

CLINICAL EVIDENCE GUIDE

PREPARATION ENABLES GREATER INTUBATION SUCCESS DURING UNEXPECTED AIRWAY COMPLICATIONS

McGRATH™ MAC Video Laryngoscope

This guide reviews the clinical evidence supporting the utility of video laryngoscopy to improve intubation success when a difficult intubation unexpectedly occurs.

The McGRATH™ MAC video laryngoscope has been shown to decrease the incidence of difficult intubations when compared to the traditional direct visualization technique. It combines the features you expect from your direct laryngoscope (technique, durability, affordability) with greater visualization in case you need it — allowing you to be prepared with a video laryngoscope during every intubation.



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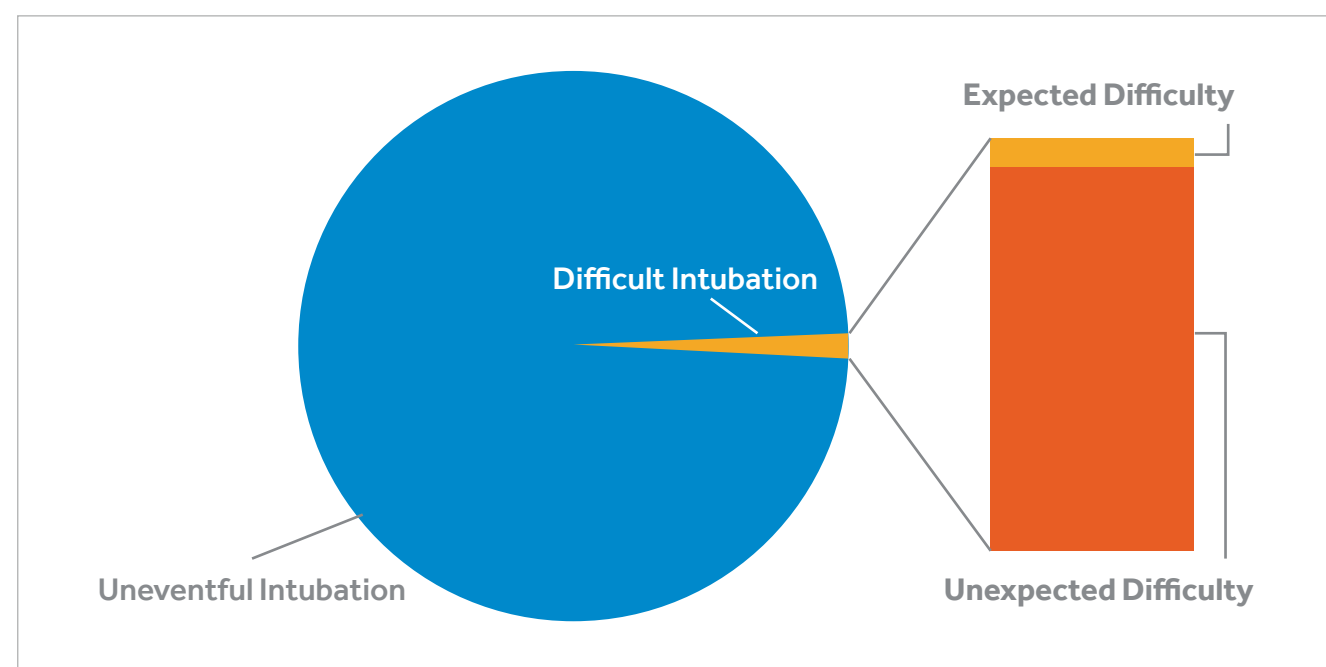
Unexpected difficult intubations happen in an instant — and can cause long-term complications for patients.

Defined difficult intubations are rare, occurring in 1% to 4% of all cases.^{1,2} Unfortunately, 50% to 93% of those difficult intubations have been shown to be unanticipated, which can lead to heightened stress in the OR and concerns for the patient (Figure 1).^{1,3,4}

A prospective study found that 75% of airway-related adverse events occur in patients who are categorized as routine, with an American Society of Anesthesiologists (ASA) rating of 1 or 2; this finding has been supported by others as well.^{5,6} Also, although extremely important, pre-assessments are not always completed and are not always accurate, nor does age seem to be an influencing factor in predicting when a difficult intubation will be encountered.^{7,8} Together, these findings begin to explain why there are such high rates of unanticipated airway complications.

