

FAKULTNÍ  
NEMOCNICE  
U SV. ANNY  
V BRNĚ



# Predikce Difficult Airways, možnosti a algoritmy, VORTEX

Lukáš Dadák

1  AKUTNE.CZ<sup>®</sup>  
years

IX. konference

25.11.2017



MUDr. Lukáš Dadák, Ph.D.

- V posledních 9 letech přednáší na kurzech podporovaných společnostmi LMA a Teleflex.
- Obrázky produktů pochází z webových stránek výrobců či distributorů.

- operační sály:
  - obtížná intubace: 1.2-3.8%
  - selhání intubace: 0.13-0.30%,
- ER + ICU: až 20%

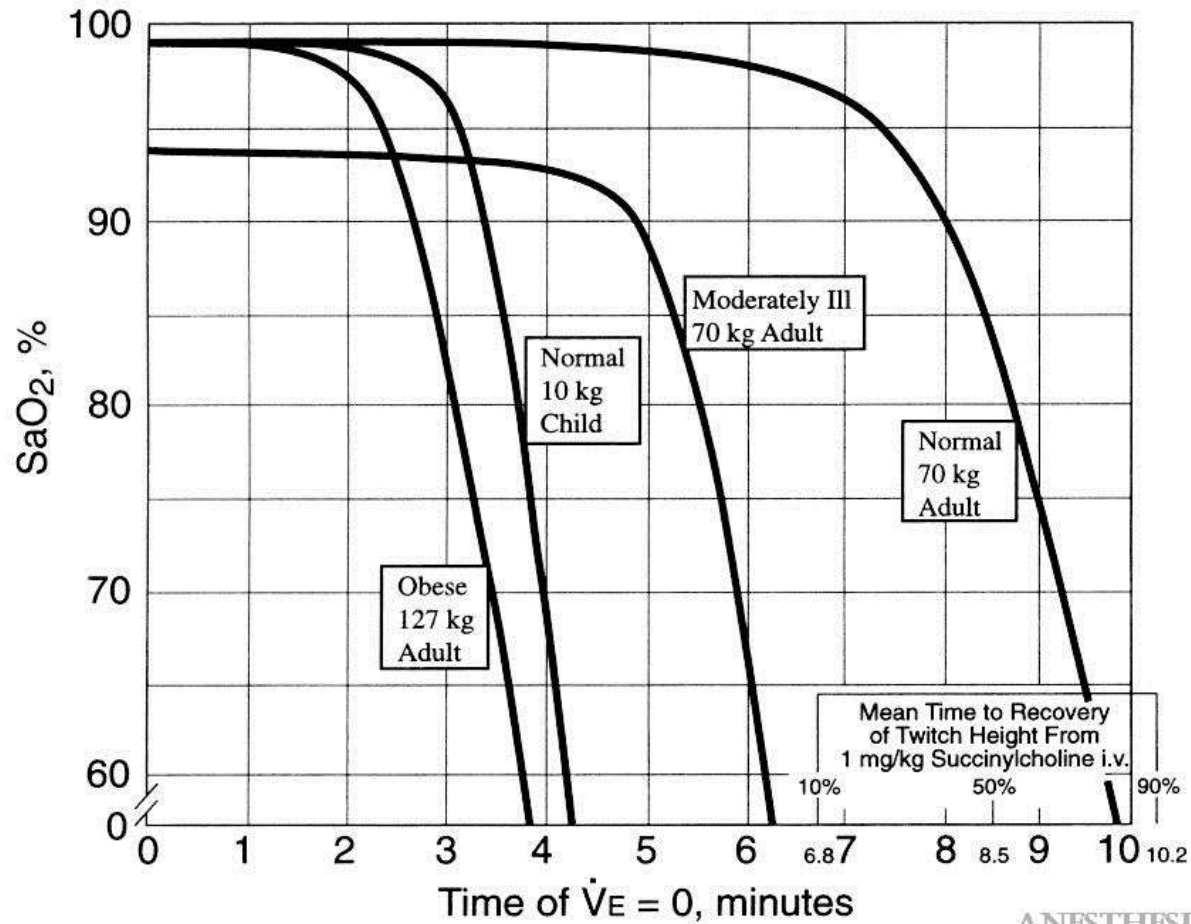
Crosby ET, Cooper RM, Douglas MJ, Doyle DJ, Hung OR, Labrecque P, et al.

The unanticipated difficult airway with recommendations for management. *Can J Anaesth* 1998;45:757-76

Heuer JF, Barwing TA, Barwing J, Russo SG, Bleckmann E, Quintel M, et al. Incidence of difficult intubation in intensive care patients: analysis of contributing factors. *Anaesth Intensive Care*. 2012;40(1):120–7

