# Redefining Emergency Airway Management


## Magill Medical Technology

Magill Medical

# SafeLM® Video Laryngeal Mask System

## 3rd Generation Laryngeal Mask

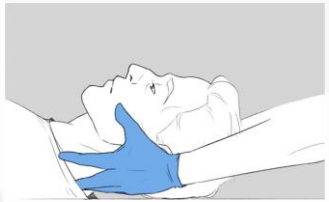
**FDA Registration (2020)**

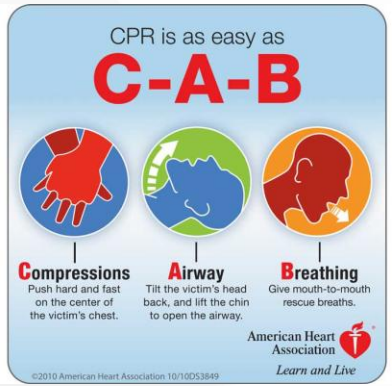
- **Videoscope (Model MGL-SP-6) : 868.5530**
- **Video Laryngeal Mask : 868.5110**

**CE Mark ( MDR ) : SX/HZ 2248988-1**

# Challenges of Emergency Airway Management

**Emergency airway management is critical for successful CPR. It is always challenging because of multiple factors.**






- Vomiting/airway secretions
- Facial/neck trauma
- Hemodynamic instability
- Agitation/altered mental status
- Immobilized cervical spine
- Chest compression for resuscitation
- Lack of time/access for muscle relaxant administration/induction agents
- Need for backup plan (rescue techniques)

Source: Advancing emergency airway management practice and research. Acute Med Surg. 2019 Oct; 6(4): 336–351.

# In hospital cardiac arrest vs out of hospital cardiac arrest

## In hospital

**Who?**

- Anesthetist
- Intubation trained doctors

\+ Availability of trained staff

\+ Full access to medications/equipment

\+ Ability to administer muscle relaxants

In hospital intubations **first attempt** success rate varies ~70-80%

## Out of hospital (OHCA)


**Who?**

- Paramedics
- Sometimes trained doctors
- Bystanders

\- Staff are less experienced in intubation

\- Less access/ability to administer muscle relaxants

The median **first-pass** success rate for (pre-hospital) intubations is higher for physicians than non-physicians

# Why is the first pass important?

| Risk Mitigation | Description |
|---|---|
| **Reduces risk of hypoxia** | Prolonged or repeated attempts are associated with hypoxemia which can worsen neurological outcomes |
| **Minimizes aspiration risk** | Repeated attempts may stimulate regurgitation, especially in unfasted patients |
| **Decreases airway trauma** | Dental injury, laryngeal edema or bleeding, laryngospasm, tracheal edema or bleeding |
| **Preserves chest compression quality** | Reduces pass in chest compressions, which maintain coronary and cerebral perfusion |
| **Improves patient outcomes** | Increased survival to hospital discharge, better neurological function, fewer ICU complications (ventilation pneumonia |

# In hospital cardiac arrest (IHCA)

- **79%** of anesthetic/ICU trainees report using SGAs frequently during IHCA vs **54%** who use TI (Goodwin, 2020)
- Not every ward/clinical area will be staffed with an intubation trained/confident healthcare provider
- Crash carts are available in every clinical area with airway adjuncts

# Out of hospital cardiac arrest (OHCA)

- >350K annual OHCA in the US alone
- ERC/AHA recommend endotracheal intubation (ETI) IF healthcare provider is properly trained. Risks of complications – **oesophageal intubation** (2.4-17%), **dislodgement, interruption of CPR** (110s, >3min in 25% cases). **Intubation failure** is 50% in pre-hospital systems (Sayre 1998, Bradley 1998)