Consequences of difficult intubations can be catastrophic, leading to oxygen desaturations, hypertension, airway trauma, dental damage, bronchospasm, ICU admissions, brain damage, or death.³ During an audit in the U.K., although approximately 80% of airway-related incidents resulted in a full recovery, 2% resulted in brain damage and 12% ultimately resulted in patient death.⁸ Enhanced technologies may prevent some of these difficulties that lead to poor patient outcomes.

FIGURE 1. Frequency of unexpected difficult intubations. In total, 1.86% of intubations were difficult, and 93% of those were unexpected. Data adapted from Norskov et al, 2015.¹



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Video laryngoscopy improves first intubation success and reduces failures

A 2016 Cochrane review found that video laryngoscopy (VL) is associated with fewer failed intubations, especially in studies that were designed to evaluate anticipated difficult airways.⁹

Complication rates climb after more than two intubation attempts, where hypoxia and esophageal intubation occur most frequently (Table).⁸ An enhanced view of the vocal cords is associated with higher first-attempt success (91.5% with VL vs. 67.7% with direct laryngoscopy [DL]; $p = 0.0001$).¹⁰ Another study with a propensity-matched multivariable logistic regression design found that VL first-attempt success was 80.4% vs. 65.4% for DL ($p < 0.001$),

with significantly lower desaturations associated with VL.¹¹ In a recent meta-analysis across several video laryngoscopes (Glidescope[™], McGrath[™] MAC, C-MAC[™], Airtraq[™], and Airway Scope instruments), first-attempt failures in patients with cervical immobilization were significantly reduced from 24.5% with traditional devices to 9.9% with VL technology ($p = 0.002$).¹² During another study in 29 cases where DL failed, 50% were resolved with VL instruments.⁶

Training has been shown to be important, as more injuries to the tongue base, palate, and tonsils occur when VL instruments are used (primarily Glidescope[™] devices) compared to DL devices.¹³ Direct visual observation of the patient's mouth has been determined to remain important when introducing a video laryngoscope.¹³ However, a meta-analysis of several studies suggests that the level of training required to successfully intubate is lower with VL technology. In this analysis, use by nonexpert operators was associated with a significant increase in first-intubation success with the Glidescope[™] video laryngoscopes compared to traditional techniques, which was not the case for experts in laryngoscopy.¹⁴

The findings presented in this guide demonstrate the value video technologies bring to laryngoscopy. Strong evidence from the Cochrane review and recent meta-analysis show that VL instruments are associated with fewer failed intubations and greater first-attempt success.^{9,12} The following article summaries demonstrate the importance of selecting the appropriate video laryngoscope to address the clinical demands, as not all video instruments are associated with the same benefits.^{15,16} These articles provide evidence to show that the McGrath[™] MAC video laryngoscope demonstrates high first-intubation success, low soft-tissue injury, and a reduction in the overall incidence of difficult intubations.¹⁵⁻¹⁷

Complication rates after >2 attempts		
Type	Rate	Fold increase compared to ≤2 attempts
Hypoxia	70%	7
Severe hypoxia	28%	14
Esophageal intubation	52%	6
Regurgitation	22%	7
Aspiration	13%	4
Cardiac arrest	11%	7

KLEINE-BRUEGGENEY 2016

Kleine-Brueggene M, et al. **Evaluation of six videolaryngoscopes in 720 patients with a simulated difficult airway: a multicentre randomized controlled trial.** *Br J Anaesth.* 2016;116(5):670-679.