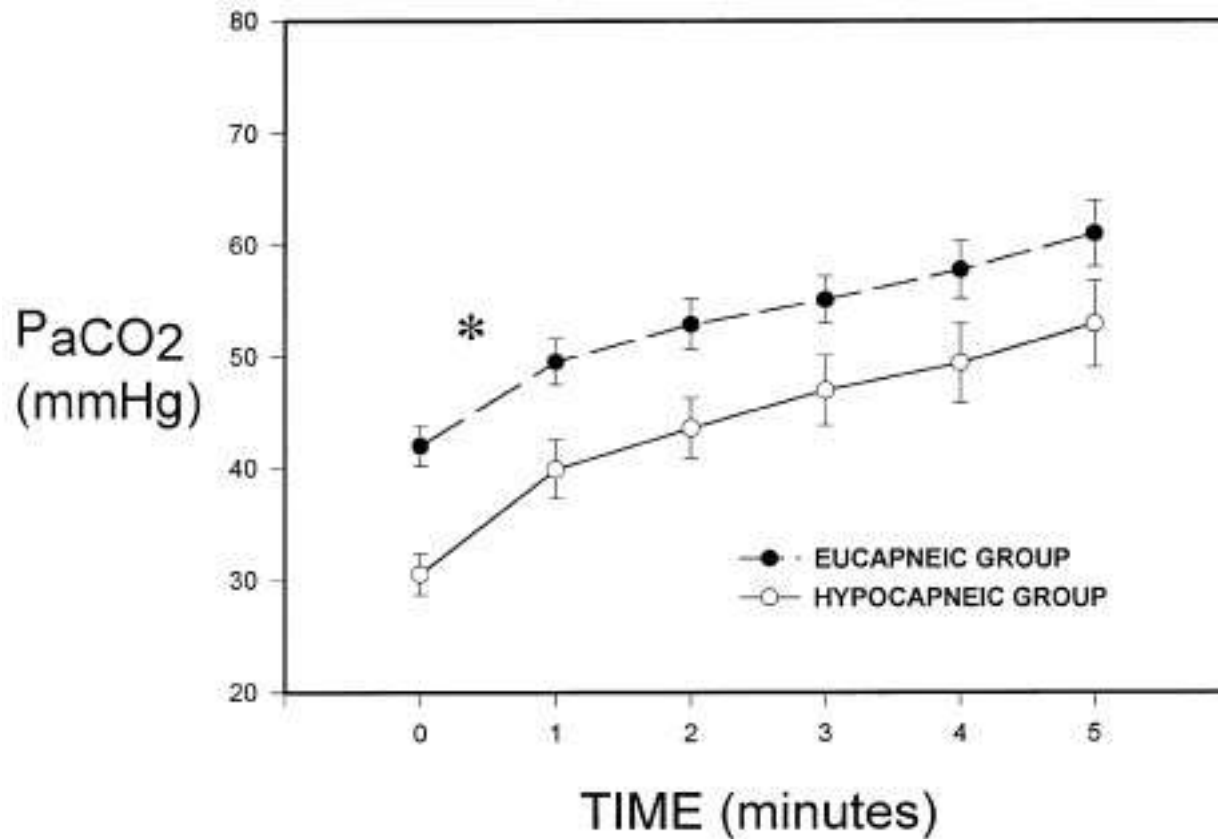
# Apnoe a oxygenace

## TIME TO HEMOGLOBIN DESATURATION WITH INITIAL $F_{A}O_2 = 0.87$



ANESTHESIOLOGY

# Apnoe a hyperkapnie

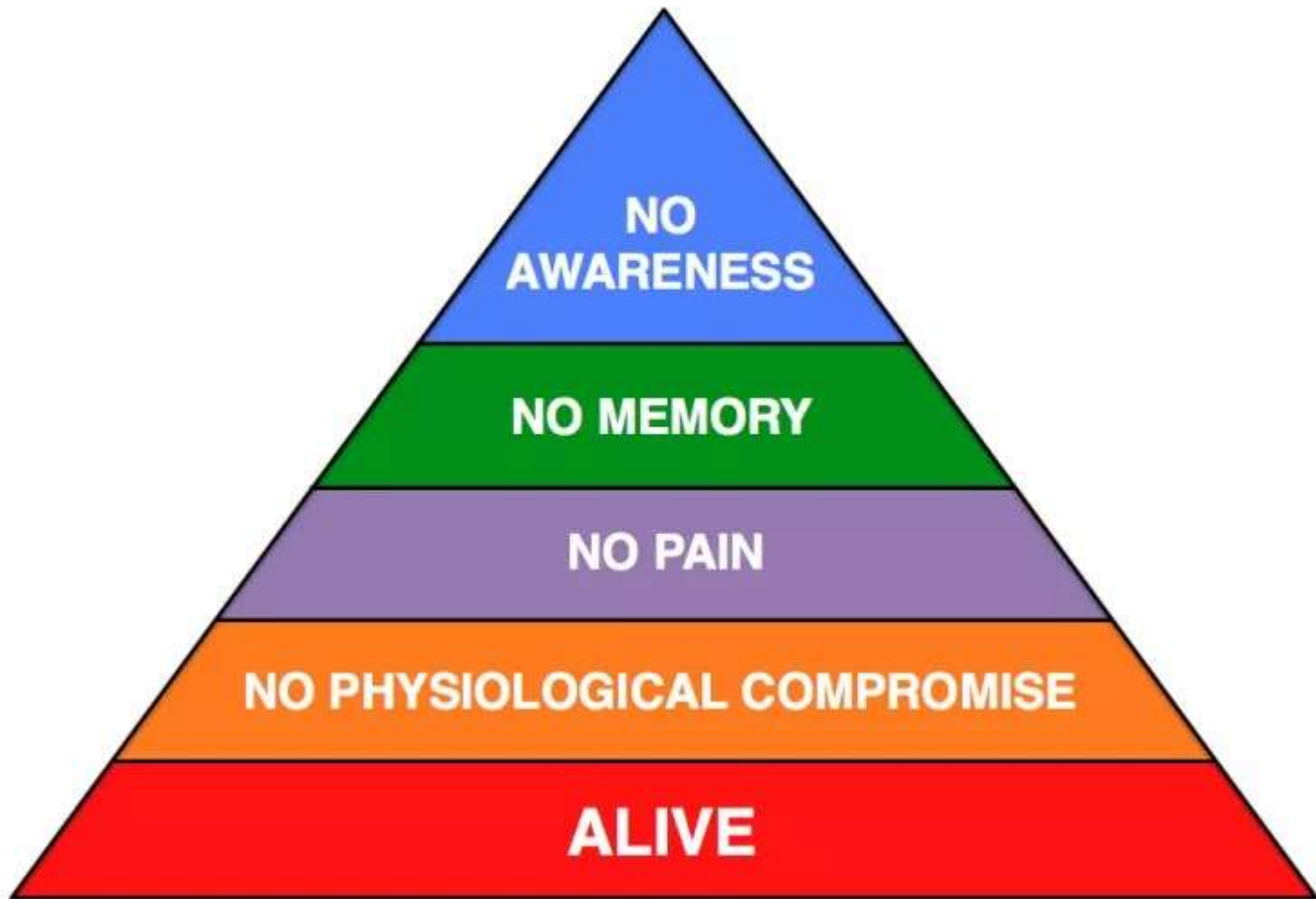




- **pečlivá volba priorit**
- pečlivé vyšetření dýchacích cest  
... odhalí některé (70% spolehlivost)
- pečlivá preoxygenace  
... získá několik minut navíc (u zdravých)
- pečlivá příprava polohy, plánu a pomůcek

# Priority (D)AM

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## Practice Guidelines for Management of the Difficult Airway

*An Updated Report by the American Society of Anesthesiologists  
Task Force on Management of the Difficult Airway*

Airway Examination Component	Nonreassuring Findings
Length of upper incisors	Relatively long
Relationship of maxillary and mandibular incisors during normal jaw closure	Prominent “overbite” (maxillary incisors anterior to mandibular incisors)
Relationship of maxillary and mandibular incisors during voluntary protrusion of mandible	Patient cannot bring mandibular incisors anterior to (in front of) maxillary incisors
Interincisor distance	Less than 3 cm
Visibility of uvula	Not visible when tongue is protruded with patient in sitting position (e.g., Mallampati class >2)
Shape of palate	Highly arched or very narrow
Compliance of mandibular space	Stiff, indurated, occupied by mass, or nonresilient
Thyromental distance	Less than three ordinary finger breadths
Length of neck	Short
Thickness of neck	Thick
Range of motion of head and neck	Patient cannot touch tip of chin to chest or cannot extend neck

This table displays some findings of the airway physical examination that may suggest the presence of a difficult intubation. The decision to examine some or all of the airway components shown on this table is dependent on the clinical context and judgment of the practitioner. The table is not intended as a mandatory or exhaustive list of the components of an airway examination. The order of presentation in this table follows the “line of sight” that occurs during conventional oral laryngoscopy.