**Table 4**
Unadjusted Outcomes by Prehospital Treatment Level.

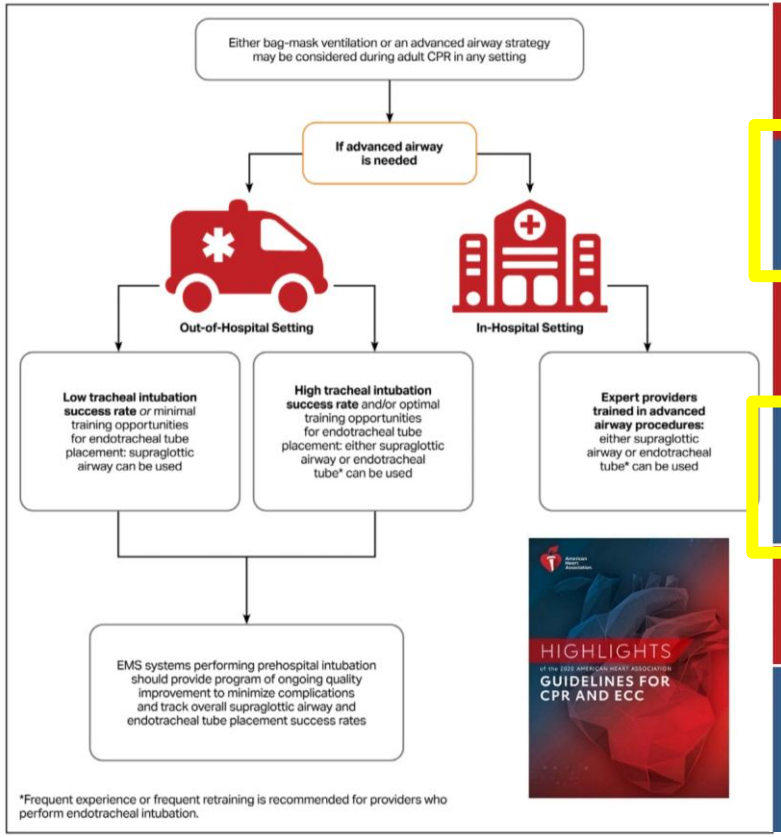
| | BLS Only | ALS Only | BLS + Late ALS (≥6 min) | BLS + Early ALS (< 6 min) |
|---|---|---|---|---|
| n | 1396 | 16599 | 11054 | 6016 |
| Survival to Hospital Discharge | 35 (2.5%) | 1494 (9.0%) | 1106 (10.0%) | 719 (12.0%) |
| Prehospital ROSC | 48 (3.4%) | 3878 (23.4%) | 3186 (28.8%) | 1995 (33.2%) |
| 24-h survival | 51 (3.7%) | 3674 (22.1%) | 2622 (23.7%) | 1739 (28.9%) |
| MRS < = 3 | 30 (2.1%) | 758 (4.6%) | 825 (7.5%) | 502 (8.3%) |

## Implementation of ALS care is a significant investment

- ALS training 1200h vs BLS 150h (US)
- ALS Course in UK (ERC) 4-6h on airway, not including ETT.
- ETT training only for anesthetic/ICU trainees (Core Training/ACCS)
- Anaesthesia residents require **125 intubation in OT** before achieving 95% success rate (Bernhard, 2012)

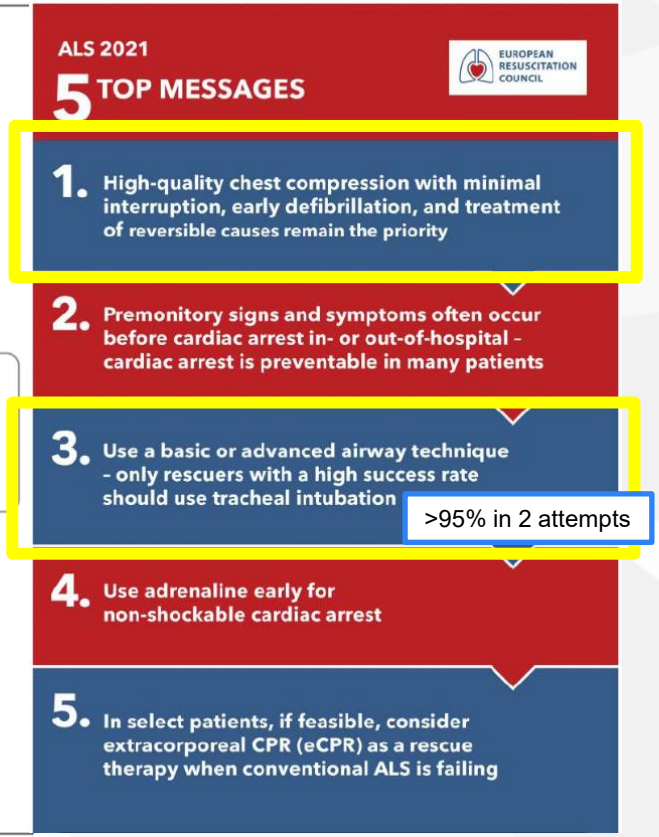
Kurz, M. C., Schmicker, R. H., Leroux, B., Nichol, G., Aufderheide, T. P., Cheskes, S., Grunau, B., Jasti, J., Kudenchuk, P., Vilke, G. M., Buick, J., Wittwer, L., Sahni, R., Straight, R., Wang, H. E., & ROC Investigators. (2018). Advanced vs. Basic Life Support in the Treatment of Out-of-Hospital Cardiopulmonary Arrest in the Resuscitation Outcomes Consortium. *Resuscitation, 128*, 132–137. https://doi.org/10.1016/j.resuscitation.2018.04.031

