



Rapid Sequence Intubation

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- ▶ 50 odd, male, fall off 10 foot ladder onto head. Laceration left frontal area
- ▶ Witnessed LOC at scene ?how long
- ▶ In A&E GCS 13-14/15, (E4V4M5-6) then has a generalised tonic clonic fit while head being sutured
- ▶ Post ictal, restless, agitated and impossible to manage, even with 3 security gaurds and Julia sitting on him. Can't do obs, won't keep oxygen on.

What are the issues to consider?

How are we going to manage him?

Introduction

- ▶ Originally anaesthetic technique for theatre
- ▶ Now advanced airway management tool
- ▶ Used in critical care prior to ICU
- ▶ Endotracheal tube with cuff inflated and in correct position is the 'Gold Standard' in airway management

Introduction

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Introduction

- ▶ RSI technique to safely and rapidly achieve this airway
- ▶ Can go horribly wrong, operator MUST have appropriate experience and training and failed drill
- ▶ Need to think about when NOT to (i.e. is ICU appropriate). Consider age and pre-morbid function, treatability of condition, prognosis, underlying diagnosis eg CCF/COPD/cancer etc
- ▶ Should have done >3 months anaesthetics and passed RITA 1 (RCA). In USA >50 intubations
- ▶ Read this on Emergency Physician RSI's

Induction Drugs

Drug	Dose Reduce if elderly/ unwell/obtunded	Onset/duration	Cons	Pros
Thiopental (500mg powder)	4mg/kg.	<30s/5-10mins	Needs re-constitution, causes hypotension, apnoea, increased airway irritability (laryngospasm, bronchospasm), necrosis if extravasated	Potent anti-convulsant (barbiturate), particularly good for head injuries and status epilepticus
Propofol (1% 200mg/20ml vials & also comes in 50ml bottles)	1.5-2.5mg/kg	20-40secs/2-5mins	apnoea, hypotension ++, stinging on injection (40%) can give with 1-2ml lidocaine,	rapid onset, good airway relaxation, smooth induction, no hang over, good for ongoing sedation
Etomidate (20mg/10ml vials)	0.2-0.3mg/kg	20-40secs/2-3mins	extraneous movements-may appear seizural, adrenal suppression esp. infusions, pain on injection, nausea & vomiting	good cardiovascular stability, more widespread ED use worldwide, short duration of action
Ketamine (usually with midazolam, & atropine in paed)	2-4mg/kg	30-60secs/10-15mins	Emergence (esp adults), movement, secretions, raised ICP/ocular pressure, vomiting, increased myocardial O ₂ demand	maintains airway reflexes /breathing, analgesic properties, safe, difficult locations eg pre-hospital, good in hypotension, bronchodilator (in status asthmaticus), IM dose, very good for paediatric sedation
Midazolam	5-10mg	2-3mins/30-90mins	Long sedation time, no analgesia, risk, not commonly used in isolation in UK	good amnesic/anxiolytic, antidote=flumazenil, wider therapeutic margin

Paralysing Agents

Drug	Dose	Onset/duration	Cons	Pros
Suxamethonium (100mg vial in fridge)	100mg (1-1.5mg/kg)	<1min/3-5mins	hyperkalaemia (esp burns >24hrs, neuromuscular disorders), fasciculations and muscle aches, raised intraocular & intragastric pressure, bradycardia	Fastest acting agent available so faster to intubation, cheap and readily available, short duration of action
Atracurium (50mg vial in fridge)	0.5mg/kg	2-2.5mins/ reversible 20-25mins	local histamine release	Degraded by Hoffmann degradation (safer in renal/hepatic disease), non-depolarising
Rocuronium	0.6mg/kg	60-90s/30-45mins	Increase duration in severe renal/hepatic disease, expensive, not readily available, too long acting for RSI	Rapid onset and short duration, minimal cardiovascular effects, non-depolarising

Opiates and Miscellaneous

Drug	Dose	Onset/duration	Cons	Pros
Fentanyl (100mcg and 500mcg vials)	50-200mcg	1-2mins/5-20mins	Apnoea,	Reduced intracranial pressure rise with laryngoscopy, analgesic, Analgesia and sedation, good cardiovascular stability, 54p/vial
Alfentanyl (Rapifen 500mcg/ml and 5mg/ml vials)	500mcg to 50-100mcg/kg	1-2mins/10mins	Apnoea,	Analgesia and sedation,
Remifentanyl (Ultiva 1mg powder)	0.5-1mcg/kg/min	1-2mins/3-6mins	Apnoea, can't be given as a bolus	extremely short duration, needs to be infusion, Analgesia and sedation (reduce propofol infusion requirements), not liver dependant metabolism, £5.12/ vial
Meteraminol, (Aramine 10mg/1 ml vial) DILUTE to 20ml with saline	0.5-1mg doses for hypotension	1-2min/20mins	S/E Tachycardia, arrythmias	Good with thiopental/propofol to avoid hypotension on induction