# Otevření úst

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# Chrup

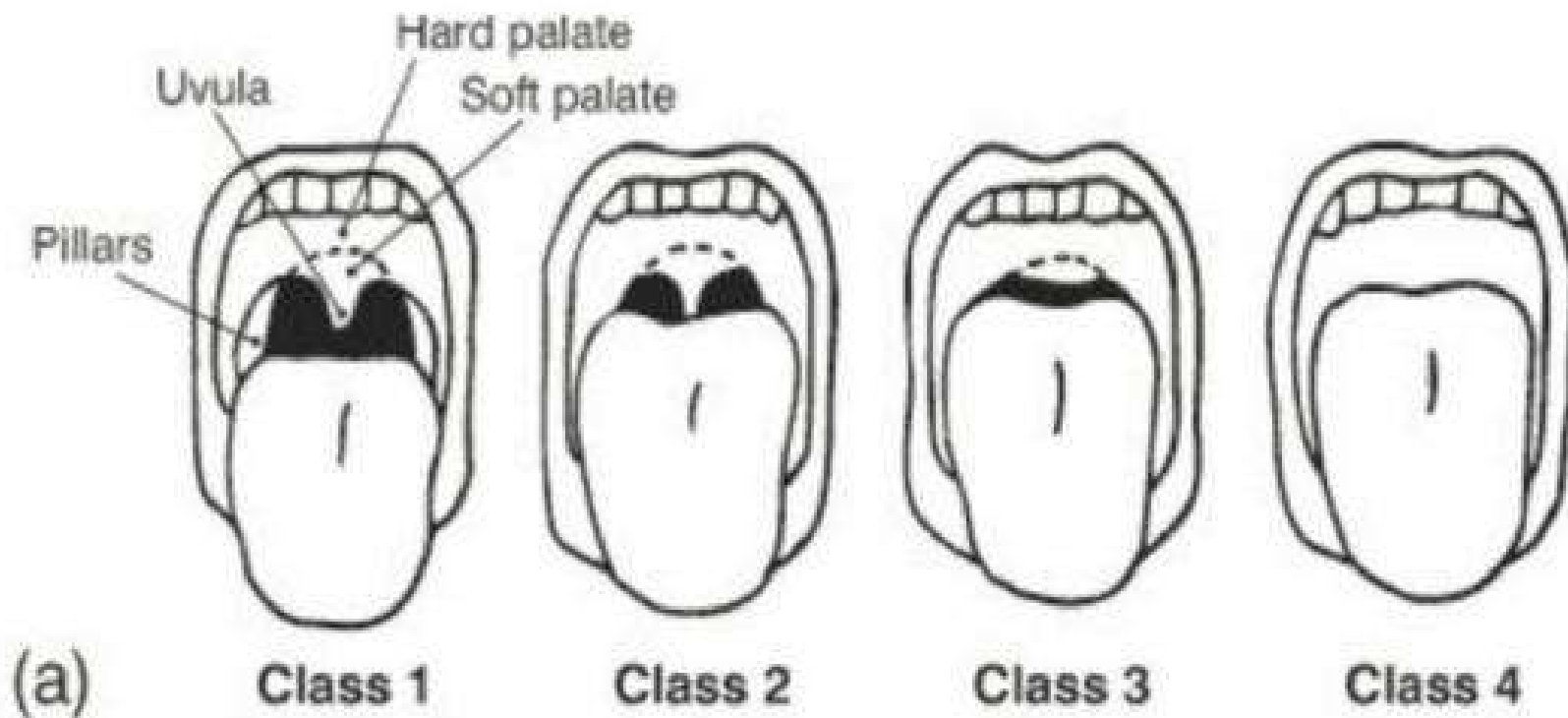
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# Patro



# Mallanpati



# Mobilita C páteře

## Neck Mobility:

With patient sitting upright, place one index finger on the patient's chin and one index finger on the occipital bone. Ask the patient to completely extend the head on the neck. The finger on the chin is (CM= cervical mobility):



- Higher than the one on the occipital bone  
**CM normal (Grade 1)**
- Same level  
**CM some limitation (Grade 2)**
- Lower than the one on the occipital bone  
**CM moderate/severe limitation (Grade 3)**

# Vyšetření krku



## OA: plastika patra aa, ...







# Pečlivě

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# Preoxygenace za spont. ventilace



- obličejovou maskou
  - maskou 3 minuty s průtokem 10 l/min O<sub>2</sub>
  - 8 hlubokých vdechů během minuty s těsnící obličejovou maskou
  - NIV