# CPR guidelines recommend using a supraglottic airway







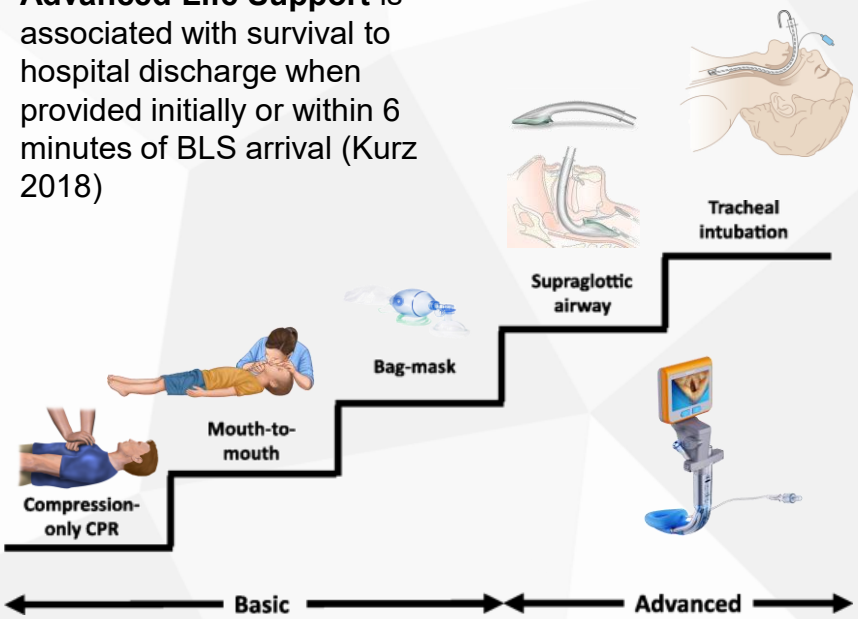



## Advantages of SAD vs Intubation

- ✓ Quicker
- ✓ Does not interrupt chest compressions
- ✓ Easy to learn and use
- ✓ Less airway trauma

# Advanced airways > basic airways during CPR

**Advanced Life Support** is associated with survival to hospital discharge when provided initially or within 6 minutes of BLS arrival (Kurz 2018)

