Society of Rural Physicians of Canada
26TH ANNUAL RURAL AND REMOTE MEDICINE COURSE
ST. JOHN'S NEWFOUNDLAND AND LABRADOR
APRIL 12 - 14, 2018

• 240

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RAPID SEQUENCE INTUBATION FOR THE RURAL DOC

Rapid Sequence Intubation (RSI) for the Rural Physician

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Rural medical generalist for 42 years, the last 28 in Inuvik Regional Hospital (the most northern hospital in Canada) and still enjoying most of it.

I DO NOT have an affiliation (financial or otherwise) with a pharmaceutical, medical device or communications organization
Speakers who have no involvement with industry should inform the audience that they cannot identify any conflict of interest

RAPID SEQUENCE INTUBATION

By definition involves the
co-administration of both
anesthetic agents
and
neuromuscular blocking agents
to produce a state of
unconsciousness and paralysis
to allow tracheal intubation

Mendelson first described the deleterious effects of aspiration in 1946.
Succinylcholine was introduced in 1951
and cricoid pressure first described by Sellick in 1961.
These were collated by Stept and Safar in 1970
to describe a technique they called

Rapid Sequence Induction and Intubation.

It consisted of preoxygenation,
induction with a predetermined dose of thiopental
followed by succinylcholine,
application of cricoid pressure at loss of consciousness,
avoidance of positive pressure ventilation,
and finally tracheal intubation with a cuffed tube
before removal of the cricoid pressure.
This technique was designed to minimize the unprotected airway time and so reduce the risk of aspiration during that short period.
We could consider this the traditional RSI.

INDICATIONS FOR RSI

Patients who require intubation have at least one of the following 5 indications:

- Inability to maintain airway patency.
- Inability to protect the airway against aspiration.
- Failure to ventilate.
- Failure to oxygenate.
- Anticipation of a deteriorating course that will eventually lead to respiratory failure.

What makes RSI difficult in a rural setting?

low staff numbers

infrequent **exposure**

unfamiliar procedures

no **back up**

ROLES DURING RSI

The airway team should be a minimum of 3 people:

- airway proceduralist
- airway assistant
- drug administrator

The team leader may perform one of the above roles if necessary, but should ideally be a separate stand alone role.

Other roles include:

- person to perform MILS (manual in line stabilization) if indicated
- person to perform cricoid pressure (if deemed necessary)
- scribe

In the event of a failed airway, another person may take on the role of the airway proceduralist and role re-allocation must be clearly communicated to the team.

AIRWAY ASSESSMENT

Identify 4 areas of airway difficulty

- **Difficult to ventilate with a BVM**
- **Difficult laryngoscopy**
- **Difficult to intubate**
- **Difficult to perform cricothyrotomy**

Predict a difficult airway using the following mnemonics:

- **MOANS**
- **LEMONS**

AIRWAY ASSESSMENT

Lemon Law

L - Looks difficult?

E - Evaluate the 3-3-2 rule

M - Mallampati

O - Obstruction/Obesity

N - Neck Mobility

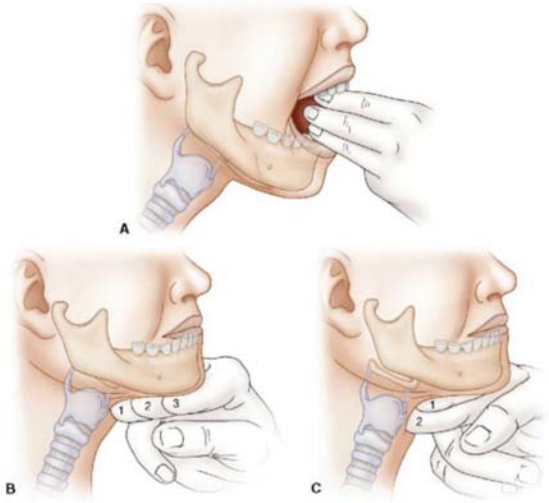
AIRWAY ASSESSMENT

L- Looks difficult?