Preparation: Patient

- ▶ Patient
- ▶ Assess pre-morbid medical conditions, medications, allergies etc
- ▶ Assess how rapidly all this is needed
- ▶ LEMON* score for predicted difficult airway if so, always get senior anaesthetic help
 - ▶ [L=Look externally (facial trauma, large incisors, beard or moustache, and large tongue), E=Evaluate the 3-3-2 rule (incisor distance <3 fingerbreadths; hyoid/mental distance <3 fingerbreadths; thyroid-to-floor of mouth distance <2 fingerbreadths) M=Mallampati (Mallampati score I-IV), O=Obstruction (presence of any condition that could cause an obstructed airway), N=Neck mobility (limited neck mobility)]
- ▶ Review need for RSI, is it appropriate?

*Can an airway assessment score predict difficulty at intubation in the emergency department? M J Reed, M J G Dunn, D W McKeown Emerg Med J 2005;22:99–102

Preparation: Equipment

▶ Equipment

- ▶ Suction, BVM, O_2 ,
- ▶ Laryngoscopes x 2, ETTs 2 sizes and cuffs checked, bougie
- ▶ Full monitoring including CO_2 monitor ready.
- ▶ If time allows invasive monitoring is better.

Preparation: Drugs

▶ Drugs

- ▶ Induction agent,
- ▶ suxamethonium,
- ▶ metaraminol drawn up and diluted,
- ▶ +/- opiate eg fentanyl
- ▶ post-induction paralysing agent and ongoing sedation drawn up (atracurium and propofol +/-opiate)

Preparation: Personnel

▶ Personnel

- ▶ for injecting drugs,
- ▶ intubator-appropriately trained senior anaesthetist or emergency physician
- ▶ cricoid pressure by trained operator. Not to be released until directed
- ▶ nurse to assist with equipment etc
- ▶ May need another operator for in-line stabilisation of C-spine in trauma



Process

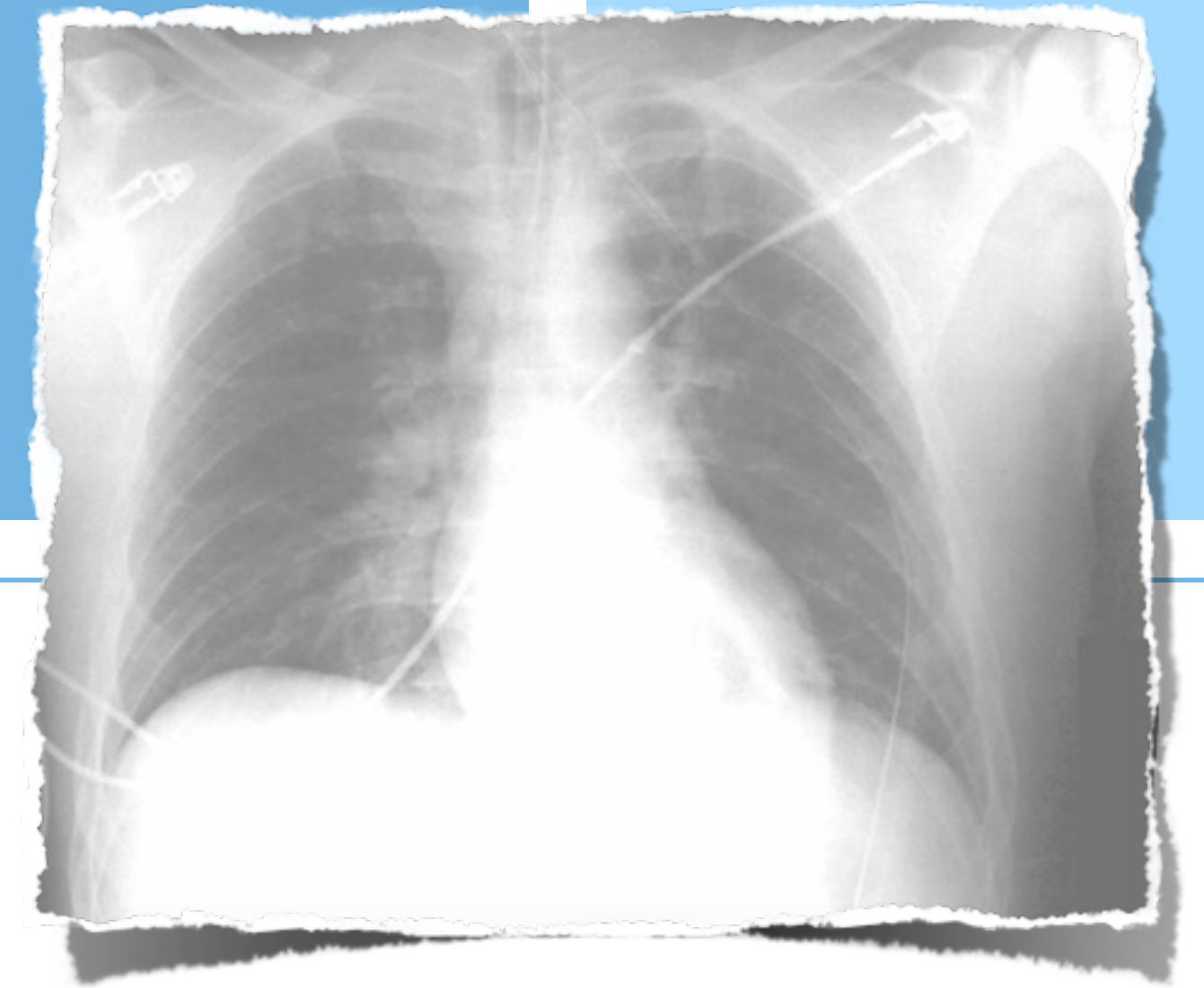
- Prepare equipment and drugs. Ensure full monitoring.
- Pre-oxygenate for 3 minutes
- Rapidly give drugs
- Apply cricoid
- Await until fasciculation passes
- Laryngoscopy/intubate <30s
- Inflate cuff
- Listen and check capnograph
- Remove cricoid,
- Tie tube & CXR
- Give Atracurium and start propofol 1% infusion at about 20ml/hr



