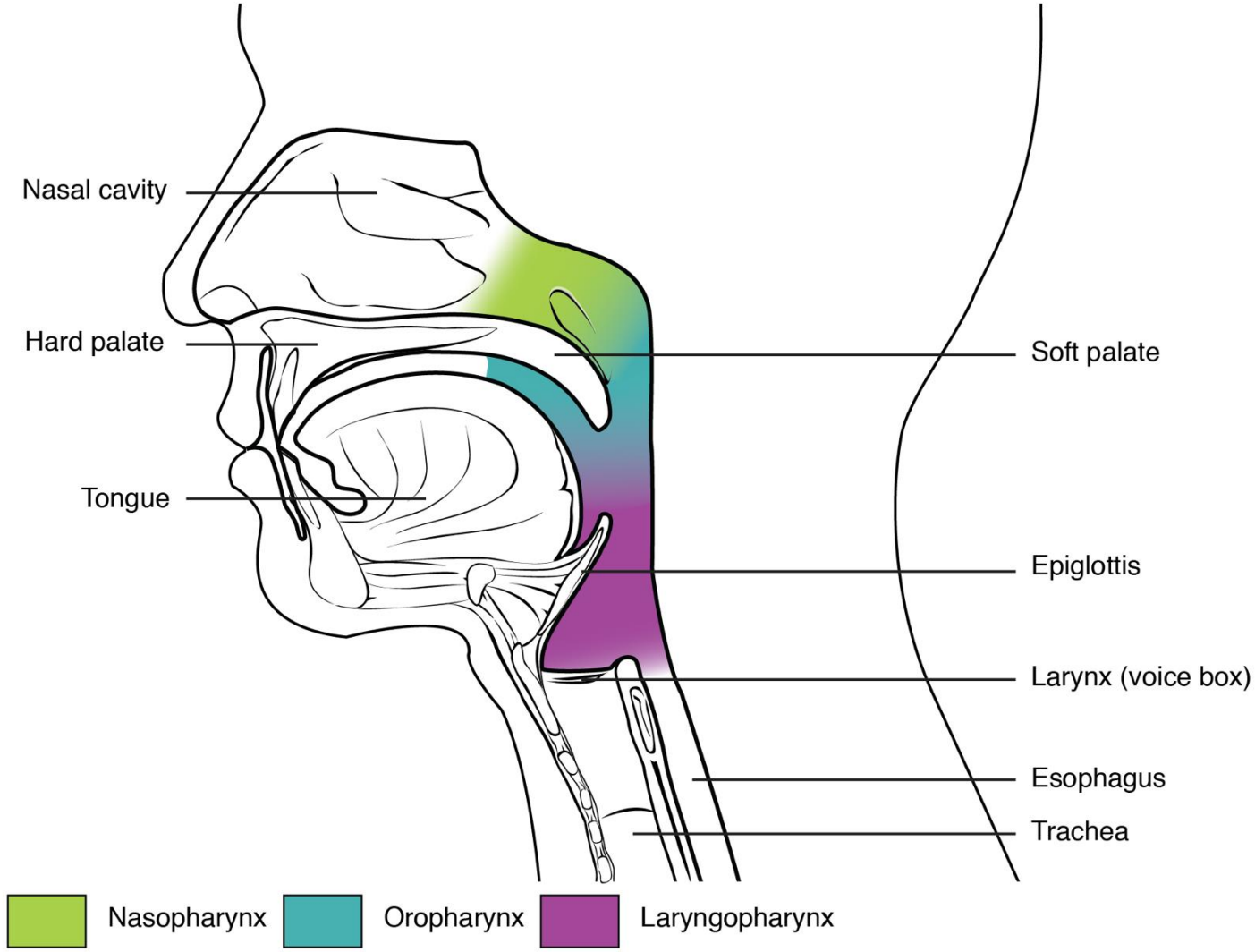
# PHYSIOLOGY AND ANATOMY LARYNGOSCOPES

# INTRO TO LARYNGOSCOPY

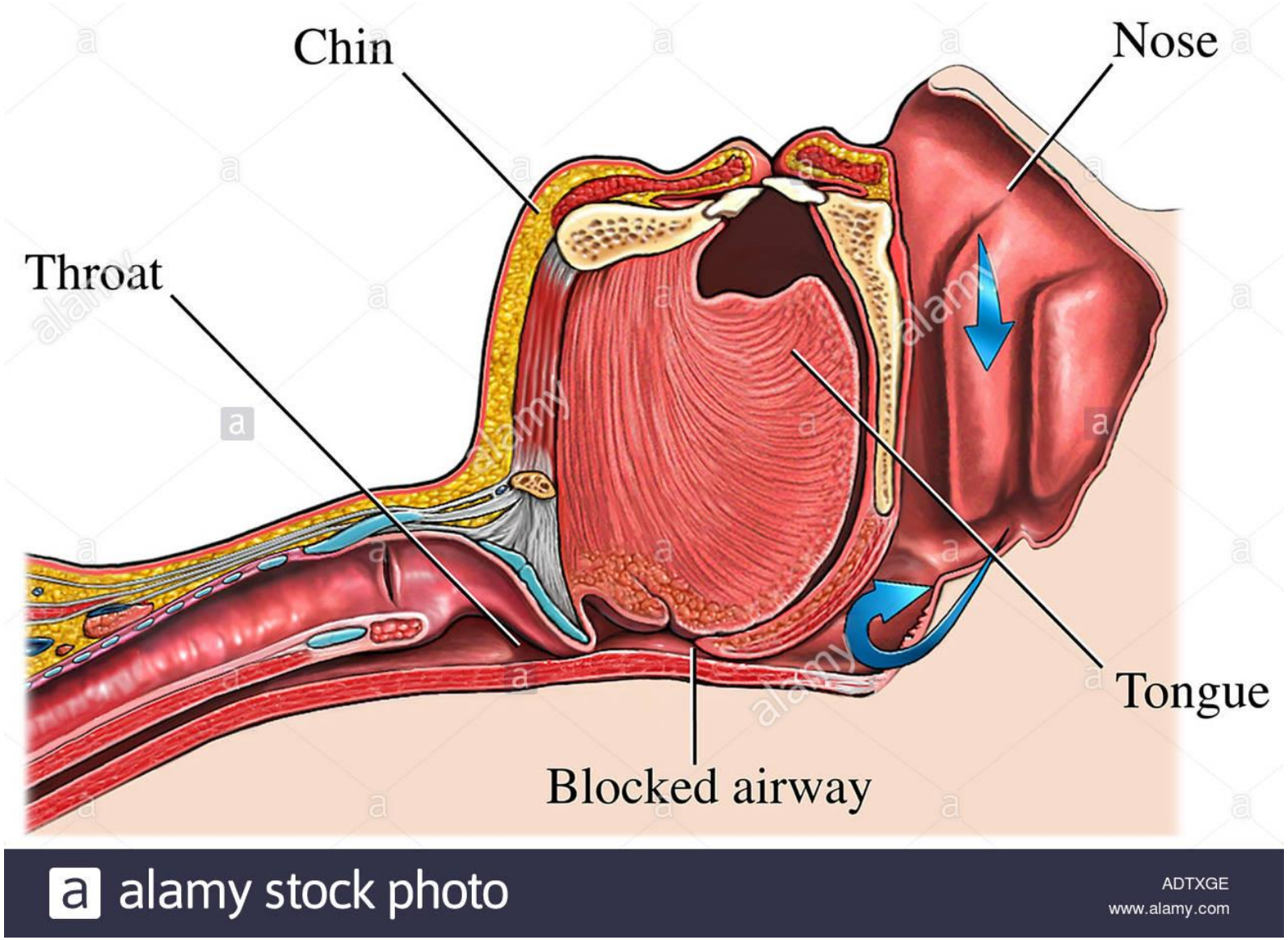
**Laryngoscopy** (la·ryn·go·sco·pi ): Laryngoscopy is a term describing the visualization or examination of the larynx by distraction of the upper airway structures.

It is typically used to enable intubation and airway management in anesthesia, critical care, and trauma scenarios.