- **Beards**
- **False teeth**
- **Secretions**
- **Obesity**
- **Trauma**

AIRWAY ASSESSMENT

E - Evaluate the 3-3-2 rule



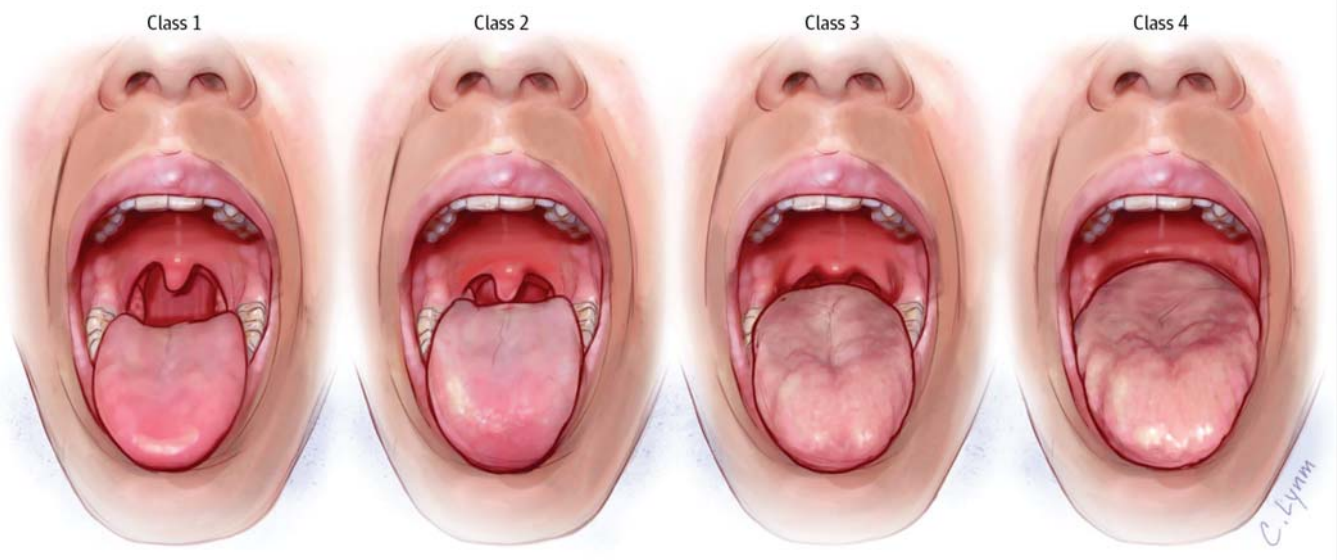
- **Can you get 3 fingers in mouth? If so, there is room for insertion of tube and laryngoscope**
- **Can you fit 3 fingers between angle of jaw and mentum? If so, you can probably lift tongue forward**
- **Can you fit 2 fingers between top op the thyroid cartilage and bottom of jaw? If not, high anterior cord probably present**

AIRWAY ASSESSMENT

M - Mallampati

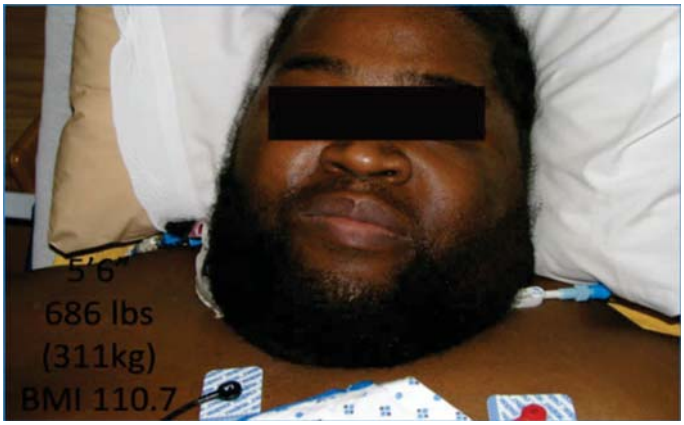
Difficulty

None	None	Moderate	Severe
Class 1	Class 2	Class 3	Class 4



AIRWAY ASSESSMENT

O - Obstruction/Obesity



- **Obstruction is anything that might interfere with visualization or tracheal tube placement**
- **Foreign body**
- **Hematoma**
- **Masses**