Post-intubation Care

- ▶ **A** Check tube position (clinically, CO₂, CXR) and secure
- ▶ **B** Ventilation, eg Oxylog (MV=TVxRR: 6ml/kg x 10-15/min).
 - ▶ Check ABGs for pCO₂ levels to guide ventilatory settings
- ▶ **C** May need arterial and central lines if patient unstable or transfer likely
 - ▶ Otherwise regular BP cycle and pulse/ECG monitoring
- ▶ **D** Will need to ensure patient is adequately sedated (propofol 1% infusion, usually at about 10-20ml/hr, but lower if low BP and increase or add eg fentanyl if pulse/BP rising/lightening, so the actual figure is very variable).
 - ▶ Paralyse with Atracurium 30-50mg boluses every 3-45 minutes
 - ▶ Some tape eyes closed with Micropore

Post-intubation Care

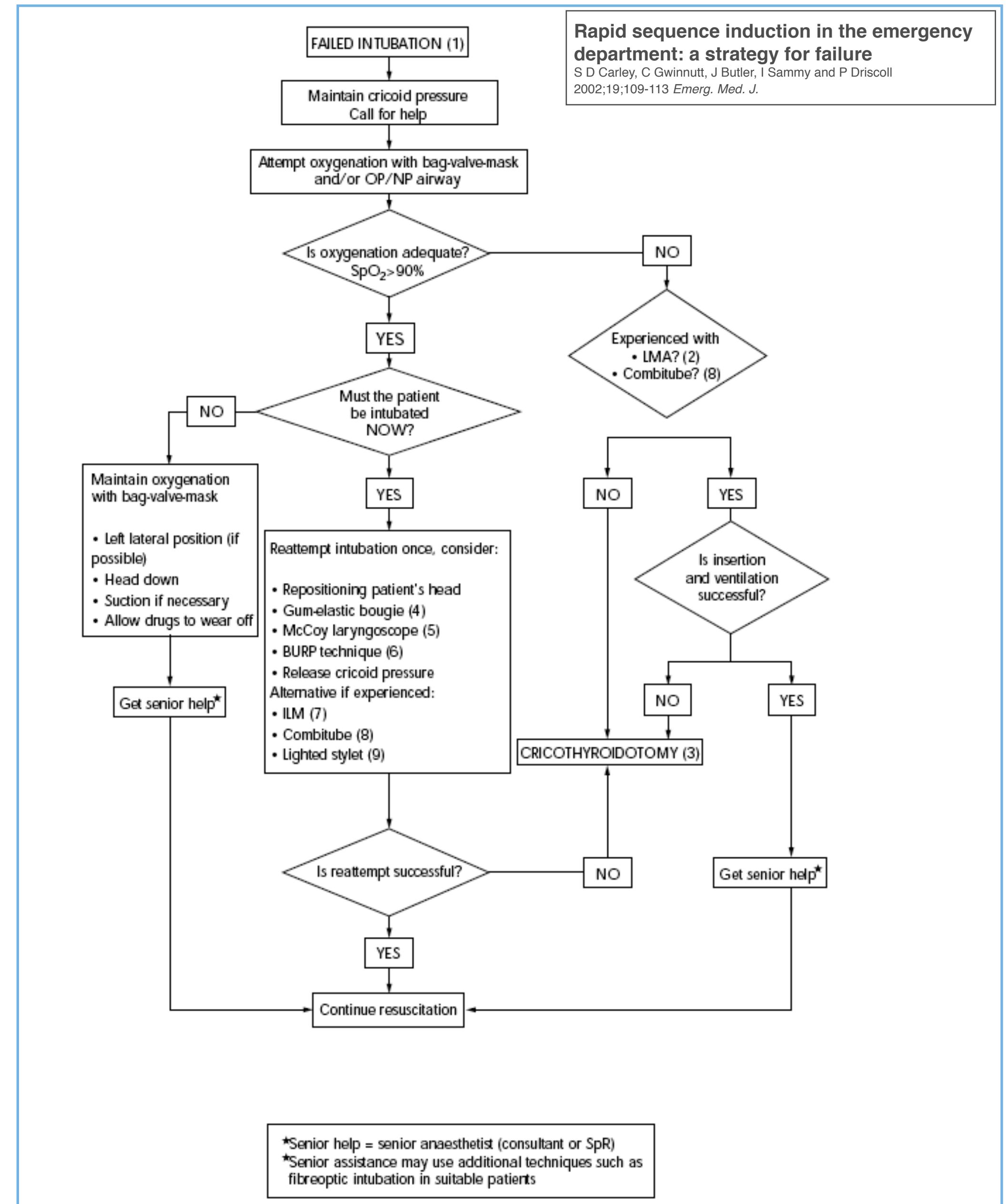


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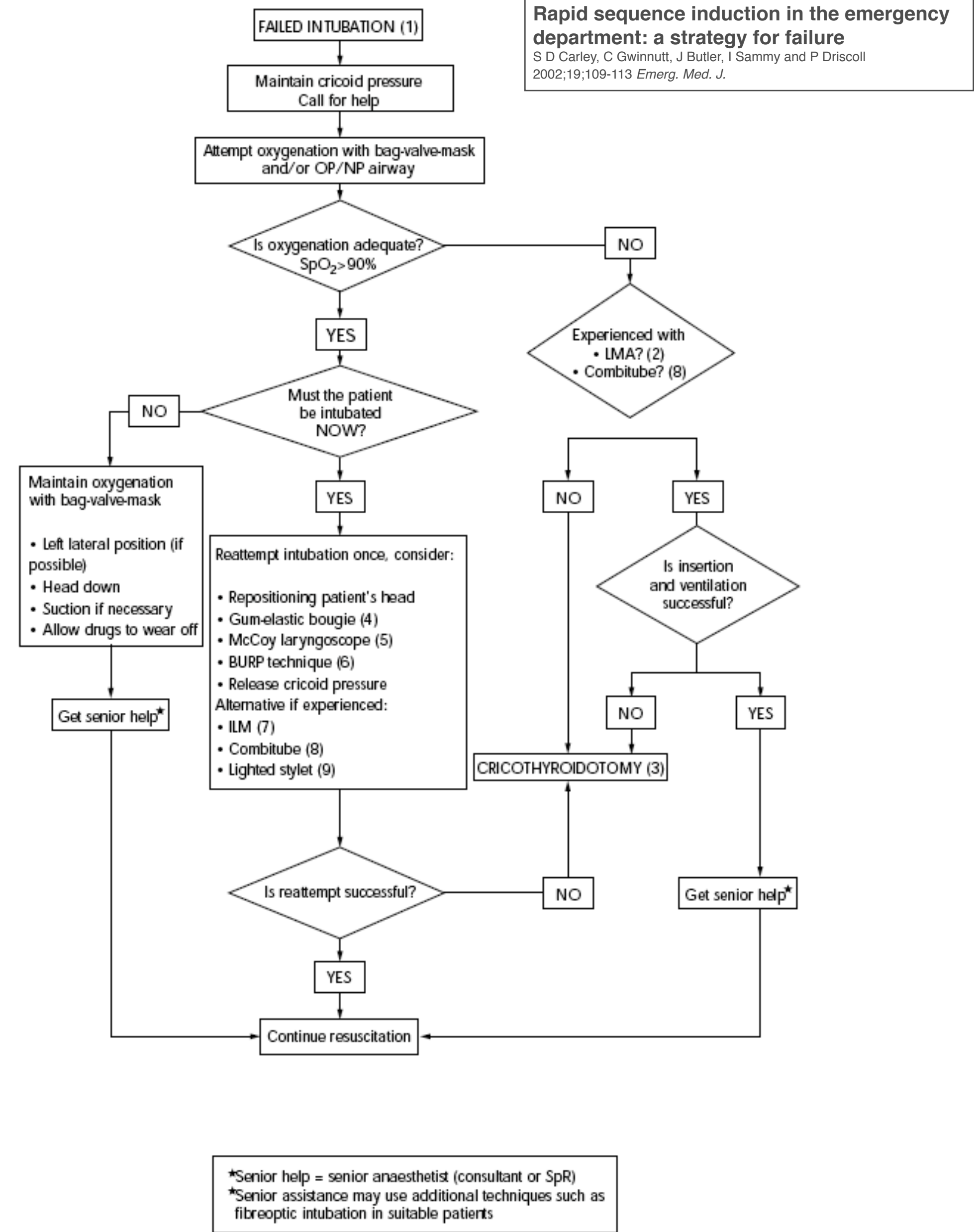
Failed Intubation drill