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STUDY INFORMATION

PURPOSE	To conduct an independent evaluation of intubation performance among six different video laryngoscopes in patients with a simulated difficult airway							
STUDY DESIGN	Prospective, multicenter, patient-blinded, randomized controlled trial							
METHODS	<p>Participants: 720 adults with ASA I-III undergoing elective surgery, n = 120 per instrument</p> <p>Endpoints: 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</p> <p>Methods: Experts with each device performed intubation on patients who were wearing a size-adjustable cervical collar</p> <p>Instruments (VL): McGRATH™ MAC (#3 blade), C-MAC™ (D-blade), Glidescope™ (#3 blade), Airtraq™ (#2 and #3 blade), AP Advance™ (difficult airway blade), and KingVision™ (#3 blade)</p>							
RESULTS	Key findings	McGRATH™ MAC (n = 120)	C-MAC™* (n = 120)	Glidescope™* (n = 120)	Airtraq™* (n = 120)	AP Advance™* (n = 120)	KingVision™* (n = 120)	P Value
	First- attempt success [95%CI]	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
	Intubation time† (median)	53 sec	56 sec	60 sec	47 sec	93 sec	59 sec	<0.01
	Soft-tissue injury (n)	6	9	27	19	43	14	<0.01
CONCLUSION	This study illustrates the importance of blade design, as the McGRATH™ MAC and C-MAC™ D-blade designs were associated with the highest first attempt success rates and lowest tissue trauma rates when compared to the other four devices.							

ASA Class I-III includes healthy patients to those with severe systemic disease that is not a constant threat to their life; POGO indicates percentage of glottis opening.

† Of successful attempts

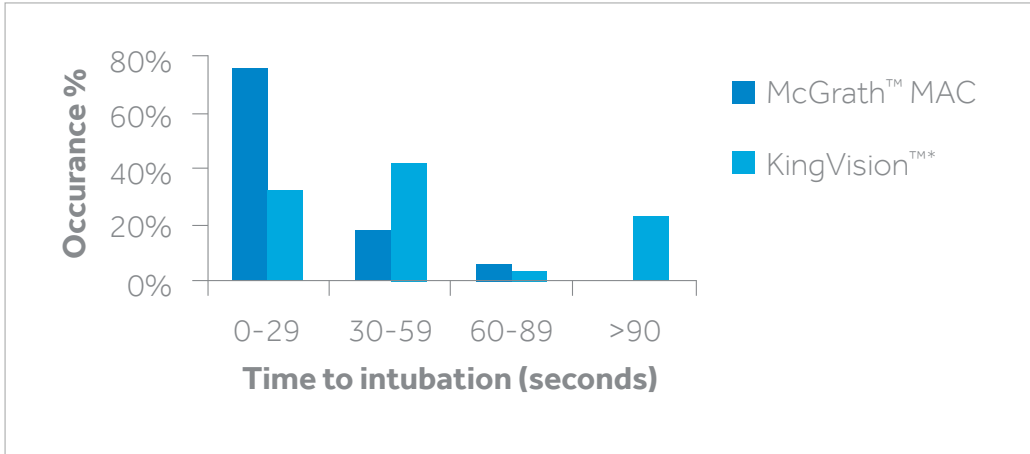


ALVIS 2016

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):30-35.

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STUDY INFORMATION

PURPOSE	To compare the safety and performance of the McGrATH™ MAC and King Vision™* video laryngoscopes in patients with predicted normal airways															
STUDY DESIGN	Single-center, single blinded, randomized controlled trial															
METHODS	<p>Participants: A total of 64 adults with a predicted normal airway undergoing a surgical procedure. (McGRATH™ MAC, n = 33; King Vision™*, n = 31)</p> <p>Endpoints: Primary: First- attempt success, time to intubation; Secondary: Oxygen saturation, number of attempts, Cormack grade, assist maneuvers, airway trauma</p> <p>Methods: 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</p> <p>Instruments (VL): King Vision™* (channeled blade); McGrATH™ MAC (#3 or #4 blade)</p>															
RESULTS	<ul style="list-style-type: none">▪ The McGrATH™ MAC video laryngoscope was associated with a significantly higher first-attempt success rate when compared to King Vision™* in predicted normal airways (100% vs. 77% respectively, p < 0.01).▪ No airway traumas were observed with either instrument during this study.▪ There was no significant difference in the number of assist maneuvers or Cormack grade. <div><table><caption>Time to intubation (seconds) Occurrence %</caption><thead><tr><th>Time to intubation (seconds)</th><th>McGrath™ MAC (%)</th><th>KingVision™* (%)</th></tr></thead><tbody><tr><td>0-29</td><td>100</td><td>77</td></tr><tr><td>30-59</td><td>0</td><td>23</td></tr><tr><td>60-89</td><td>0</td><td>0</td></tr><tr><td>>90</td><td>0</td><td>23</td></tr></tbody></table></div>	Time to intubation (seconds)	McGrath™ MAC (%)	KingVision™* (%)	0-29	100	77	30-59	0	23	60-89	0	0	>90	0	23
Time to intubation (seconds)	McGrath™ MAC (%)	KingVision™* (%)														
0-29	100	77														
30-59	0	23														
60-89	0	0														
>90	0	23														
CONCLUSION	This study found that the McGrATH™ MAC video laryngoscope was associated with a shorter time to intubation, higher first attempt success rates, and fewer desaturations when compared to the King Vision™ video laryngoscope.															