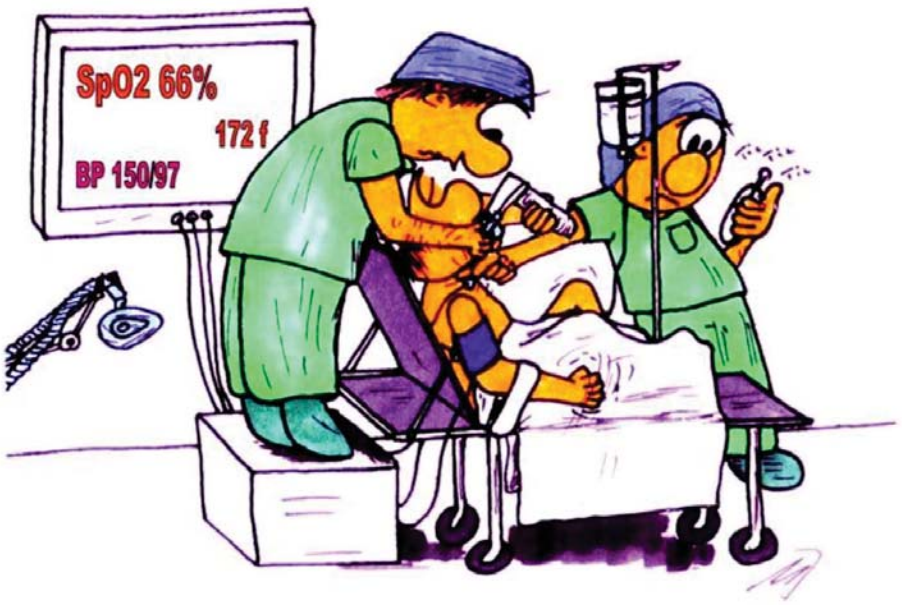
AIRWAY ASSESSMENT

N - Neck Mobility

- **Ideally we want our patients in a sniffing position for better visualization with the adult head slightly elevated and extended**
- **This may be impossible with Elderly and Trauma patients**
- **Does patient have c-collar in place?**
- **Does patient have osteoporosis or arthritis?**

THE MULTIPLE P PHILOSOPHY

Proper **P**reparation **P**revents **P**oor **P**erformance



SEQUENCE OF ADMINISTRATION

t -5 min	**Pre oxygenation**
t -2 min	**Premedication**
t -0 min	**Sellick Maneuver** **Induction** **Paralytic**
t +1 min	**Intubation**

THE MULTIPLE P'S OF RSI

PREPARE (self, team, patient & equipment)

PREOXYGENATE

PRETREATMENT

POSITION PATIENT PROPERLY

PLAN FOR DIFFICULTY OR FAILURE

PARALYZE WITH INDUCTION

TIME ZERO — **PASS THE TUBE**

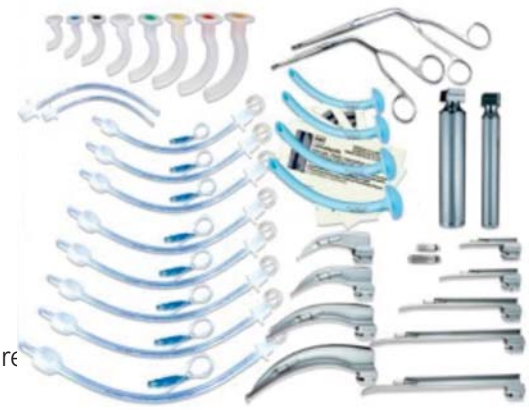
PROOF OF PLACEMENT

t +90 seconds — **P**OST-INTUBATION MANAGEMENT

THE MULTIPLE P'S OF RSI

PREPARE EQUIPMENT

- Adequate Ambu-mask/oxygen sources/suction
- 2 laryngoscope handles
- assortment of blades
- assortment of ET tubes, stylette, syringe
- 2 assistants familiar with the procedure
- 1-2 secure IV lines
- all pharmaceutical agents needed for the procedure
- back-up plan and rescue airway devices
- oximetry and capnography monitoring