- ▶ Anticipate problem airways and have anaesthetic support
- ▶ Patients do not die from failure to intubate
- ▶ They die from failure to ventilate or aspiration
- ▶ If you can't intubate in 30s, ventilate and try again, usually with a bougie through the cords and railroading the ETT
- ▶ If you don't see the ETT go through the cords be very suspicious!
- ▶ If you can't intubate call for urgent senior help, head down, left lateral position and ventilate until patient wakes up and/or help arrives
- ▶ Consider McCoys laryngoscope, LMA, iLMA, lighted stylet etc
- ▶ If you cannot attain an airway/ventilate, you may need to do a cricothyrotomy-otherwise the patient may die

Failed Intubation Drill

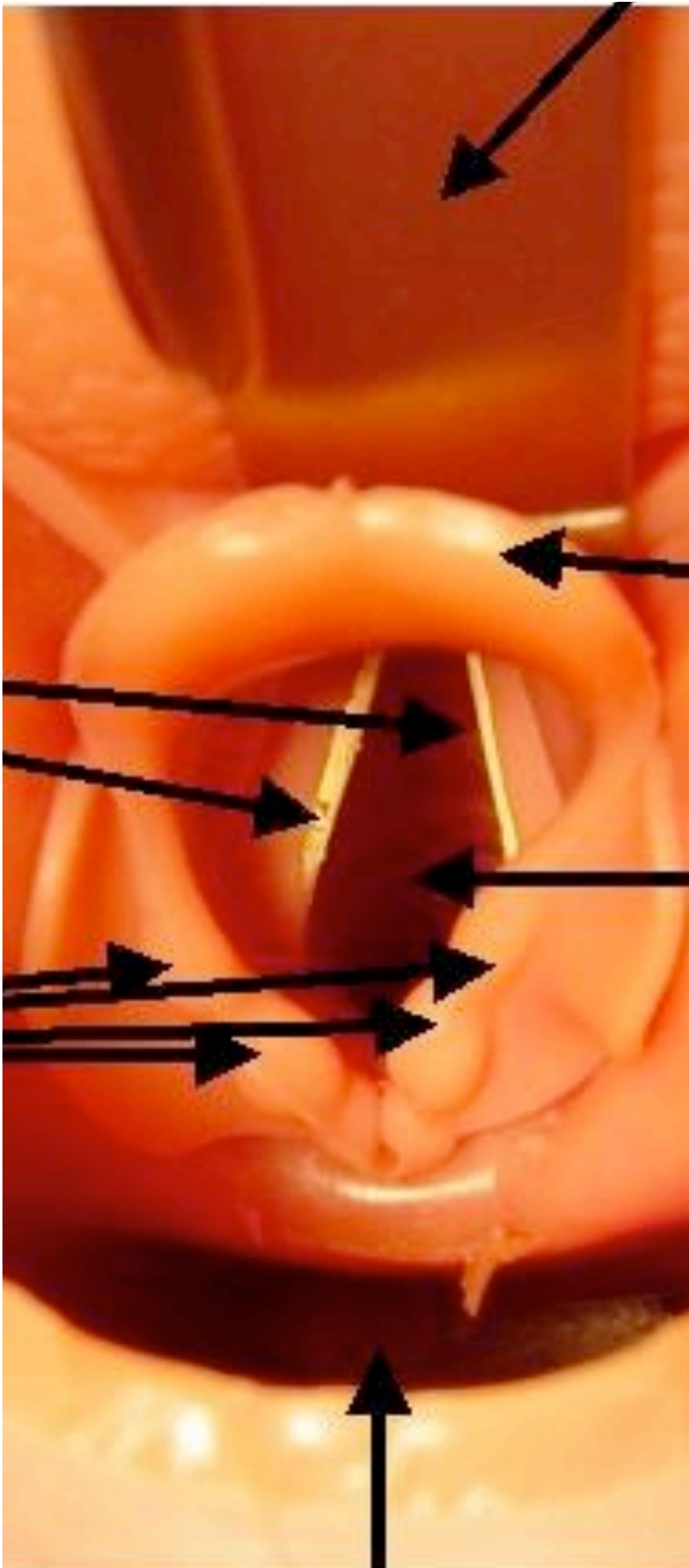
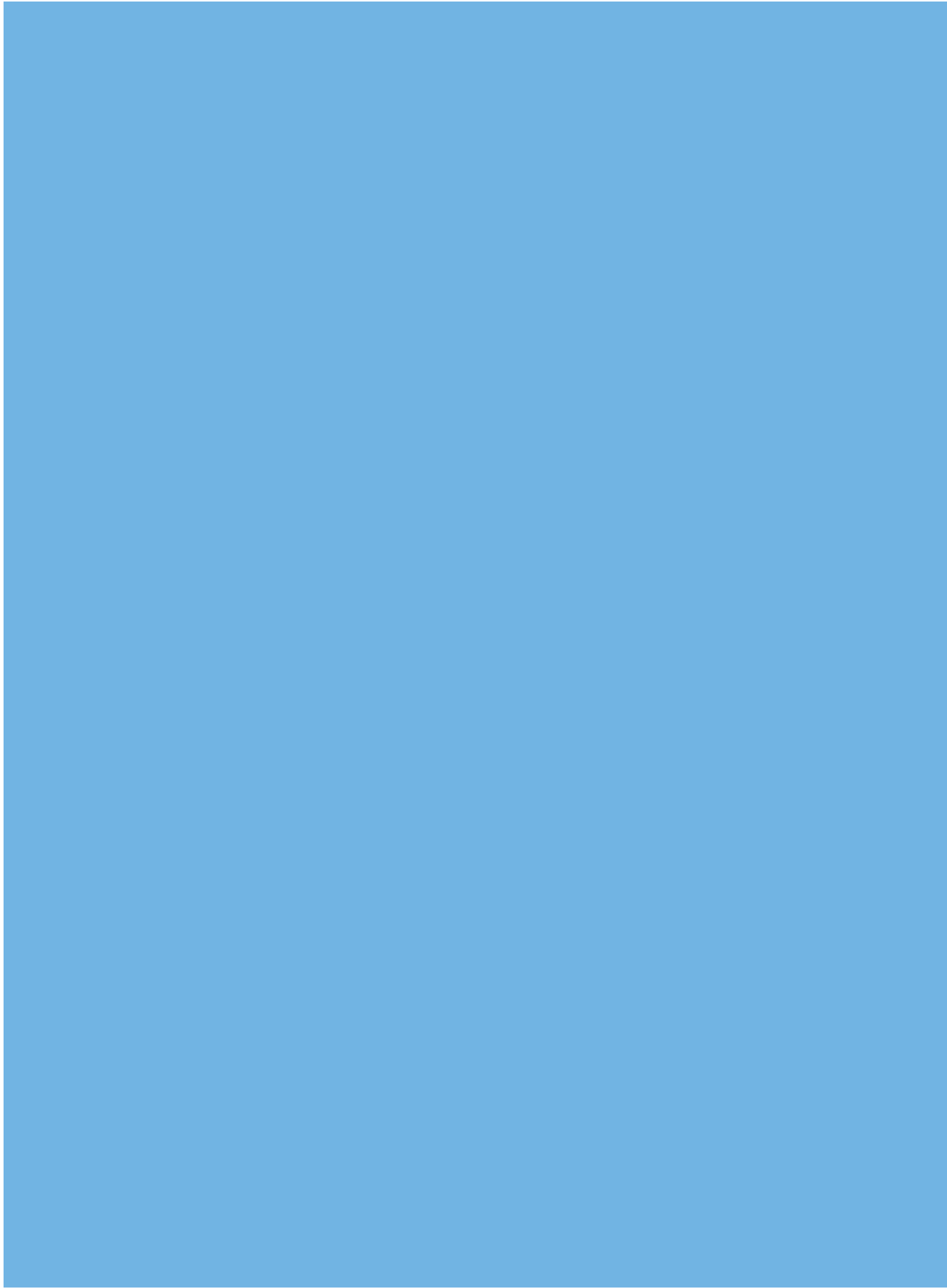