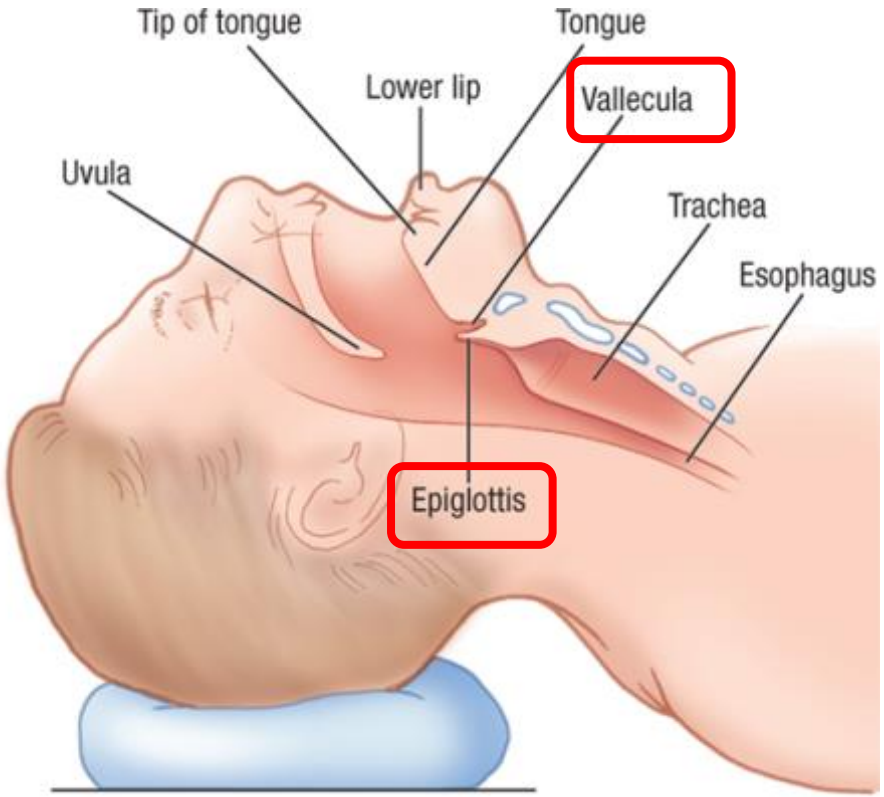
# AIRWAY ANATOMY

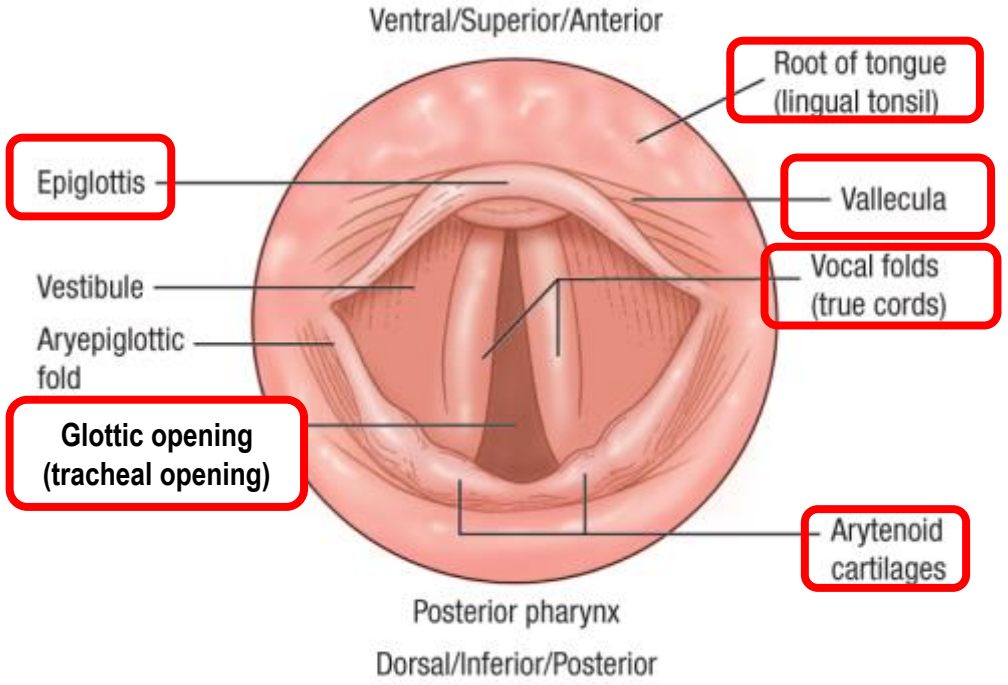


# AIRWAY VIEW IN SUPINE POSITION



# KEY AIRWAY ANATOMY FOR LARYNGOSCOPY:




*Glottic opening*: the opening between the vocal cords. This is the target for tracheal intubation.

*Vallecula* (val·lec·u·la): the space between the base of the tongue and the epiglottis

*Arytenoid cartilages* (ar·y·te·noid): A pair of small triangular cartilages in the larynx that help to move the vocal cords

# INTRODUCTION TO LARYNGOSCOPES

A **laryngoscope** (la·ryn·go·scope) is used to lift the upper airway structures, such as the epiglottis, out of the way to allow visualization of the vocal cords (larynx) and enable intubation through the glottic opening.

Laryngoscopes are used where-ever tracheal intubations are performed, including  OR, ED, ICU, NICU, PICU, EMS

# DIRECT VS. INDIRECT (VIDEO) LARYNGOSCOPY

Direct Laryngoscopy:

- Uses direct vision or line of site from the eye of the clinician to the patients tracheal opening  or glottic opening.

