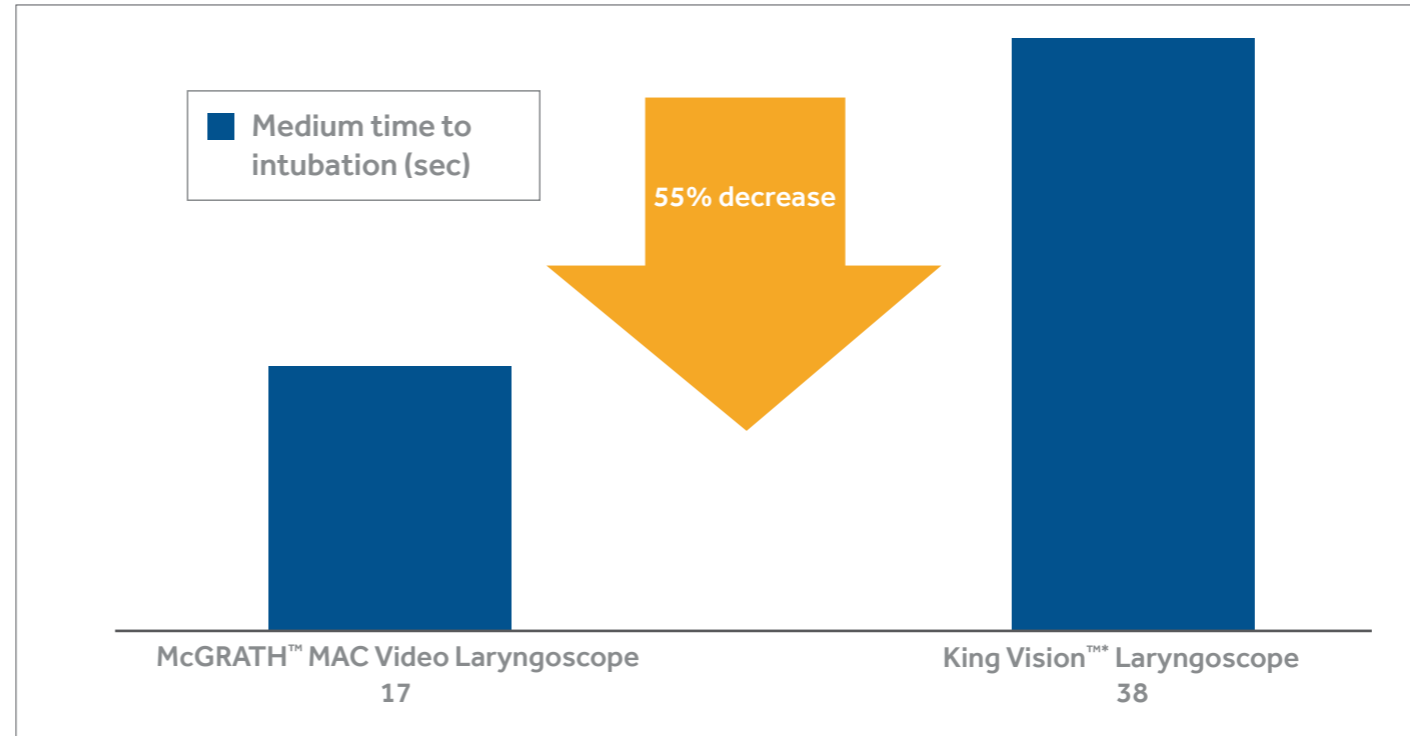
▶ De Jong et al.

▶ Alvis et al.

Alvis BD, et al.

Randomized controlled trial comparing the McGRATH™ MAC video laryngoscope with the King Vision™\* video laryngoscope in adult patients

Minerva Anesthesiol. 2016; 82(1):30-5



STUDY INFORMATION

STUDY DESIGN	Single center, single blinded, randomized controlled trial
METHODS	<ul style="list-style-type: none"> <li>▪ <b>Participants:</b> 64 adults with a predicted easy airway undergoing a surgical procedure. (McGRATH™ MAC VL, n=33; King Vision™*, n=31)</li> <li>▪ <b>End Points:</b> Primary: 1st attempt success, time to intubation. Secondary: Oxygen saturation, number of attempts, Cormack grade, assist maneuvers, airway trauma.</li> <li>▪ <b>Methods:</b> Operators who had performed at least 100 direct laryngoscopies and no more than 10 video laryngoscopies with the randomized instruments were allowed to perform the intubation.</li> <li>▪ <b>Instruments (VL):</b> King Vision™* (Channeled Blade); McGRATH™ MAC VL (#3 or #4 blade)</li> </ul>
RESULTS	<ul style="list-style-type: none"> <li>▪ McGRATH™ MAC VL was associated with significantly higher 1st attempt success rate when compared to King Vision™* (100% vs. 77% respectively, p&lt;0.01).</li> <li>▪ No airway traumas were observed with either instrument during this study.</li> <li>▪ No significant difference in the number of assist maneuvers or Cormack grade.</li> <li>▪ Median time to intubation was less in the McGRATH™ MAC VL group</li> </ul>



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[medtronic.com.co.uk/mcgrath-mac-vl](https://www.medtronic.com.co.uk/mcgrath-mac-vl)

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Review the evidence of the benefits associated with the McGRATH™ MAC video laryngoscope

## INCREASED FIRST PASS SUCCESS RATE

► Kriege et al.

► Kleine-Brueggene M

## LESS HEMODYNAMIC INSTABILITY

► Altun et al.

► Yokose et al.

## COST EFFECTIVE

► Alsumaliet et al.

## AVOID DIFFICULT INTUBATIONS

► De Jong et al.

## IMPROVED PERFORMANCE COMPARED TO OTHER VIDEO LARYNGOSCOPES

► Alvis et al.

► Kleine-Brueggene M



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