Failed Intubation Drill



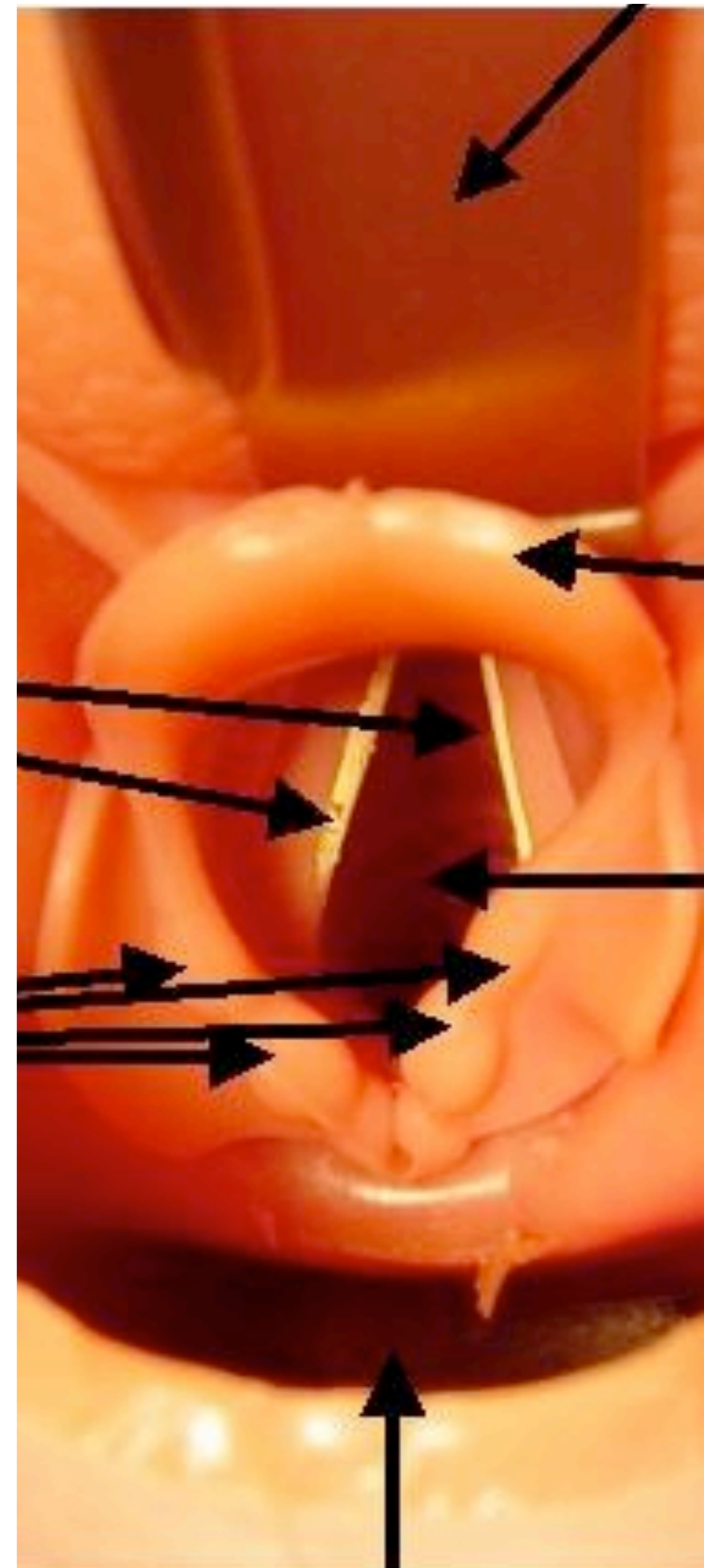
Complications

- ▶ Hypotension
- ▶ Hypoxia
- ▶ Aspiration
- ▶ Oesophageal Intubation/Main stem bronchi intubation
- ▶ Airway trauma
- ▶ Failure to intubate/ventilate
- ▶ Death from hypoxia/arrythmias
- ▶ Post-intubation awareness/vomiting
- ▶ Masseter spasm
- ▶ Laryngospasm/Bronchospasm





Questions?



Weight:

kg

Main Menu

Predictors of Difficult Intubation

Predictors of Difficult BVM & Cric

I. Preparation

II. Preoxygenation

III. Pretreatment

IV. Put to Sleep

V. Paralyze

VI. Pass the Tube

VII. Placement Verification

Calculated Drug Doses

Weight:

kg

L	Look Externally Beard, small jaw, buck teeth, craniofacial deformity, trauma
E	Evaluate Internally "3-3-2 rule" 3 fingers of jaw opening, 3 fingers mentum to hyoid, 2 fingers hyoid to thyroid
M	Mallampati Patient sitting (if possible), mouth open, tongue max protruded
O	Obstruction Look for pre-glottic obstructions-tongue enlargement, edema
N	Neck Mobility Assure ability to manipulate neck/head
S	Saturation Assure that SaO ₂ is > 85%

Mallampati Airway Classification



Class I

Class II

Class III

Class IV

Weight:

kg

[Main Menu](#)

Predictors of Potentially Difficult BVM:

BONES

Beard/Mustache Obesity No teeth Elderly
Snore regularly

The presence of any 2 was 72% sens &
73% spec for difficult BVM

Predictors of Potentially Difficult Cric:

SHORT

Surgery Hematoma Obesity Radiation
Trauma

Weight:

kg

[Main Menu](#)

I. Preparation

1. ET Tube with stylette: Male: 8-9
Female: 7-8 Child: (age + 16)/4
2. Check Laryngoscope and have 2 blades ready; O₂ & BVM connected; suction ready; drugs ready
3. Evaluate for DIFFICULT intubation and DIFFICULT BVM (NEVER paralyze a patient who you think you can't intubate OR ventilate!)