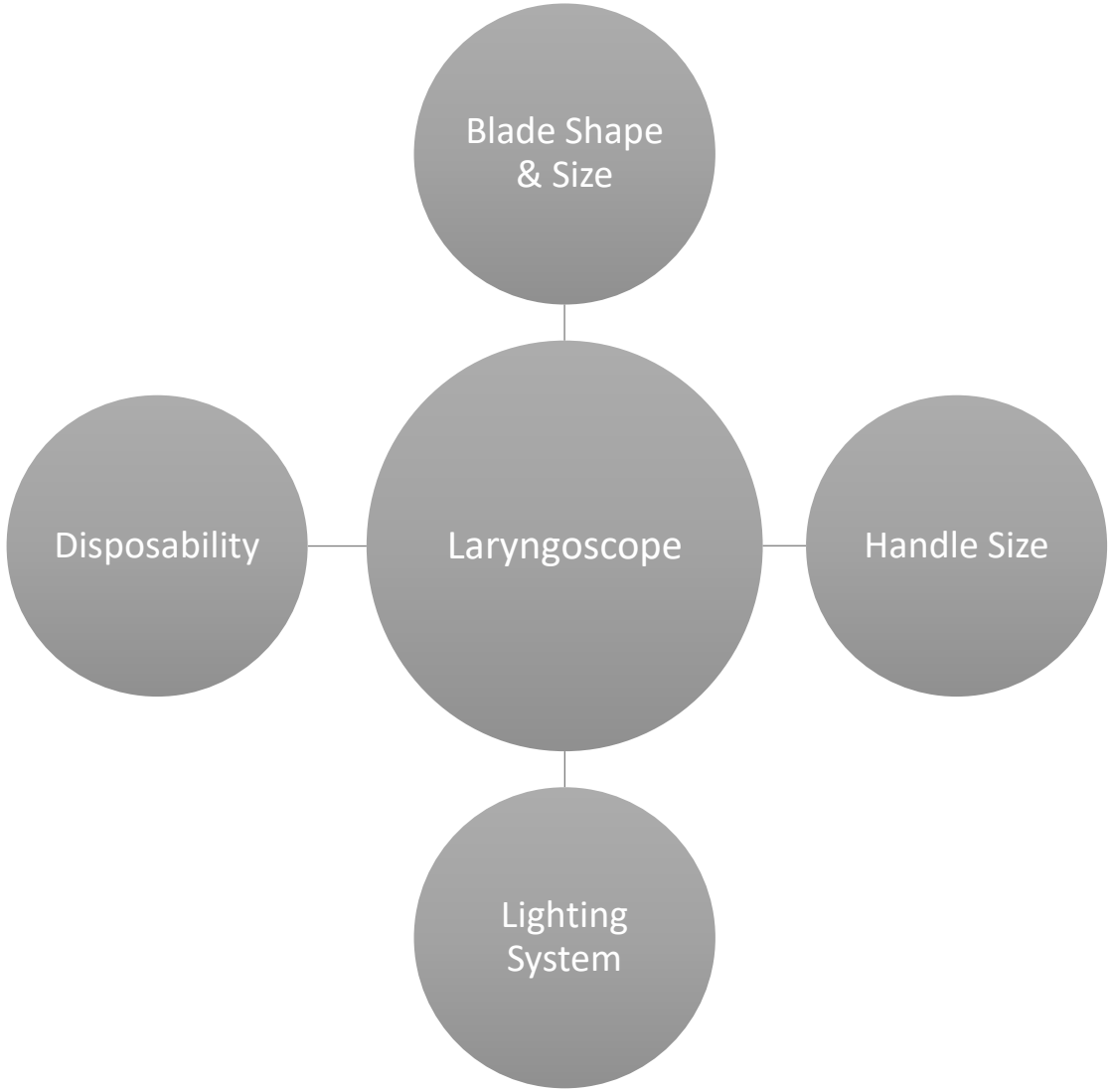

Indirect Laryngoscopy

- Techniques that do not use direct glottic opening visualization.  In video laryngoscopy, an image of the patient glottic opening is transmitted to a monitor screen.


# LARYNGOSCOPY USE CASES FOR TRACHEAL INTUBATION

| Est. % of Intubations | Dept | Primarily used by | Use Environment | Use profile |
|---|---|---|---|---|
| 75% | OR | Anesthesiologist<br>CRNA | Planned, Controlled | • Highest volume of placements<br>• Largely direct laryngoscopy<br>• Limited video laryngoscopes, primarily used for difficult airway |
| 7% | ICU<br>NICU<br>Floor | RT<br>Intensivist | Emergent | • Laryngoscopes in crash cart<br>• Use is infrequent & unplanned |
| 12% | ED | Intensivist | Emergent | • Often difficult, traumatic airway |
| 5% | EMS | Paramedic<br>EMT | Emergent, uncontrolled environment | • Highest use of video<br>• Difficult, traumatic airway<br>• Less frequent intubations so less experienced in laryngoscopy |

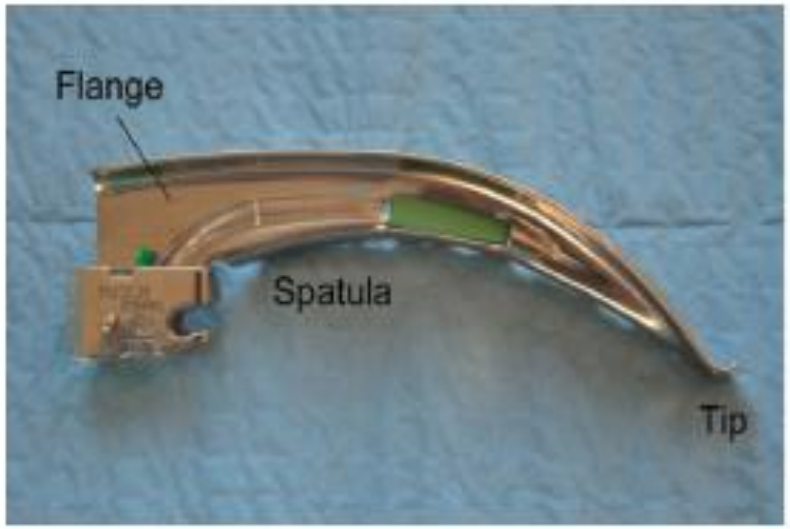
# LARYNGOSCOPES ARE DEFINED BY SEVERAL VARIABLES