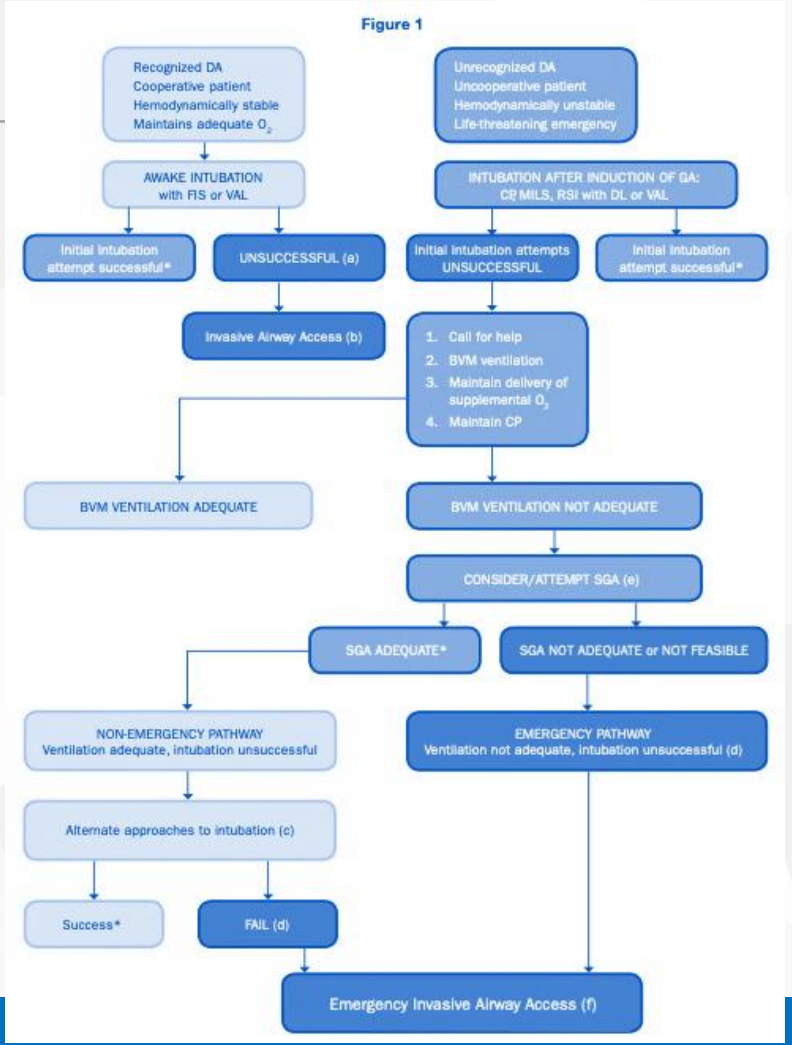



| Outcome or Aspect | SGA | Tracheal Intubation (TI) |
|---|---|---|
| Ease/speed of insertion | High—faster, less interruption | Requires more skill; risk of prolonged pauses |
| Regurgitation risk | Lower compared to bag-mask ventilation | Lower risk overall; TI protects airway |
| Neurologically intact survival | Lower in meta-analysis | Higher (OR 1.33) PMCEurope PMC |
| Feasibility RCT outcomes | Similar survival and outcomes | Similar outcomes PMCEurope PMC |
| PART trial outcomes | Better 72-hr survival, ROSC, hospital survival, neuro outcomes | Lower survival and ROSC PMCEurope PMC |
| Compression interruption | Generally minimal | Risk of long pauses; impact varies with provider skill |

Newell, C., Grier, S., & Soar, J. (2018). *Airway and ventilation management during cardiopulmonary resuscitation and after successful resuscitation*. Critical Care, 22, Article 190. Published August 15, 2018

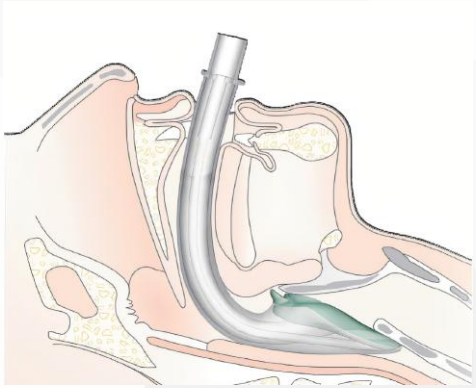
# Difficult airway (DA) management

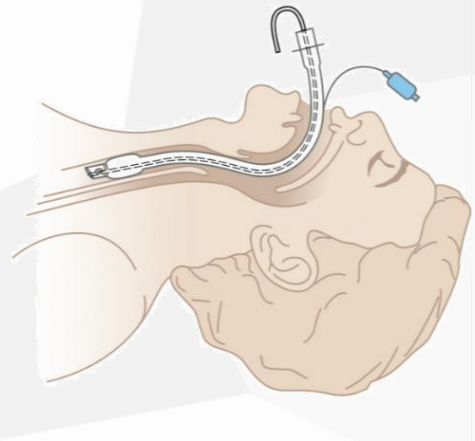
- An adequate SGA can be the difference between an emergency and non-emergency
- Unrelaxed patients present a risk for significant more cervical spine motion (coughing, bucking, gagging) during awake intubation attempt
- Airway trauma, cervical spine immobility can exacerbate an inherently difficult airway
- Need for a rescue airway after failed intubation – CICO scenario (Cannot Intubate, Cannot Oxygenate)




**Difficult airway management algorithm in trauma**. (From Hagberg CA, Kaslow O. difficult airway management algorithm in trauma updated by COTP. ASA Newsletter. 2014;78:56-60

# Conventional SGA vs endotracheal intubation (ETT)





| Feature | Supraglottic Airway (SGA) | Endotracheal Tube (ETT) |
|---|---|---|
| **Ease of Inserion** | Generally **easy and quick**, often blind insertion | **More complex**, requires visualisation (laryngoscopy) |
| **Skill Level Required** | Can be placed by **non-specialists** | Requires **advanced training** (e.g. anaesthesia, ALS) |
| **Time to Insert** | **Faster** (10–30 seconds typically) | **Slower**, especially in difficult airways |
| **Airway Seal** | Lower-pressure seal; risk of **air leak** | High-pressure **cuffed seal** |
| **Aspiration Protection** | **Partial** (especially with second-gen SGAs) | **Full protection** with inflated cuff |
| **Ventilation Pressure Tolerance** | Limited (≤20–30 cm $H_2O$) | Tolerates **high pressures** (>30 cm $H_2O$) **t** |
| **Airway Protection (Definitive)** | ❌ Not definitive | ✅ Yes (meets all criteria) |
| **Risk of Dislodgement** | **Higher**, may move with patient or positioning | **Lower**, once secured |

# Advantages of a Laryngeal Mask vs. the ETT Intubation

- ✓ Less incidence of airway and tooth trauma
- ✓ Improved hemodynamic stability at induction and during emergence[1]
- ✓ Lower frequency of coughing during emergence [1]
- ✓ Minimal increase in intraocular pressure following insertion[1]
- ✓ Reduced anesthetic requirements for airway tolerance[1]
- ✓ Improved oxygen saturation during emergence[1]
- ✓ Lower incidence of post surgery sore throats in adults[1]
- ✓ Increased speed and ease of placement by inexperienced personnel[1]
- ✓ Decreased drug cost and overall costs depending on the length of the case[2]
- ✓ Improved operating theater efficiency (reduced induction and increased room turnover time)