[II. Preoxygenation](#)

Weight:

kg

I. Preparation

Main Menu

II. Preoxygenation5 minutes on 100% O₂;8 Vital Capacity breaths on 100% O₂;

Highest attainable saturation.

In healthy patients, expect ~6-8 minutes to desaturate 100-90%. In most ED patients with underlying cardiopulmonary disease, time to desaturation is significantly less. Time is shorter in kids and in obese patients

III. Pretreatment

Weight:

kg

III. Pretreatment

Cerebral Protective Agents and modifiers of physiologic response to intubation (Optional). If "cerebral protection" is desired, drugs must be given at least 2 minutes prior to intubation. **Indication:** Increased ICP/head injury; Bronchospasm; "Anti-bradycardia" effect

L	<p>Lidocaine Lidocaine 1.5 mg/kg IV Can use to blunt ICP rise during intubation & to ↓ bronchospasm in asthma</p>
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O	<p>Opiates Fentanyl (Sublimaze) 2-4 mcg/kg IV Can use to blunt physiologic/CV response to intubation (HTN, tachy, etc.)</p>
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	<p>Anticholinergic Agents Use in children to prevent potentially lethal bradycardia / asystole (seen with SUX) and in adults with a 2nd dose of SUX. Also used as an antisialagogue with ketamine</p>
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Weight:

kg

III. Pretreatment

Main Menu

IV. Put to Sleep (Induction)

- A. Apply Cricoid Pressure. Don't release until placement is verified.
- B. **Do Not** ventilate until patient is intubated or reoxygenation is required.

1. Etomidate (Amidate)-Agent of choice for most RSI**Adult/Children: 0.3 mg/kg IV rapid push****Onset 30-45s; Duration 3-10 min;****Pregnancy Category C**

Little effect on BP or cardiovascular parameters. Myoclonic mvts (not seizures) often seen (30%). Etomidate causes transient, asymptomatic adrenal suppression (12h). Decrease dose in elderly or hypotensive.

Weight:

kg

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2. **Ketamine (Ketalar)**-*Agent of choice in asthma and hypotension*

Adult/Children: 1-2.5 mg/kg IV rapid push or 5-10 mg/kg IM

Onset <30s; Duration 5-15 min;

Pregnancy Category Unknown

Releases endogenous epinephrine and increases BP, ICP, MVO₂. Excess salivation controlled w/

atropine/glycopyrrolate. Avoid ketamine in head injury.

V. Paralyze



Weight:

kg

IV. Put to Sleep

Main Menu

V. Paralyze *Can be given simultaneously with induction agents*

1. **Succinylcholine (Anectine)**

Paralytic of choice for most RSI

Adult/Children: 1.5-2 mg/kg IV rapid push

Onset 30-60 sec IV; Duration 6-12 min IV; Pregnancy Category C

Use can cause profound bradycardia in children and in adults w/ multiple doses.

2. **Rocuronium (Zemuron)**

Good second-line agent

Adults/Children: 1 mg/kg IV rapid push

Onset 45-90 sec; Duration 15-40 min; Pregnancy Category B

Does not release histamine



Weight:

kg

2. Rocuronium (Zemuron)*Good second-line agent***Adults/Children: 1 mg/kg IV rapid push****Onset 45-90 sec; Duration 15-40 min;****Pregnancy Category B**

Does not release histamine

Contraindications to Succinylcholine

1. Known hyperkalemia
2. Crush injuries
3. Significant burns > 48 hours old
4. Spinal cord injury > 48 hours old
5. Denervating and neuromuscular diseases
(Muscular dystrophy, ALS, etc.)
6. Open globe eye injuries
7. Renal failure ONLY if patient is hyperkalemic

VI. Pass the Tube; VII. Placement Verification



Weight:

kg

V. Paralyze

Main Menu

VI. Pass the Tube (Intubate)*Attempt at 45 seconds post paralysis***Tube depth:** $12 + \text{age}/2$, up to 22-24 cm in adults**BURP****(Backward-Upward-Rightward-Pressure)****ELM (External Laryngeal Manipulation)****VII. Placement Verification**

Auscultation in axillae and over stomach;

Capnography; Air aspiration from tube; CXR

Weight:

kg

Lidocaine (1.5 mg/kg)	
Fentanyl (2-4 mcg/kg)	
Atropine (0.02 mg/kg) Min 0.1 mg, Max 0.4 mg Peds (< age 10 if SUX is used)	
Glycopyrrolate Peds (0.004 mg/kg)	
Glycopyrrolate Adult	0.2-0.4 mg
Defasciculating Agents (Use only if paralyzing with SUX) 1/10 the paralytic dose of SUX or any non-depolarizing agent	
Succinylcholine (1.5-2 mg/kg)	
Rocuronium (1 mg/kg)	
Etomidate* (0.3 mg/kg)	
Ketamine IV (1-2.5 mg/kg)	
Ketamine IM (5-10 mg/kg)	