THE MULTIPLE P'S OF RSI

PRE-OXYGENATE

- Oxygen 21% and Nitrogen 78%
- 100% Oxygen delivered for at least 3 minutes (preferably 8) in an attempt to achieve **NITROGEN WASHOUT**
- We do this in hopes to increase the amount of oxygen and develop a reserve in order to help the patient desaturate less quickly while intubation attempt is being made

THE MULTIPLE P'S OF RSI

Lidocaine

PRETREATMENT

- Anesthetize the airway reflexes that lead to elevate ICP
- **Dose:** 1-1.5 mg/kg
- **Peak:** 3 mins
- **Duration:** 20 mins
- **Adverse:** Hypotension, Allergy, Seizures, Bradydysrhythmias

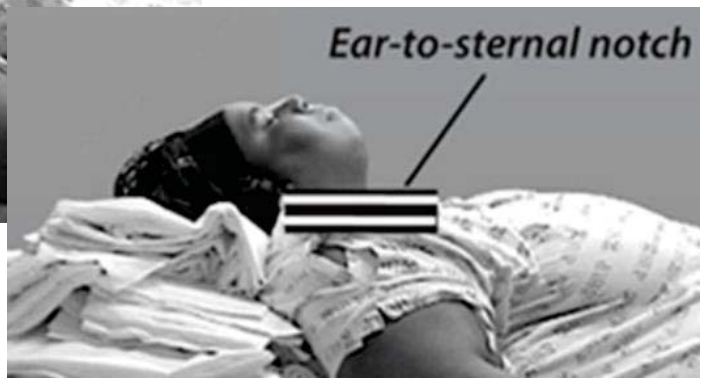
PRETREATMENT

Fentanyl

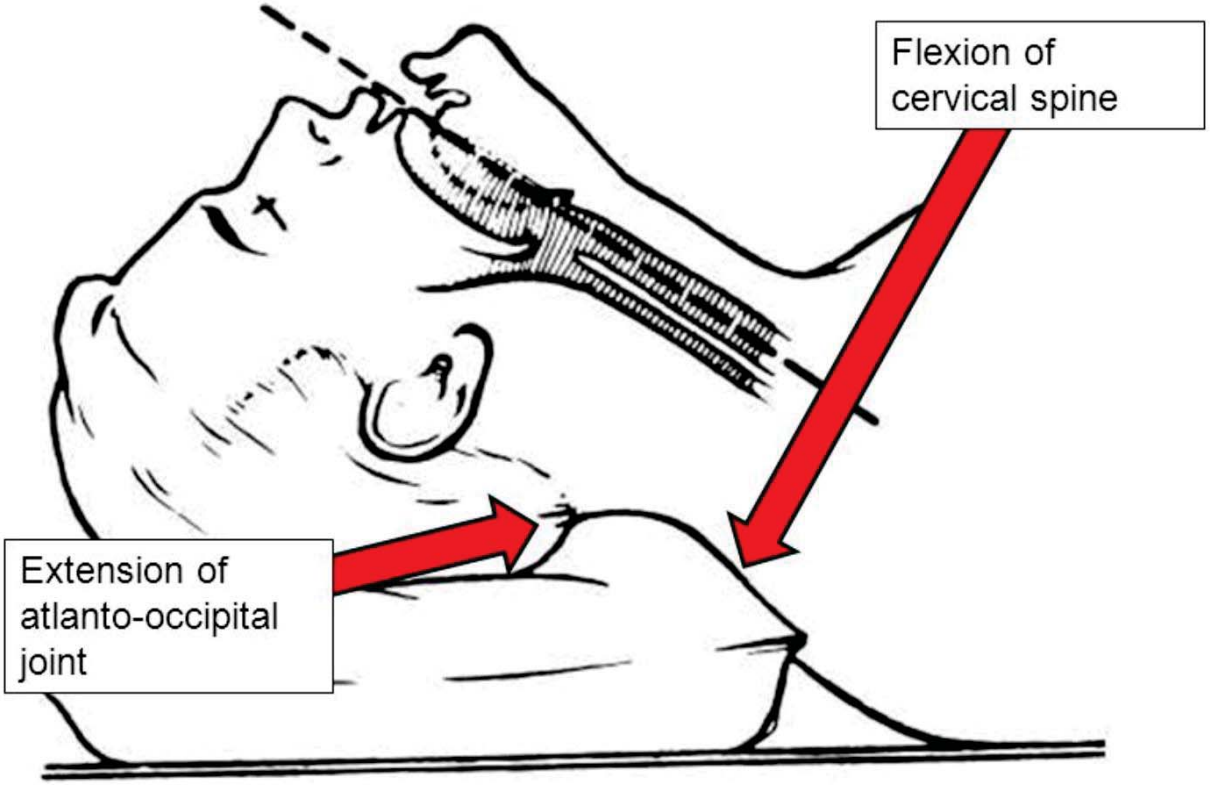
- **Dose** IV 2-10 mcg/kg TBW
- **Onset:** <60 seconds (maximal at ~5 min)
- **Duration:** dose dependent (30 minutes for 1-2 mcg/kg
- **Use:** may be used in a low dose as a sympatholytic premedication (e.g. TBI, SAH, vascular emergencies)
- **Drawbacks:** respiratory depression, apnea, hypotension, slow onset, nausea and vomiting, muscular rigidity in high induction doses, bradycardia