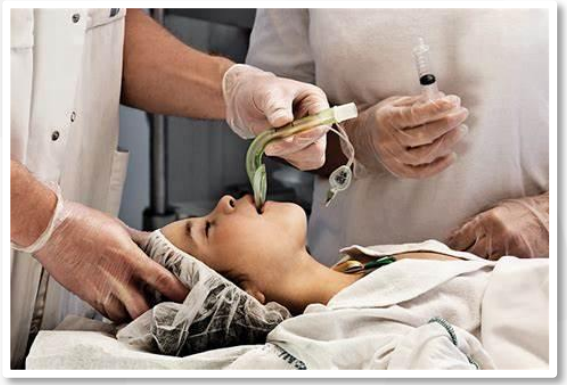

1. Brimacombe, J. The Advantages of the LMA Over the Tracheal Tube or Facemask: A Meta-Analysis. CAN J ANAESTH 1995; 42:11 pp 1017-23
2. Macario, A., Chang, P., Stempel, D., Brock-Utne, J. A Cost Analysis of the Laryngeal Mask Airway for Elective Surgery in Adult Outpatients. Anesthesiology. 1995. 83(2):250-7.
3. T. C. R. V. van Zundert, Brimacombe, J., Ferson, D., Bacon, R., Wilkinson, D. “Archie Brain: celebrating 30 years of development in laryngeal mask airways”; Anaesthesia. 2012 67: 1375–1385

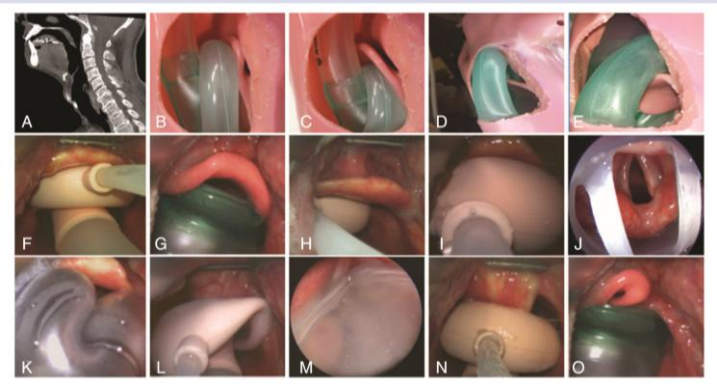
# Blind Technique Limits the Application of SGA

With traditional Blind Technique (1st and 2nd gen SGA), **malposition occurs in 50% to 80%** with SGA, which increase the risk of injury to epiglottis, poor airway sealing, unexpected position shift and aspiration.

***Video Technique is a MUST for 3rd Gen SGA***

**- Airway Management KOLs**




Source: A. A. J. Van Zundert, Malpositioning of supraglottic airway devices: preventive and corrective strategies British Journal of Anesthesia 116 (5): 579–82 (2016) doi:10.1093/bja/aew104

# Why is video guidance important for SADs?

**Malposition occurs in 50% to 80% laryngeal mask blind placement !**


Lack of seal
(non-inflatable cuff)