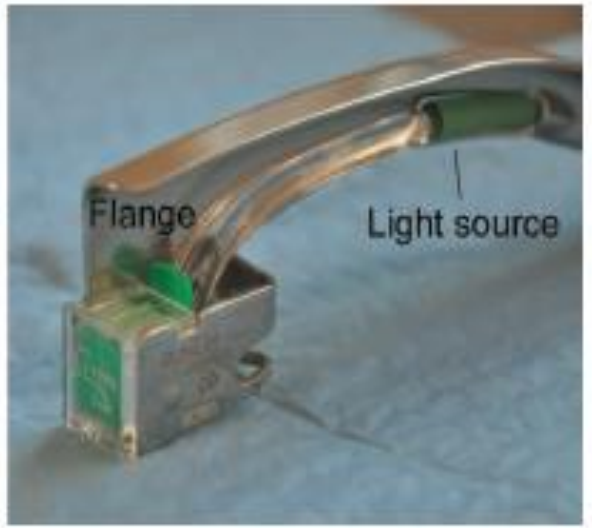


# BLADES TYPES - INTRODUCTION

There are numerous blade designs, but they have common features:

- Spatula – curved surface that passes over the surface of the tongue
- Flange – used to direct or displace the tongue. The shape and height of flange can vary significantly between blade designs and manufacturers
- Tip – designed to lift the epiglottis either directly or indirectly
- Light source – provides illumination of the anatomy and vocal cords



# BLADE SHAPES: CURVED VS. STRAIGHT

- All blades generally fall into either a "Curved" or "Straight" style.

## Curved

- Wider flange and curved blades are helpful in keeping the tongue retracted from the field of vision and allowing more room for passing the tube

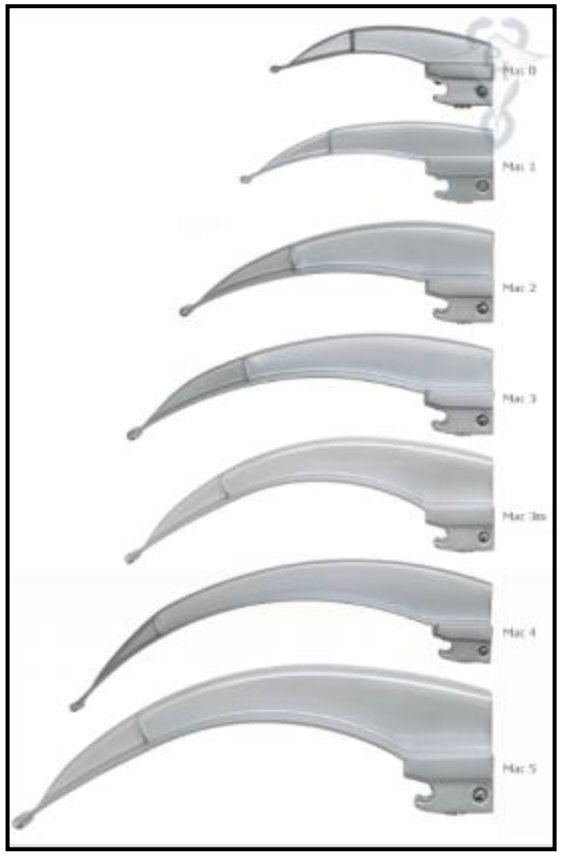
## Straight

- Provide straighter path for the endotracheal tube, making intubation easier once the larynx can be seen.
- Preferred in patients with large, floppy epiglottis because the tip is designed to lift the epiglottis out of the way
- More likely to be used in pediatrics

# THE MOST COMMON BLADES: MAC AND MILLER

Although there are numerous blade designs, more than 90% of intubations are done with either a Macintosh, aka Mac, or Miller blade.

Mac Blades
(Curved, like the 'C' in Mac)



Miller Blades

(Straight, like the 'L's' in Miller)

# BLADE SIZES

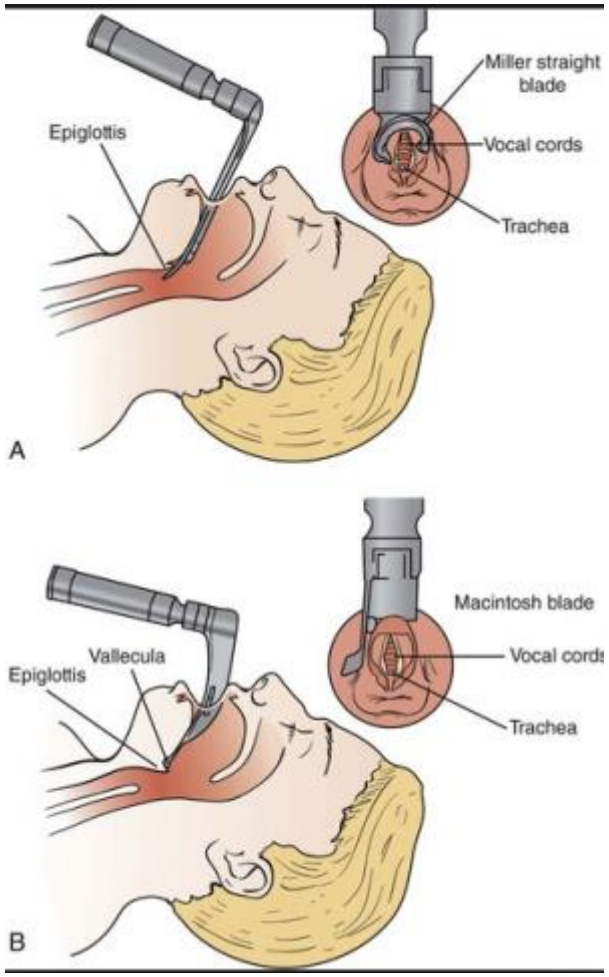
| Size | Patient Size | % of market |
|---|---|---|
| 000 | Small premature infant | Minimal |
| 00 | Premature infant | 1.2% |
| 0 | Neonate | 2.8% |
| 1 | Small Child | 3.7% |
| 1.5 | Child | 1.2% |
| 2 | Child | 19.2% |
| 3 | Adult | 37.5% |
| 3.5 | Adult, strong curve | 1.8% |
| 4 | Large adult | 22.6% |
| 5 | Extra-large adult | Minimal |