THE MULTIPLE P'S OF RSI

POSITION PATIENT



Sniffing Position



THE MULTIPLE P'S OF RSI

PLAN FOR DIFFICULTY OR FAILURE

THE MULTIPLE P'S OF RSI

PARALYZE WITH INDUCTION

Sedation
then
Paralysis

INDUCTION AGENT → **UNCONSCIOUSNESS**

PARALYTIC AGENT → **MOTOR PARALYSIS**

Ideal RSI Induction Agent

Does not exist (unfortunately!), but if it did it would:

- smoothly and quickly render the patient unconscious, unresponsive and amnestic in one arm/heart/brain circulation time
- provide analgesia
- maintain stable cerebral perfusion pressure and cardiovascular haemodynamics
- be immediately reversible
- have few, if any, side effects

INDUCTION AGENT

PROPOFOL

- **Dose:** 1-2.5 mg/kg IBW + (0.4 x TBW) (others simply use 1.5-2.5 mg/kg x TBW as the general guide)
- **Onset:** 15-45 seconds
- **Duration:** 5 – 10 minutes
- **Use:** Haemodynamically stable patients, reactive airways disease, status epilepticus
- **Drawbacks:** hypotension, myocardial depression, reduced cerebral perfusion, pain on injection, variable response, very short acting