Inserted too deep


Tip of cuff folding over

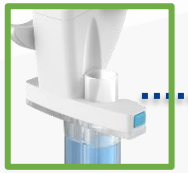

Downfolding of
epiglottis

# How SafeLM® Works

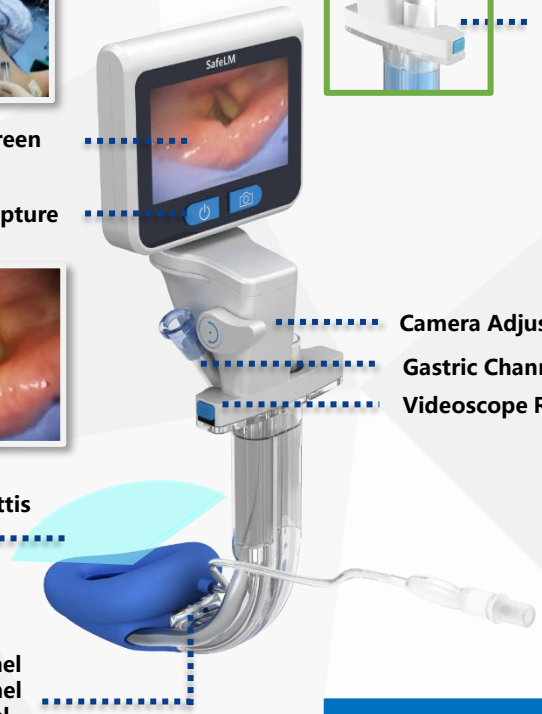
LCD Screen

Power, Image Capture

>180° viewing angle
Ensure clear view to glottis



Airway &
Intubation Channel




Camera Adjusting Handle

Gastric Channel

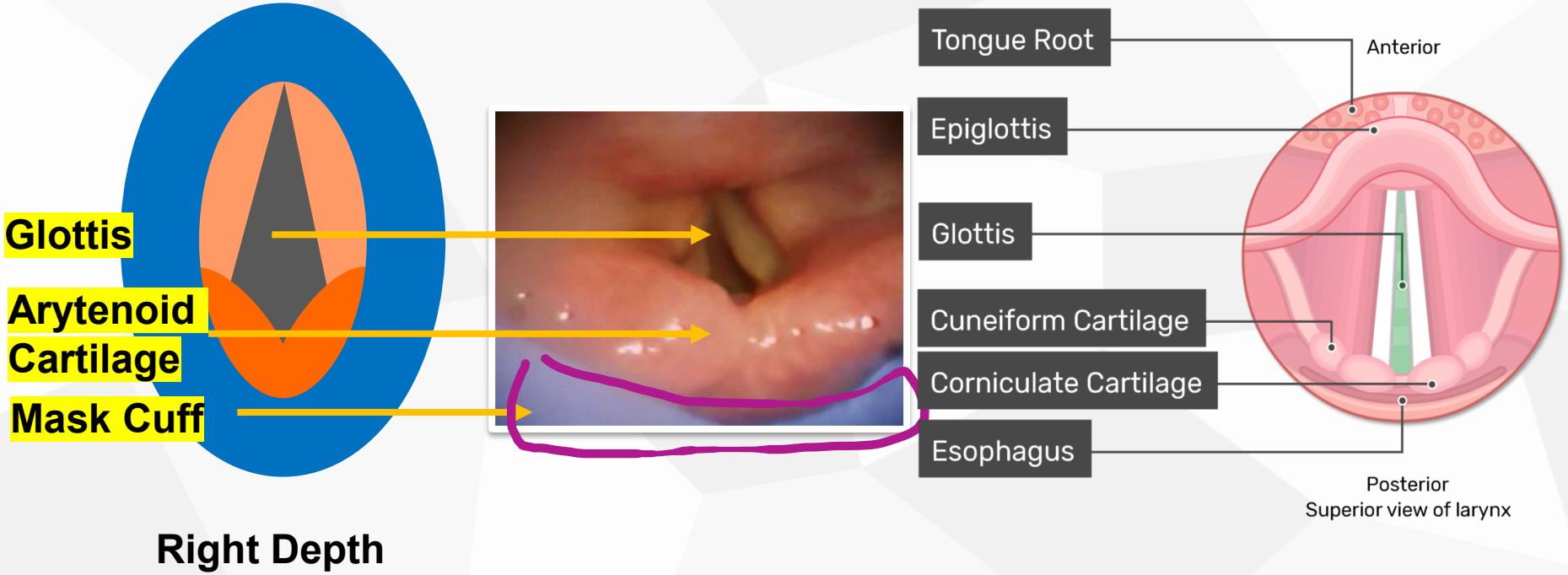
Videoscope Release Button

Airway Channel
Gastric Channel
Video Channel

**Size #2- #5**




# Insertion Depth




**Right Depth**

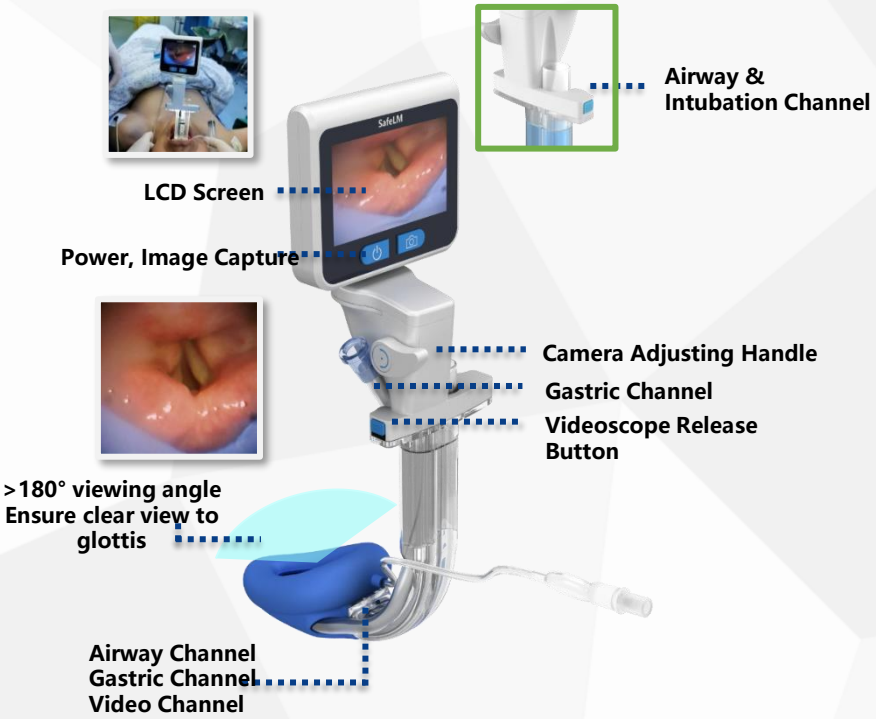
# Why does it matter if my patient is ventilating well?