$$PAO_2 = P_iO_2 - [PACO_2/R]$$

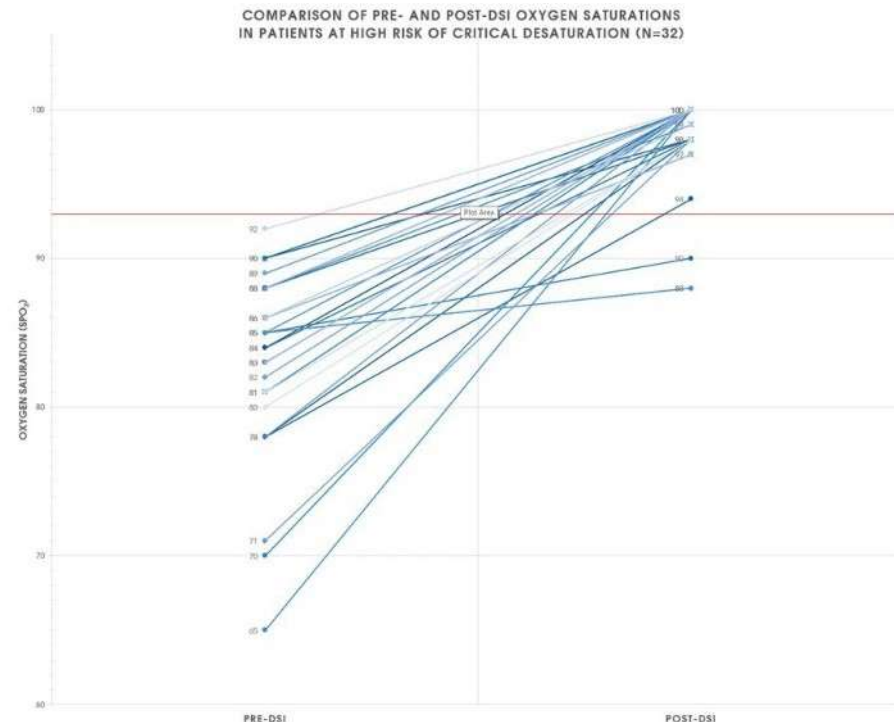
Vzduch: 21% O<sub>2</sub>

$$PAO_2 = 0.21 \times (101.3 - 6.7) - 5.3/0.8 = 13.2 \text{ kPa}$$

**100% O<sub>2</sub>:**

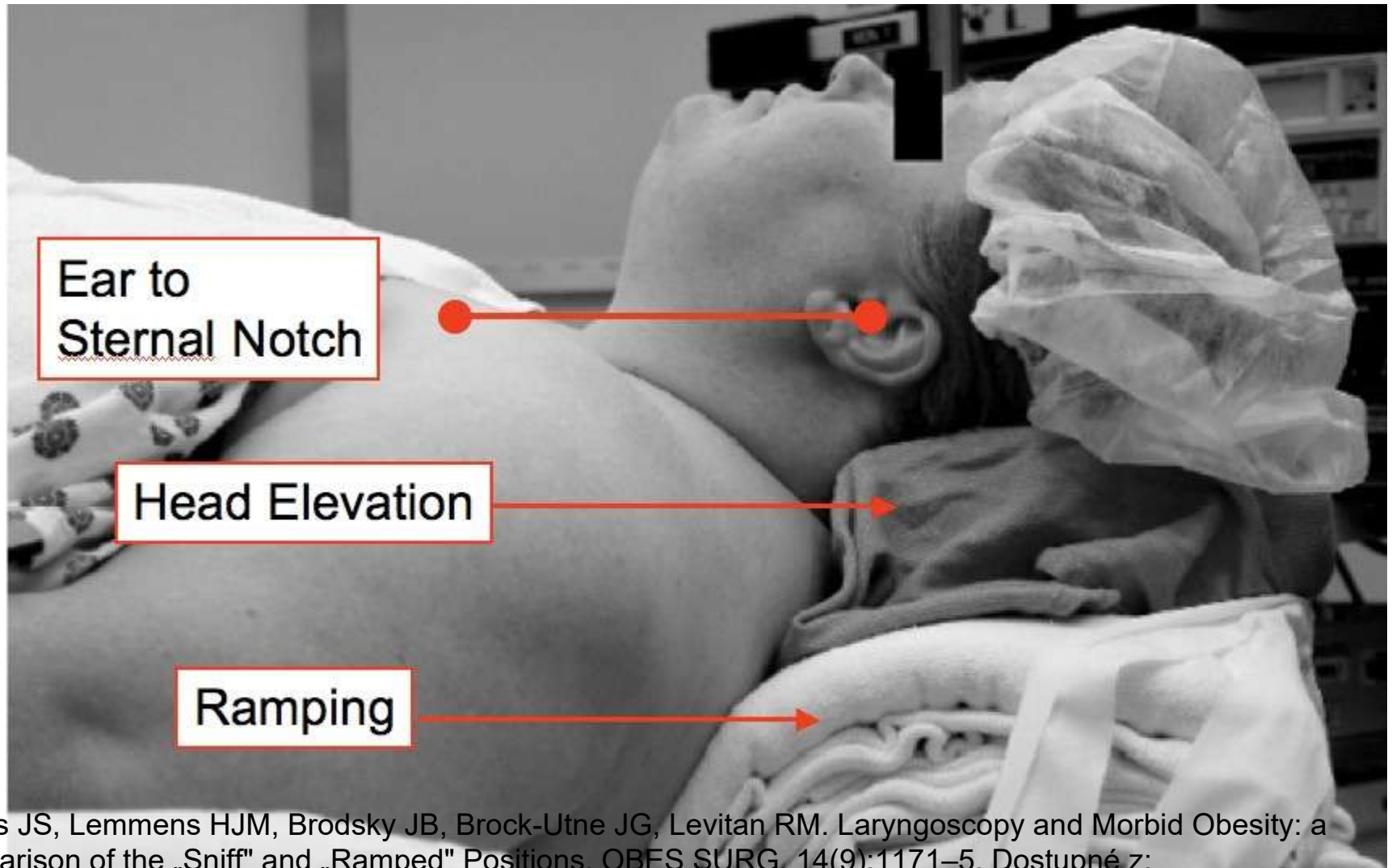
$$PAO_2 = (101.3 - 6.7) - [5.3/0.8] = 88 \text{ kPa}$$

Kde? ... FRC ... až 1800 ml O<sub>2</sub>  
= 7 minut spotřeby



- pečlivá volba priorit
- pečlivé vyšetření dýchacích cest  
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- **pečlivá příprava polohy, plánu a pomůcek**

# Polohování před intubací



Collins JS, Lemmens HJM, Brodsky JB, Brock-Utne JG, Levitan RM. Laryngoscopy and Morbid Obesity: a Comparison of the „Sniff” and „Ramped” Positions. OBES SURG. 14(9):1171–5. Dostupné z:

## DIFFICULT AIRWAY ALGORITHM

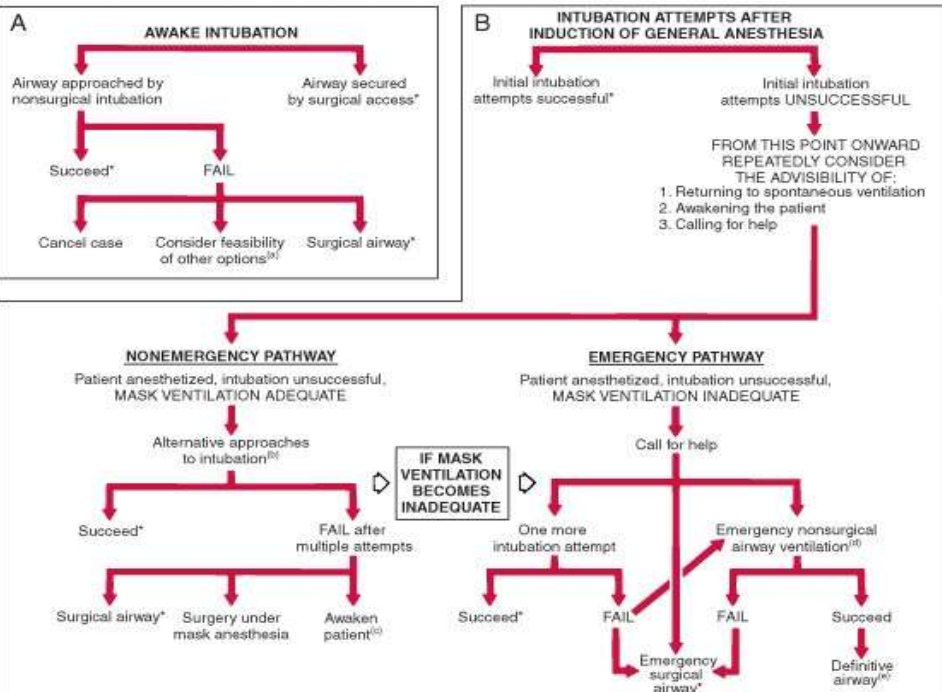
### 1. Assess the likelihood and clinical impact of basic management problems:

- Difficult intubation
- Difficult ventilation
- Difficulty with patient cooperation or consent

### 2. Consider the relative merits and feasibility of management choices:

- |   |  |      |   |
|---|--|------|---|
| A | Nonsurgical technique for initial approach to intubation | -VS- | Nonsurgical technique for initial approach to intubation  |
| B | Awake intubation   | -VS- | Intubation attempts after induction of general anesthesia |
| C | Preservation of spontaneous ventilation                  | -VS- | Ablation of spontaneous ventilation                       |

### 3. Develop primary and alternative strategies:



\* CONFIRM INTUBATION WITH EXHALED CO<sub>2</sub>

(a) Other options include, but are not limited to: surgery under mask anesthesia, surgery under local anesthesia infiltration or regional nerve blockade, or intubation attempts after induction of general anesthesia.

(b) Alternate approaches to difficult intubation include, but are not limited to: use of different laryngoscope blades, awake intubation, blind oral or nasal intubation, fiberoptic intubation, intubating stylet or tube changer, light wand, retrograde intubation, and surgical airway access.

(c) See awake intubation.

(d) Options for emergency nonsurgical airway ventilation include, but are not limited to: transtracheal jet ventilation, laryngeal mask ventilation, or esophageal-tracheal combitube ventilation.

(e) Options for establishing a definitive airway include, but are not limited to: returning to awake state with spontaneous ventilation, tracheotomy, or endotracheal intubation.