**Key Takeaways**

- Blade sizing is related to patient size
- Not all configurations are available in all sizes

# BLADE DESIGN & TECHNIQUE

Slight variations in laryngoscopic technique follow from the choice of blade design, and it is often a matter of personal preference.




**Straight blade:** Tip goes *under the epiglottis* and lifts it directly

**Curved blade:** Tip fits *into the vallecula* and indirectly lifts the epiglottis

# VIDEO TIME OUT: 13 MIN

**Anatomy & Direct Laryngoscopy (2:42 min)**

https://youtu.be/ThISkCIbv7o

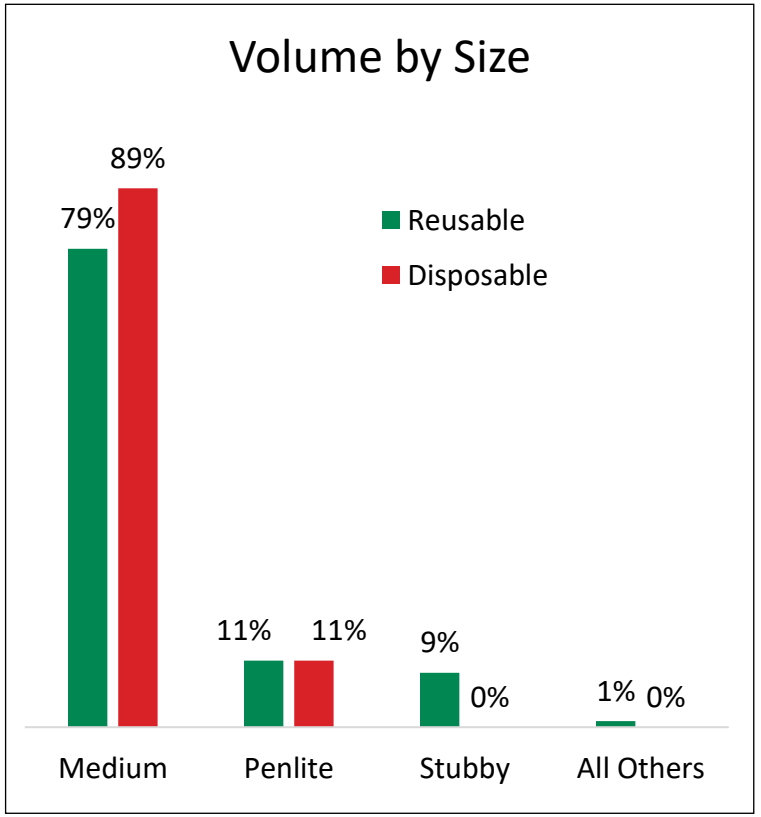
Brief video that covers critical anatomy, blade types, and technique for direct laryngoscopy.

**Direct and Indirect Laryngoscopy in 10 mins**

https://vimeo.com/129280563

A clear, practical explanation of direct and indirect laryngoscopy, when each is preferred, pros/cons, trends in video use