Folding of epiglottis

| Risk | Description |
|---|---|
| **Air leak** | Poor seal can lead to loss of TV, especially during positive pressure ventilation → reduction of ventilation efficiency |
| **Gastric insufflation** | Aspiration risk/regurgitation |
| **Tissue trauma/nerve injury** | Pressure on laryngeal structures can cause sore throat, dysphonia |
| **Need for rescue airway** | If deterioration due to leak/failed ventilation, malposition may delay/complicate intubation |

# Real case shows that blind technique is NOT easy

# SafeLM® Specifications




## Resuable Videoscope

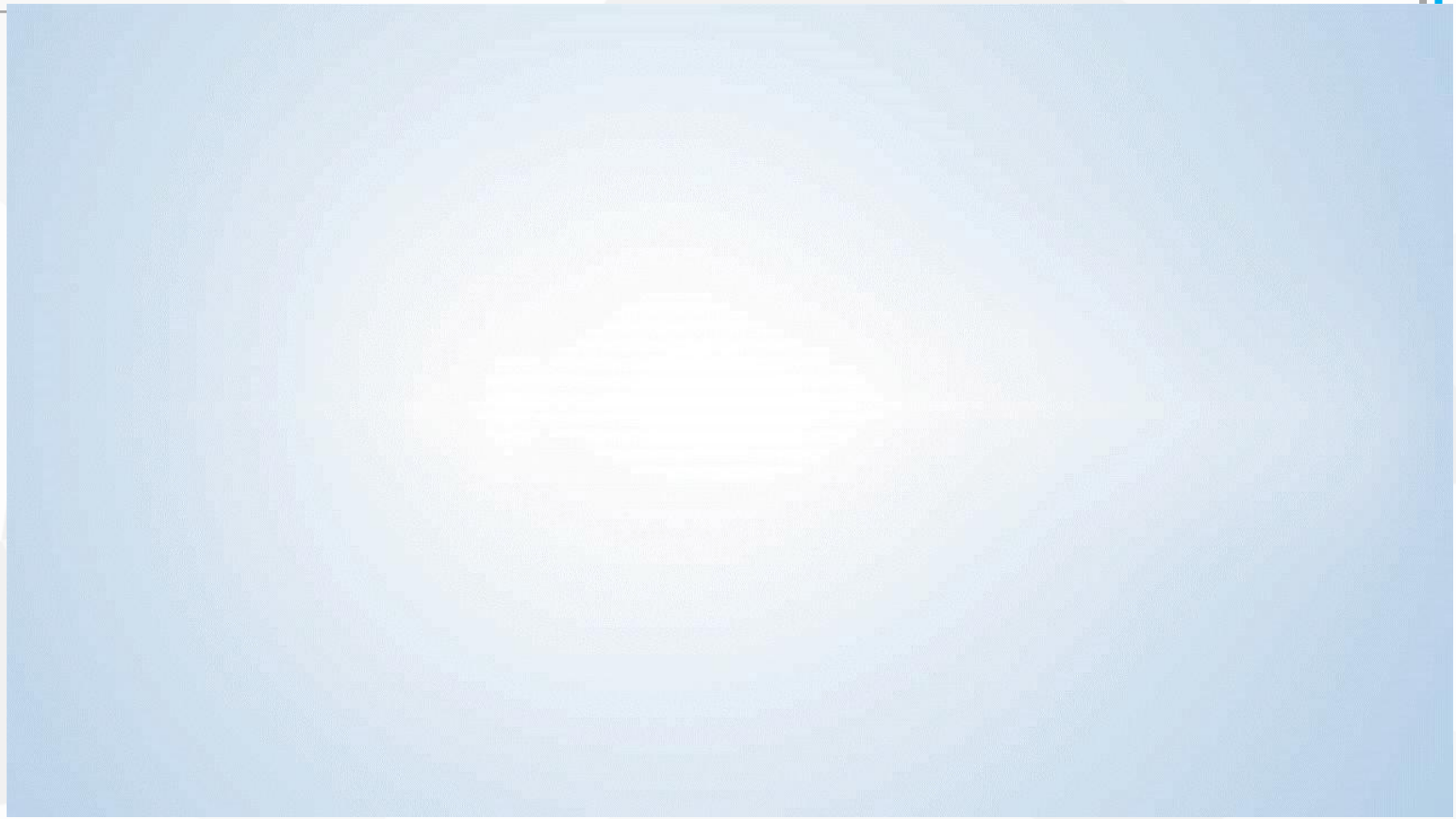
**Model: EM-16A (Adult)  EM-16C(Pediatric)**
**Meet IEC 60601-1-12 Edition for Emergency medical services environment**