### 1. Assess the likelihood and clinical impact of basic management problems:

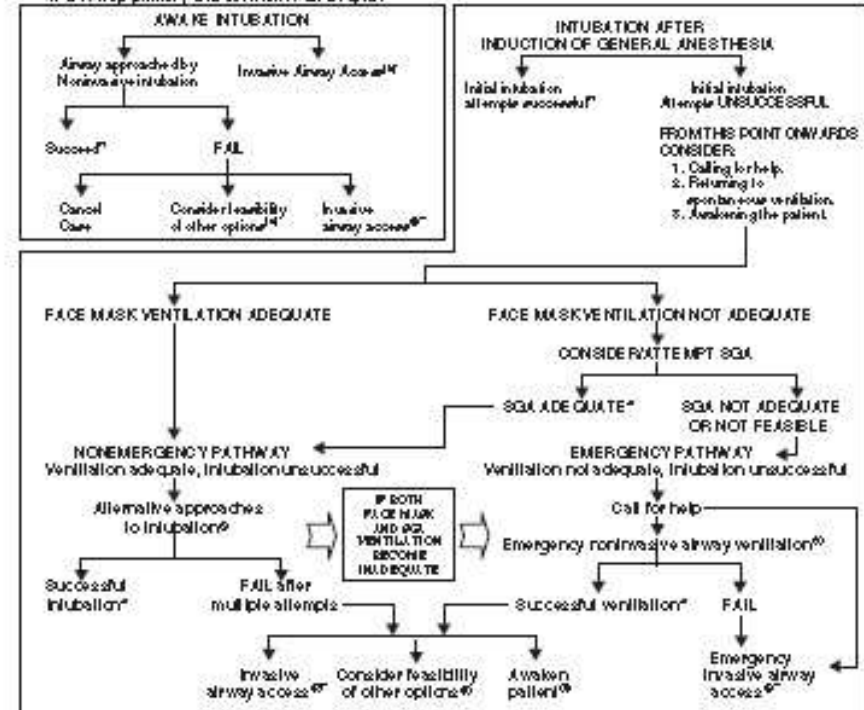
- Difficulty with patient cooperation or consent
- Difficult mask ventilation
- Difficult supraglottic airway placement
- Difficult laryngoscopy
- Difficult intubation
- Difficult surgical airway access

### 2. Actively pursue opportunities to deliver supplemental oxygen throughout the process of difficult airway management.

### 3. Consider the relative merits and feasibility of basic management choices:

- Awake intubation vs. intubation after induction of general anesthesia
- Non-invasive technique vs. invasive techniques for the initial approach to intubation
- Video-assisted laryngoscopy as an initial approach to intubation
- Preservation vs. ablation of spontaneous ventilation

### 4. Develop primary and alternative strategies:



<sup>(a)</sup> Confirm ventilation, tracheal intubation, or SGA placement with exhaled CO<sub>2</sub>.

<sup>(b)</sup> Other options include (but are not limited to) surgery utilizing face mask or supraglottic airway (SGA) in awake state (e.g., LMA, iLMA, laryngeal tube), local anesthetic infiltration or regional nerve blockade. Pursuit of these options usually implies that mask ventilation will not be problematic. Therefore, these options may be of little value if this step in the algorithm has been reached via the Emergency Pathway.

<sup>(c)</sup> Alternate approaches to difficult intubation include, but are not limited to: video-assisted laryngoscopy, alternative laryngoscope blades, SGA (e.g., LMA or iLMA) as an intubation conduit (with or without fiberoptic guidance), fiberoptic intubation, intubating stylet or tube changer, light wand, and blind oral or nasal intubation.

<sup>(d)</sup> Consider re-positioning of the patient for awake intubation or canceling surgery.

<sup>(e)</sup> Emergency non-invasive airway ventilation consists of a SGA.

Fig. 1. Difficult Airway Algorithm.

# DAS 2004 → 2015

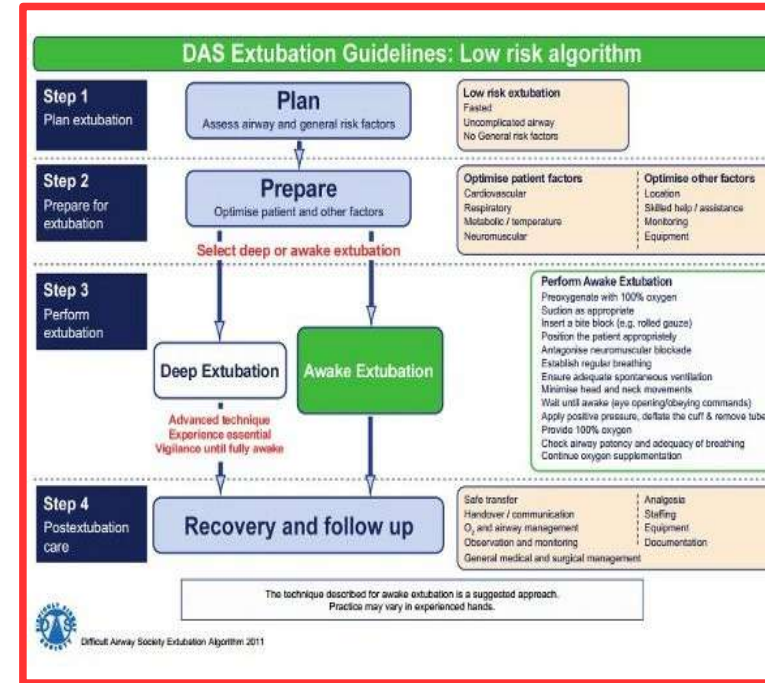
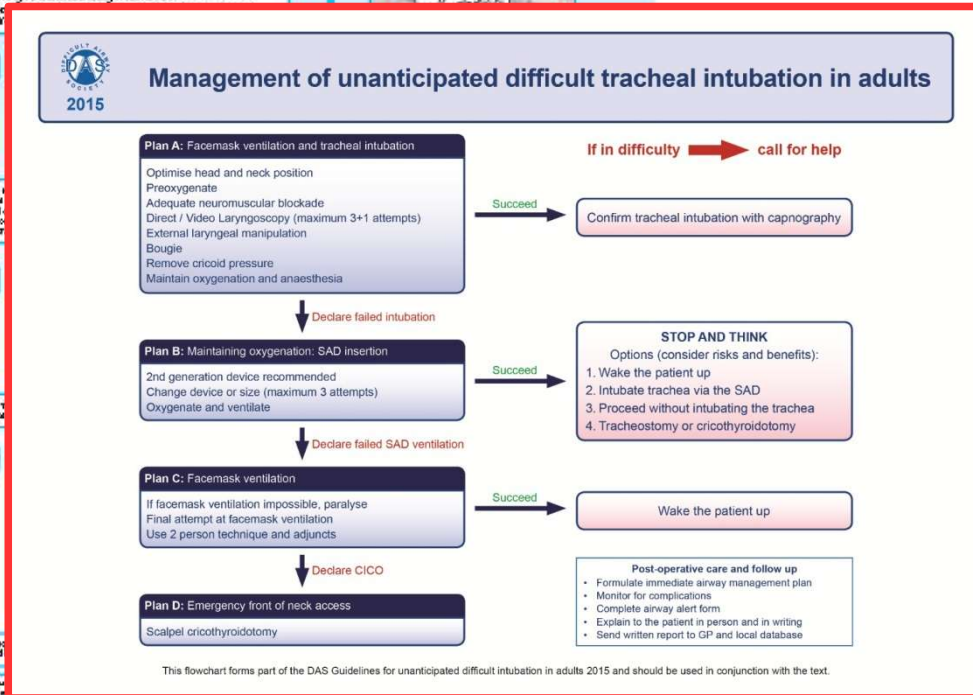
Direct laryngoscopy → Any problems → Call for help