INDUCTION AGENT

KETAMINE

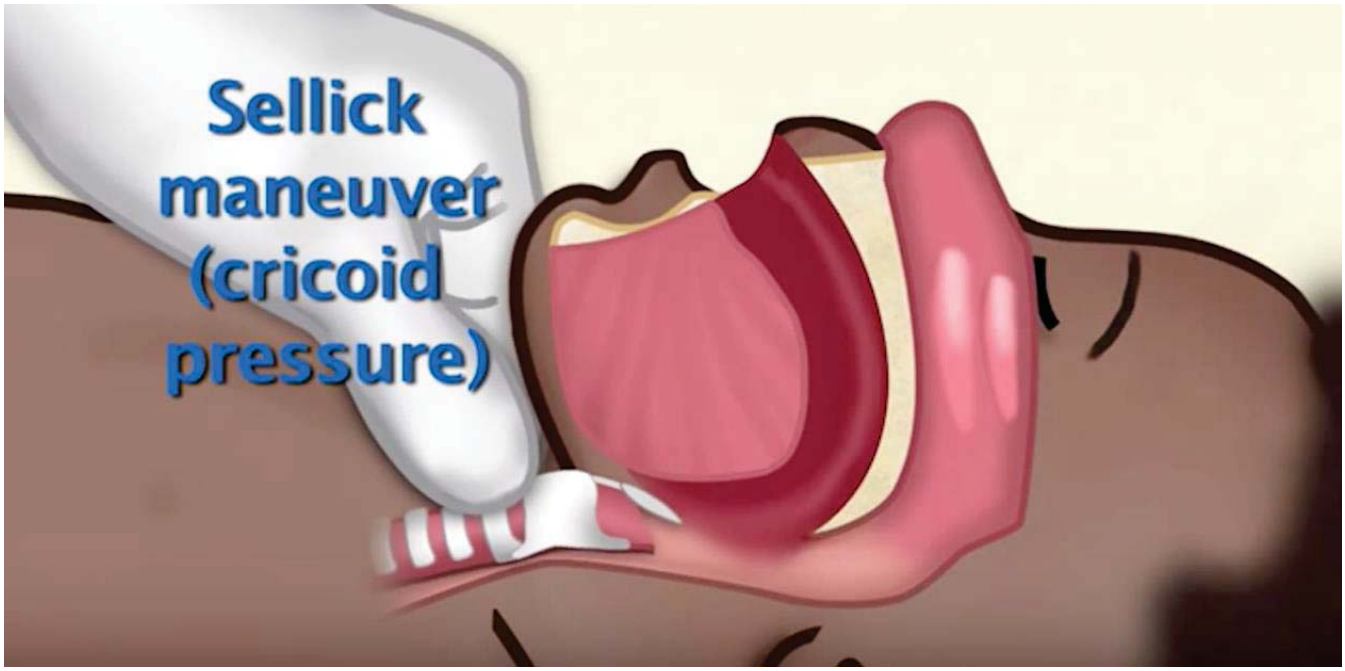
- **Dose:** 1.5 mg/kg IV (4mg/kg IM)
- **Onset:** 60-90 sec
- **Duration:** 10-20 min
- **Use:** any RSI, especially if hemodynamically unstable (OK in TBI (traumatic brain injury), does not increase ICP despite traditional dogma) or if reactive airways disease (potent bronchodilator and potent analgesic)
- **Drawbacks:** increased secretions, caution in cardiovascular disease (hypertension, tachycardia), laryngospasm (rare), raised intra-ocular pressure

CRICOID PRESSURE

Also known as “Sellick’s Maneuver”

Should be automatic

- Begin just as induction agent is administered
- Maintain until endotracheal tube placement is confirmed and tube is secure (cuff inflated)
- Used to occlude the esophagus and prevent passive regurgitation
- If patient starts to actively vomit - RELEASE! and suction oropharynx (otherwise can lead to esophageal rupture)



PARALYZE

Succinylcholine (or rocuronium)

GO BIG OR GO HOME

PARALYTICS

SUCCINYLCHOLINE

- **Dose:** 1.5 mg/kg IV (2 mg/kg IV if myasthenia gravis) and 4 mg/kg IM (in extremis)
- **Onset:** 45-60 seconds
- **Duration:** 6-10 minutes
- **Use:** widely used unless contra-indicated; ideal if need to extubate rapidly following an elective procedure or to assess neurology in an intubated pateint
- **Drawbacks:** numerous contra-indications (hyperkalemia, malignant hyperthermia, >5d after burns/ crush injury/ neuromuscular disorder), bradycardia (esp after repeat doses), hyperkalemia, fasciculations, elevated intra-ocular pressure, will not wear off fast enough to prevent harm in CICV (can't intubate,can't ventilate) situations