**Model: SP-6 (Adult)  SP-C (Pediatric)**
**For In-hopsital eveironment**

## Disposable Video Laryngeal Mask

| Size | #2 | #2.5 | #3 | #4 | #5 |
|---|---|---|---|---|---|
| Patient Age | Pediatric | | Adult | | |
| Patient Weight(kg) | 10-20 | 20-30 | 30-50 | 50-70 | 70 -100 |
| Recommend Cuff Volume (ml) | 10 | 14 | 20 | 30 | 40 |
| Max. Cuff Volume (ml) | 15 | 21 | 30 | 45 | 60 |
| Max ET tube allowed(ID, cm) | - | - | 6.5 | 7.0 | 7.5 |
| Max. OG tube allowed (Fr) | 10 | 10 | 14 | 14 | 14 |

# SafeLM® The first effective 3rd generation laryngeal mask



# Advantages of SafeLM compare to Conventional LMA (1st 2nd Gen)

| Category | Conventional LMAs | SafeLM (Video LM) |
|---|---|---|
| 1.Insertion technique | Blind placement into hypopharynx | **Video-guided with real-time visualization of airway anatomy** |
| 2.Placement | Guesswork, confirmation with fibreoptic | **Direct visualisation of optimal placement & troubleshoot malposition** |
| 3.Airway trauma | Risk of trauma due to blind insertion | **Reduced trauma with gentle and guided placement** |
| 4.Real-time monitoring | No | **Yes** |
| 5.ETT change | Limited/Required fibreoptic bronchoscopy | **Facilitates visualized intubation** |
| 6.Training tool | Limited training feedback | **Shared visualization and teaching** |
| 7.Documentation | No documentation | **Recordable video for review** |

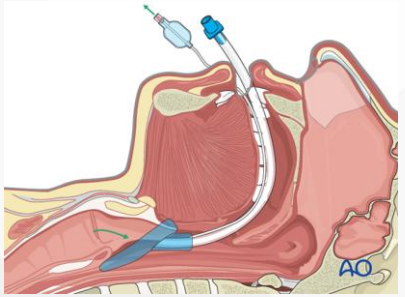
# SafeLM® advantages

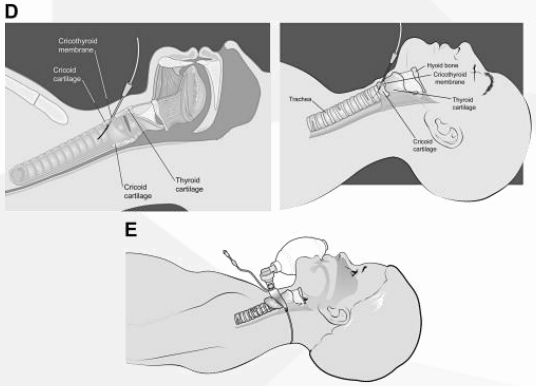
- ✓ Easy to learn and use, reducing training time and cost
- ✓ Increased fist attempt success rate of SGA placement and ventilation
- ✓ Reduce airway trauma
- ✓ Monitor airway to avoid malposition or aspiration
- ✓ Perform intubation while maintaining oxygenation for difficult airway
- ✓ Compact design
- ✓ Video assisted suction

# SafeLM® Video Assisted Intubation

# Benefits of SafeLM for ED teams

- ✓ **Does not interrupt chest compressions**
- ✓ **Less training/experience required** (no fixed time training for emergency intubations)
- ✓ Able to visualize obvious airway obstruction (growths/polyps/secretions/blood)
- ✓ Faster than intubation
- ✓ Ability to perform a simultaneous cricothyrotomy if front of neck access is required (FONA)



# Airway management in military hospitals

1. **Trauma dominated patient population** → **Need for definitive airway to prevent aspiration, with a low risk of displacement/failure**
   - Maxillofacial injuries
   - Airway burns or blast injuries
   - Penetrating neck trauma
2. **Need for rapid, secure airway control** → **Priority on first pass success and high retention device**
   - Airway must remain secure during transport over long distances and potentially rough terrain
3. **Variable provider skill levels** → **Easy to learn and use with minimal setup/training**
   - Combat medics, emergency physicians, anesthetists
4. **Surgical airway readiness** → **Prepared for FONA**
   - Cricothyrotomy is taught as a primary airway option

Changsha Magill Medical Technology Co. Ltd.

# Seeing is Trusting


## SafeLM® Video Laryngeal Mask System