### FIBRE OPTIC GUIDED TRACHEAL INTUBATION THROUGH SUPRAGLOTTIC AIRWAY DEVICE (SAD) USING Aintree INTUBATION CATHETER

Please ensure the SAD is in place; give 100% oxygen; confirm adequate sedation/anaesthesia, ventilation & paralysis

**Aintree catheter**

- mean length 30cm or higher
- diameter 2.8mm or higher, 4.5mm inner diameter
- easily pushed did not allow any possibility for dislodging the scope
- thick frame to resist cord kinking & strain
- flexible enough for loading on endotracheal tube
- stiff enough to stabilise the endotracheal tube
- cone
- vent



THE



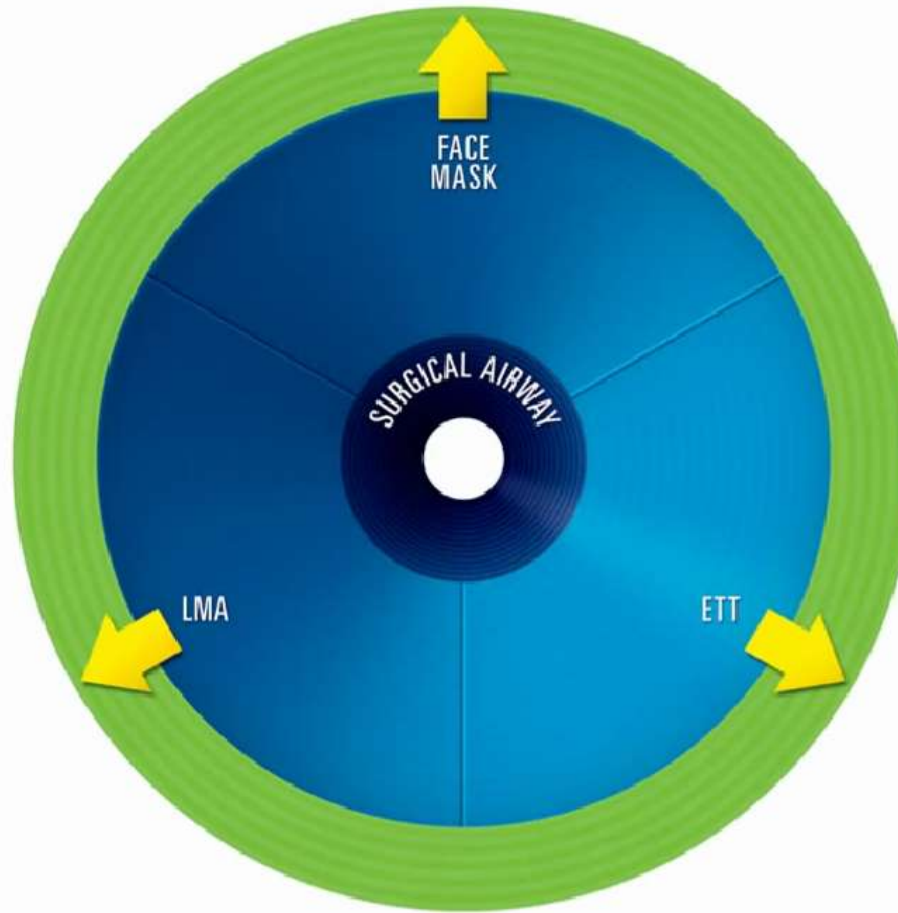
Vír

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# Oxygenace a ventilace = bezpečná zóna





# Na 2. pokus něco změní



## VORTEX OPTIMISATION STRATEGIES

	FACE MASK	LARYNGEAL MASK AIRWAY	ENDOTRACHEAL TUBE
<b>1. Manipulation</b> Head & Neck	Sniffing Position/Jaw Thrust/Bed Height		
	Dentures In		Dentures Out
Larynx	Laryngeal Manipulation (incl. ease cricoid)		
Device	2 hands	Twist Cuff Inflation	Rotate
<b>2. Adjuncts</b>	OPA NPA	Introducer Bougie Laryngoscope	Stylette Bougie Magill Forceps
<b>3. Size/Type</b>	FM	LMA	Blade/Handle/VL ETT
<b>4. Suction</b>			
<b>5. Pharyngeal Muscle Tone</b>	Prospect of recovery: consider reverse BZD's, opioids, NMBD's GZ or No prospect recovery: consider adequacy anaesthesia/m. relaxation		



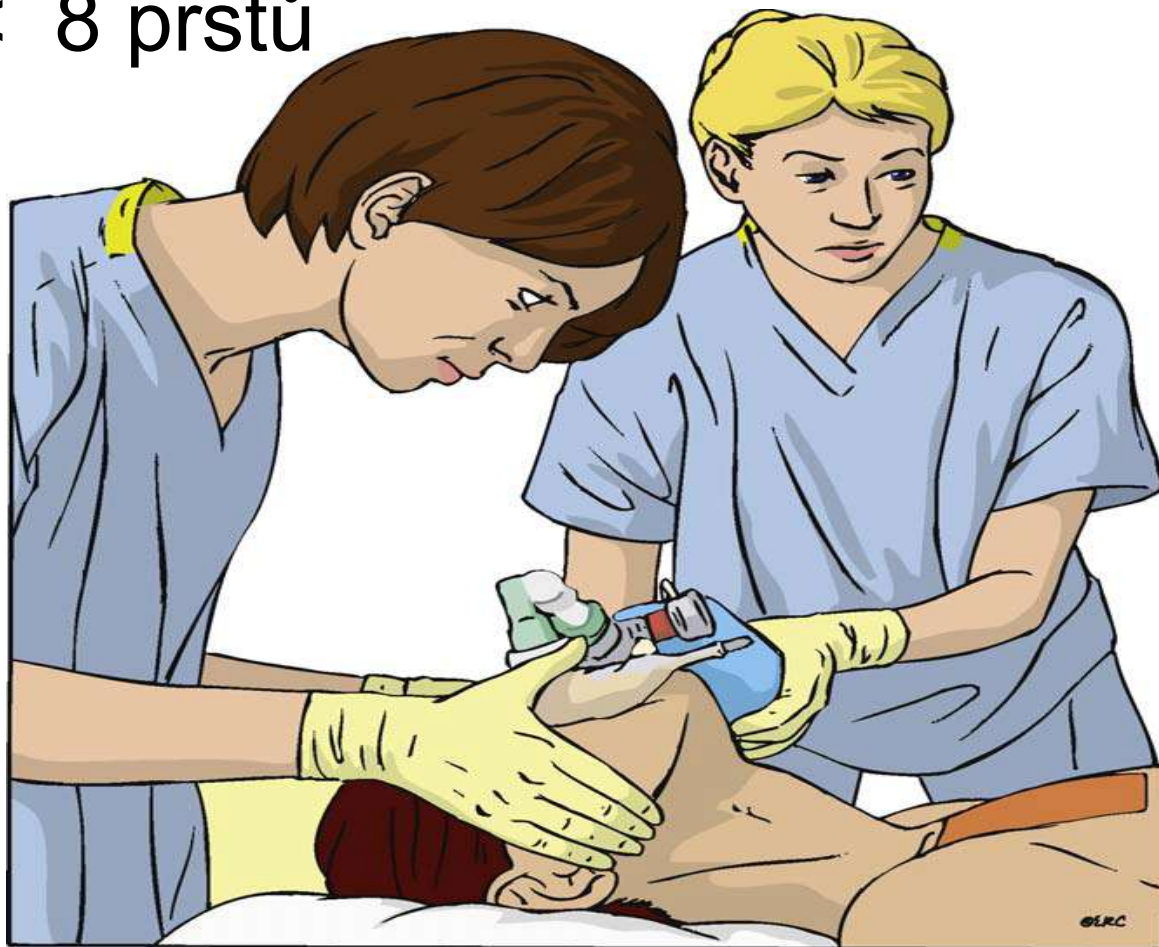
# Úspěšná ventilace obličejovou maskou

- správná velikost masky #1..#5
- správná poloha hlavy
  - záklon
  - trojhmat
  - při jejich selhání ústní vzduchovod, mírná rotace hlavy
- správná technika ventilace
  - obličej zvedám do masky
  - sleduji tlaky v d. cestách (<10, <<20cm H<sub>2</sub>O)
  - sleduji výdech pacienta, EtCO<sub>2</sub>