# HANDLE SHAPES

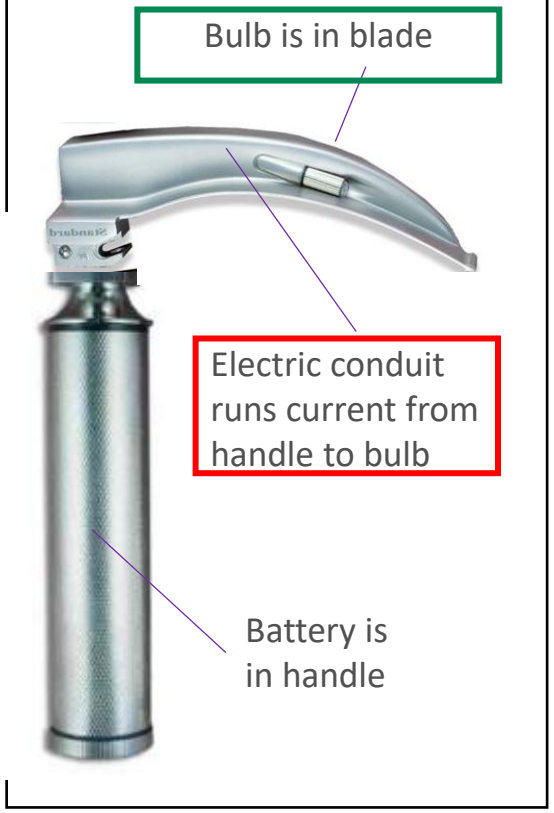

Key Takeaways

- Almost all sales are either **Medium, Penlight, or Stubby**

# LIGHTING SYSTEM: STANDARD VS. FIBEROPTIC LED

## Standard LED

**AKA: Conventional**

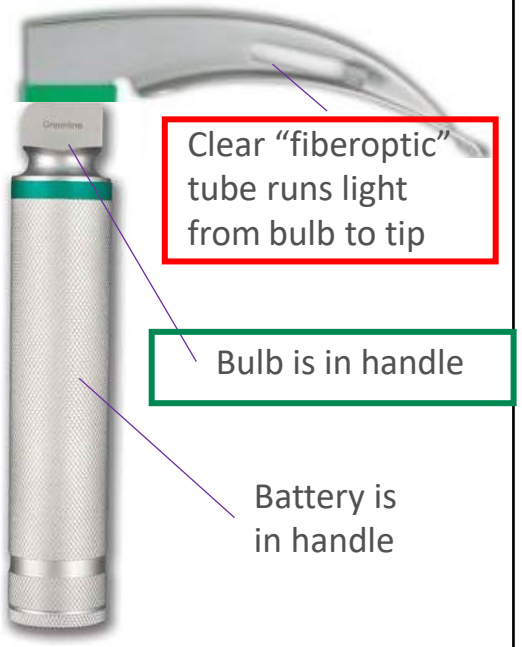



**9% of market**

## Fiberoptic LED

**AKA: Green Line, Green system**

**Greenline = ISO 7376**




**91% of market**

### Key Takeaways

- Most disposables and reusables utilize an LED light source (bulb)
- The key difference is where the light source (bulb) is located
- Fiberoptic LED, often called Green or Greenline, always has a green collar
- Per ISO standards, Green Line blades and handles interchangeable regardless of manufacturer
- Although Fiberoptic LED is the most popular, Standard LED has superior light quality for fully-disposable products

# VIDEO TIME OUT:  4 MIN STANDARD VS. FIBER OPTIC LED LIGHTING

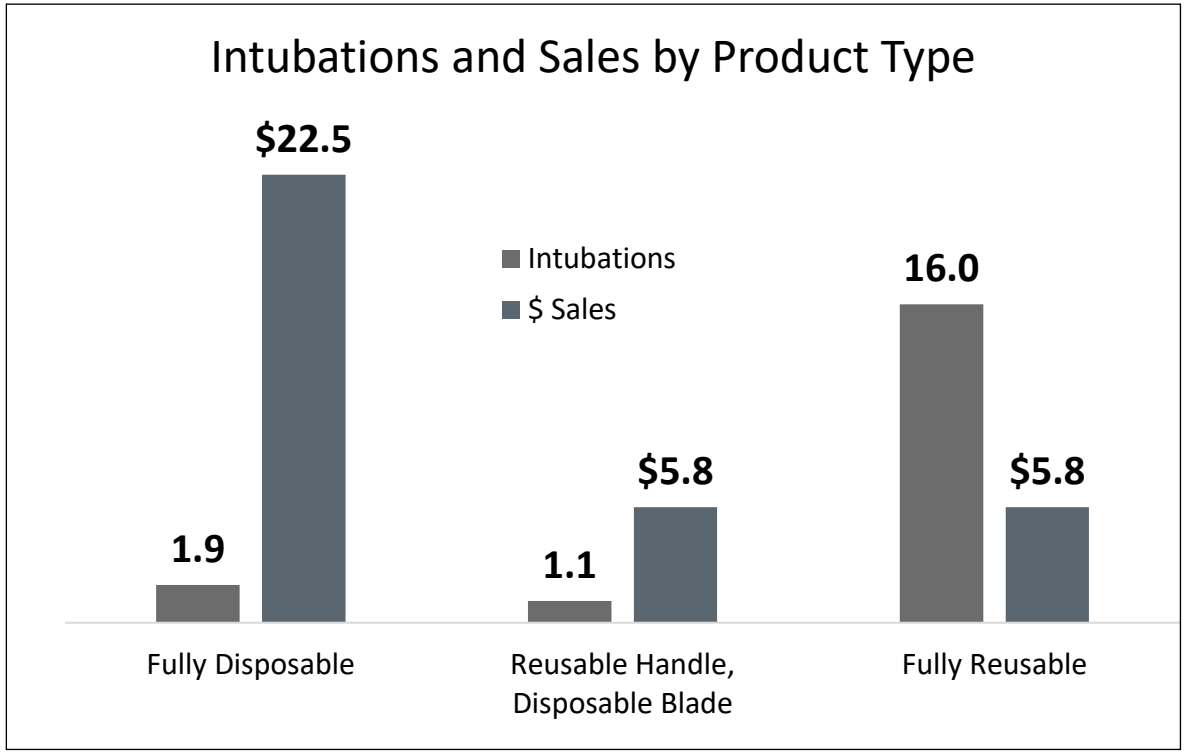
Link here:  https://www.youtube.com/watch?v=isxV4pphogE