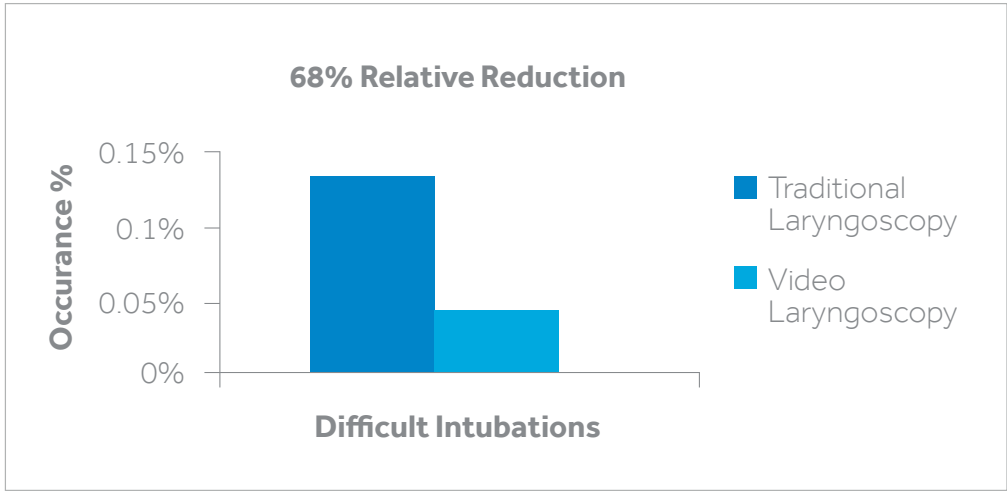


DE JONG 2013

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

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STUDY INFORMATION

PURPOSE	To evaluate the effectiveness of video laryngoscopy in reducing the incidence of difficult intubations in the ICU						
STUDY DESIGN	Single-center, un-blinded, prospective before-after trial						
METHODS	<p>Participants: A total of 210 adults in the ICU</p> <p>Endpoints: Primary incidence of difficult intubation; Secondary: First-attempt success, number of intubation attempts, Cormack grade, and complications related to the intubation</p> <p>Methods: In total, 140 consecutive intubations were performed with a traditional direct laryngoscopy approach and then 70 consecutive intubations were performed with the McGrath™ MAC video laryngoscope. Intubations were performed by operators with a range of experience.</p>						
RESULTS	<ul style="list-style-type: none"> There was no significant difference in the secondary endpoints or the experience of the operators. A significant improvement in the Cormack grade was observed when the video technology was used. The video technology decreased the incidence of difficult intubations compared to a traditional approach:  <table border="1"> <caption>68% Relative Reduction</caption> <thead> <tr> <th>Intubation Method</th> <th>Occurance %</th> </tr> </thead> <tbody> <tr> <td>Traditional Laryngoscopy</td> <td>~0.13%</td> </tr> <tr> <td>Video Laryngoscopy</td> <td>~0.04%</td> </tr> </tbody> </table>	Intubation Method	Occurance %	Traditional Laryngoscopy	~0.13%	Video Laryngoscopy	~0.04%
Intubation Method	Occurance %						
Traditional Laryngoscopy	~0.13%						
Video Laryngoscopy	~0.04%						
CONCLUSION	The systematic implementation of video technology during intubation is associated with a significant reduction of difficult intubations encountered in the ICU.						

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