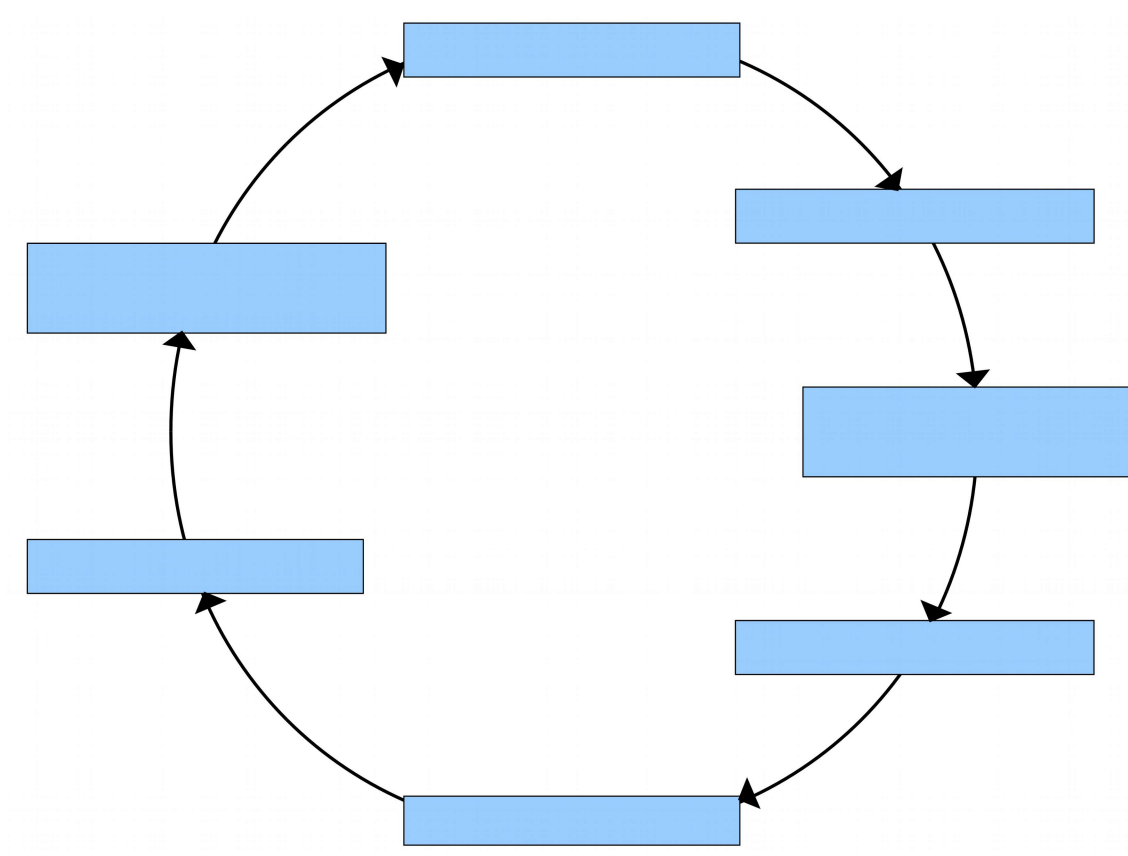
# Ventilace obličejovou maskou

3 prsty << 8 prstů





# Selhání ventilace obličejovou maskou



**Nach Wenzel et al., Resuscitation 1998; 38: 113-8**

# Krize?

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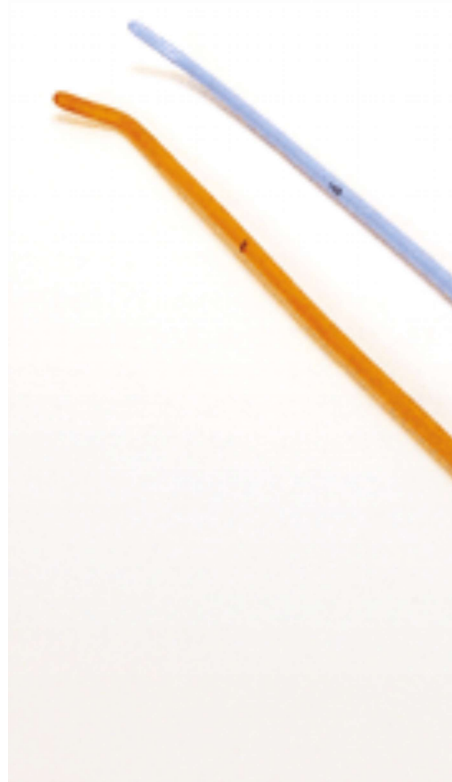
- Rozpoznat problém
- Volat o pomoc
- Mít plán