- In under 4 mins, learn how to easily identify a Standard LED (aka Conventional) and Fiber Optic LED (Green Line)
- Have your IntuBrite Standard and Fiber Optic samples in hand to follow along

# REUSABILITY

## Reusable

Reusable items are designed to withstand reprocessing (high-level disinfection or sterilization). Most are guaranteed for duration (e.g. 5-7 years) and/or a defined number of autoclave cycles (e.g.) 4,000.
Often, the electronic parts (bulb, battery, etc.) can be replaced when broken




## Disposable

Disposable items are designed for single-patient use.

**Key Takeaways**

- All the money is in disposables.
- Winning disposable blades only to use with current reusable handles is a pot. wedge
- Winning reusables is unlikely. Don't devote time here.

# REUSABLE VS DISPOSABLE: TRADE OFFS

| | Reusable Handle & Blade | Disposable Handle & Blade |
|---|---|---|
| **Benefits** | • High quality weight and feel<br>• What most physicians are accustomed to using – viewed as the gold standard | • Fresh battery and light for each use<br>• No maintenance or reprocessing resources<br>• Single patient use – no risk of cross-contamination |
| **Drawbacks** | • Performance failure/variability due to reprocessing wear & tear<br>– Light quality degrades/ flicker<br>– Battery failure, incorrect reinstallation<br>– Component failure<br>• High initial capital investment<br>• Maintenance & replacement<br>• Reprocessing time & costs (chemicals, time, labor, supplies) | • Not perceived to have the quality of a reusable<br>• Cost is more 'tangible' to department<br>• Environmental impact perceived to be more than reusable |

# VIDEO REUSABLE & DISPOSABLE

Video laryngoscopes are also ‘reusable’ or ‘disposable’

**Reusable:** Video monitor, handle and blade are intended for multi-patient use with handle cleaning and blade reprocessing between patients.

**Disposable:** These are really a combination of reusable and disposable components. Video monitor and camera are reusable. The ‘blade’ is either single use or has a disposable sheath.

**McGrath Mac (Medtronic)**
Reusable monitor, handle & metal stem with camera.
Clear disposable sheath fits over the camera stem.

**King Vision (Ambu)**
Reusable monitor fits into the disposable blade/handle combo

# OPTIONAL VIDEOS

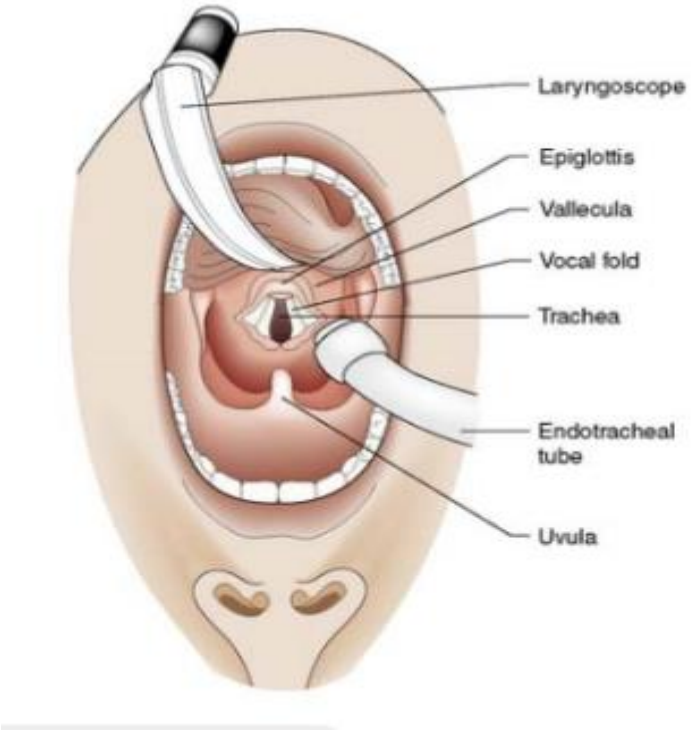
**Good views from practioner's POV**
https://www.youtube.com/watch?v=4V_poulbcnA

**Direct Laryngoscopy** https://www.youtube.com/watch?v=AZeBumPaj4g
Use of Mac and Miller blades for intubation

**Anatomy and Intubation**
https://youtu.be/iOPpSGbuYmQ
- Skip to the 6:30 min mark: @ 6:30 Anatomy; Great view of vallecula lift at 7:30 / Mallampati overview
- @ 8:30 Intubation Equipment; @ 12:00 Direct laryngoscopic intubation

*The first 6.5 mins are pharmacology – double back to it if you can*

**Intubation using Direct and Indirect (Video) Laryngoscopes**
https://www.youtube.com/watch?v=gnkYGRMaw7o
**First 6 min** shows use of different direct and video laryngoscopy devices



# QUESTIONS?