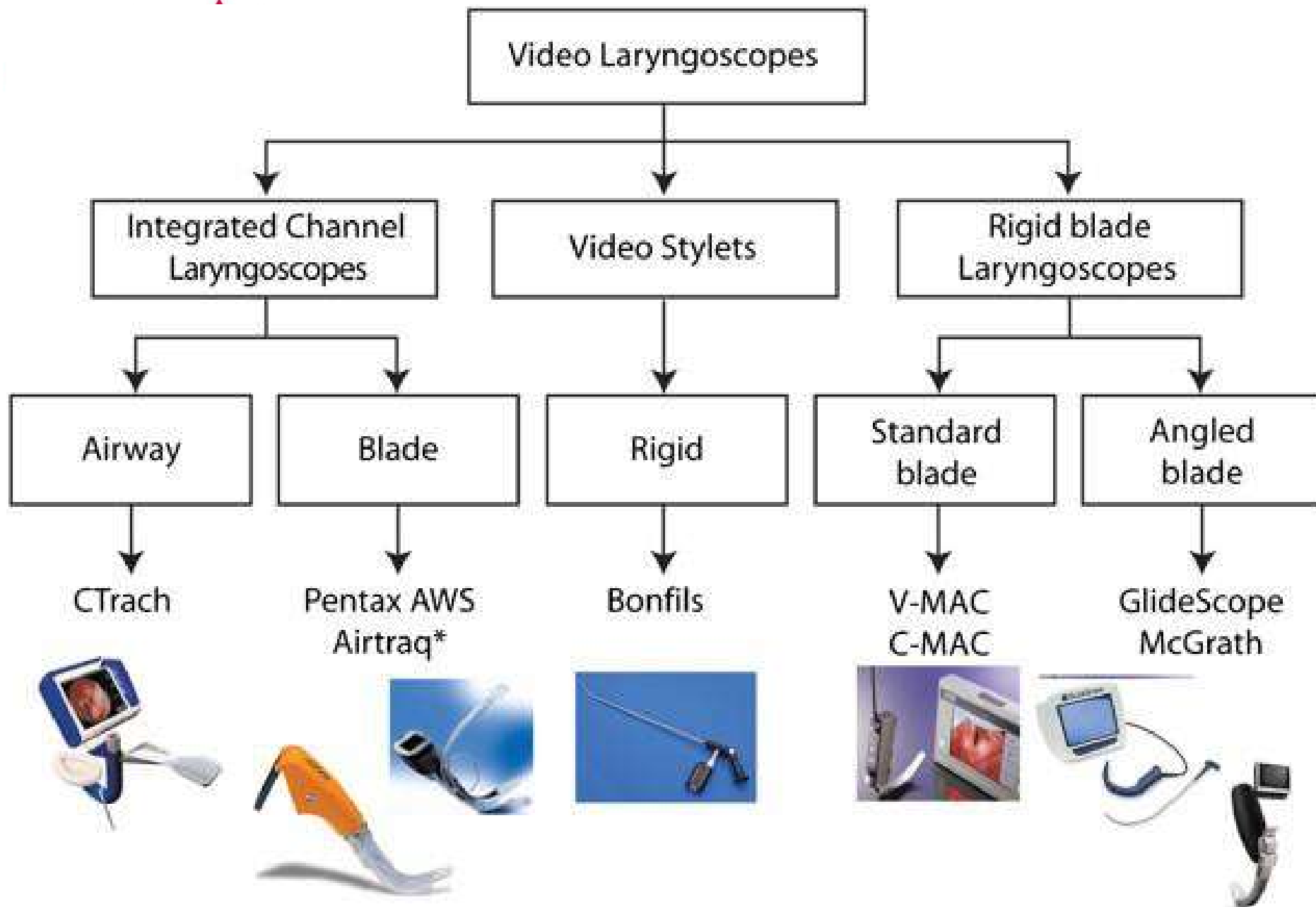
# Jen 3 +1 cesty



# Bužie, BURP

Co ještě můžu zlepšit?







# VLS GlideScope®

- zavádění – **střední čarou**  
– uvula – kořen jazyka – epiglotis – glotis
- zavaděč v tracheální rource „J“



# Severní polokoule larynx v horní části obrazovky

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# VLS: Samá pozitivita ?

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## Závěry studií:

- lepší vizualizace glotis
- vyšší úspěch v zajištění difficult airways
- rychlejší učení nováčků
- dobrá spolupráce intubujícího týmu (všichni vidí)



## VLS: I negativa !

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- falešný pocit jistoty ...
- poranění v d.ústní (manipulace bez optické kontroly)
- krev a sekrety na optice znemožní vidění
- Magillovy kleště nejsou kompatibilní se zahnutím lžice



## Závěr 1:

---

**Vyšetřit** všechny = odhalit některé (70% spolehlivost)

**Preoxygenovat** všechny = získat několik minut navíc

Předvídej nemožnost ventilace / intubace

Měj **plán dřív než** vznikne **problém**.

Připrav všechny **pomůcky včas**.

Vizualizace glotis **při vědomí není v anestezii** garantována

Vizualizace glotis **včera není dnes** garantována

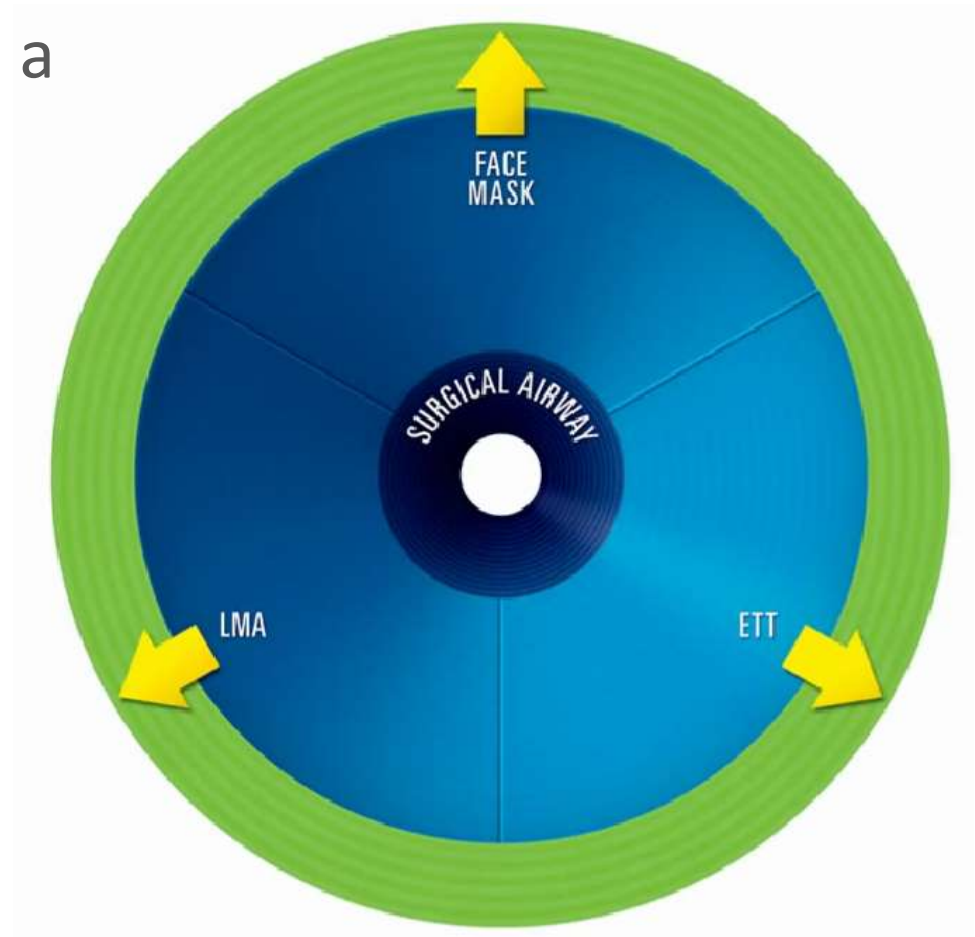
### Videolaryngoskopie

- „per se“ nezajišťuje oxygenaci ani ventilaci.
- umožňuje lepší pohled na glotis
- je vhodnou alternativou přímé laryngoskopie za dobré oxygenace a ventilace pacienta
- je vhodná k výuce nováčků  
(učí se pak přímou laryngoskopií rychleji)

## Závěr 3:

Způsoby zajištění ventilace a oxygenace:

- 3 nechirurgické
- 1 chirurgická



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# Děkuji za pozornost!

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[www.fnusa.cz](http://www.fnusa.cz)







- <http://vortexapproach.org/>
- <http://www.das.uk.com/>
- <https://doi.org/10.1093/bja/aev460>
- Practice Guidelines for Management of the Difficult Airway: An updated report by the American Society of Anesthesiologists Task Force on management of the difficult airway. *Anesthesiology* 118:251-70, 2013.  
doi:10.1097/ALN.0b013e31827773b2  
<http://anesthesiology.pubs.asahq.org/article.aspx?articleid=1918684>