PARALYTICS

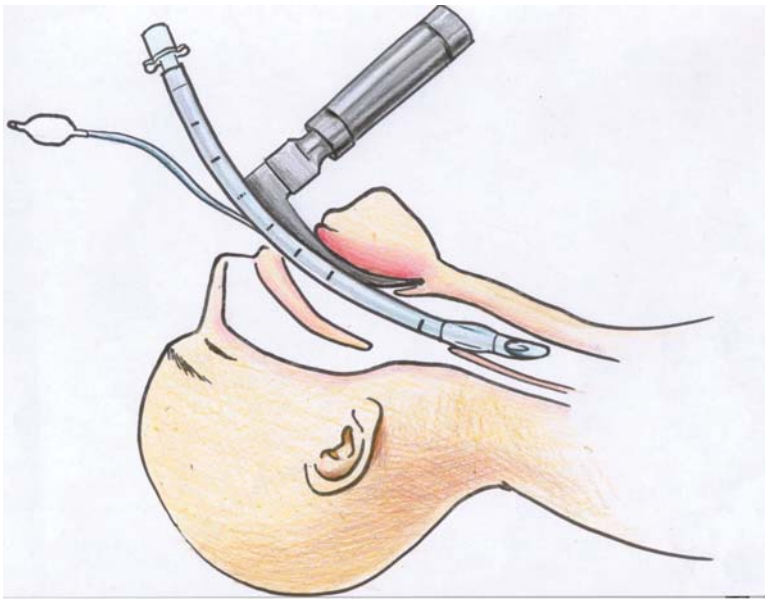
ROCURONIUM

- **Dose:** 1.2 mg/kg IV IBW
- **Onset:** 60 seconds
- **Use:** can be used for any RSI unless contra-indication or require rapid recovery for extubation after elective procedure or neurological assessment; ensures persistent ideal conditions in CICV situation (i.e. immobile patient for cricothyroidotomy) – can be reversed by sugammadex
- **Drawbacks:** allergy (Rare)

THE MULTIPLE P'S OF RSI

TIME ZERO

PASS THE TUBE!



Inflate cuff as soon as you think the tube is in the trachea

Only then release cricoid pressure

THE MULTIPLE P'S OF RSI

PROOF OF PLACEMENT

Objective ways to confirm:

- **Pulse Oximetry**
- **ETCO2**
- **Chest X-Ray**

Subjective ways to confirm:

- **Direct visualization**
- **Tube misting**
- **Breath sounds**

WAVEFORM CAPNOMETRY

- Becoming a standard of care
- Easy to use
- Good measure of pulmonary perfusion
- Relates well to PACO2
- Does have limitations

COMPLICATIONS

If you miss or are unable to intubate after 30 seconds

- Ventilate with BVM/high flow O2 with cricoid pressure maintained
- Make **ONE** more attempt to intubate
- If still unsuccessful, continue BVM/cricoid pressure
- Secure airway with backup device (CombiTube, LMA or King-LT-D)
- Non-anaesthetists performed 4394 intubations and failed to intubate in 41 cases (0.9%); anaesthetists performed 2587 intubations and failed in 11 (0.4%) (P=0.02) (**Observational study of the success rates of intubation and failed intubation airway rescue techniques in 7256 attempted intubations of trauma patients by pre-hospital physicians.**

Lockey D1, Crewdson K2, Weaver A2, Davies G2.)

PLAN "A" ALTERNATIVES

- **Different:**
  - **Size of blade**
  - **Type of blade**
  - **Position (patient and provider**
- **Hockey stick bend in ETT or Directional tip ETT**
- **Gum Elastic Bougie or Flex-guide Endotracheal Tube Introducer**
- **Remove the introducer as you pass through the cords**
- **"BURP"**
- **Have someone else try**

BURP

Backward

Upward

Rightward

Pressure:

manipulation of the trachea

90% of the time best view will be obtained
by pressing over the
thyroid cartilage

PLAN "B"
BVM and BACKUP AIRWAY Techniques

Can you ventilate with a BVM?

Consider 2 Nasopharyngeal and an Oropharyngeal Airway

Gum Elastic Bougie

Combitube

KING - LT-D

LMA

WHAT DO WE DO WHEN FACED WITH A "CAN'T INTUBATE CAN'T VENTILATE" SITUATION?

PLAN "C"
CRIC

THE MULTIPLE P'S OF RSI

Post Intubation Management

- Cardiac monitor
  - monitor for dysrhythmias
    - bradycardia, tachycardia, ectopy
- Blood pressure monitoring (manual or NIBP)
  - monitor for hypo- or hypertension
- Pulse oximetry
  - monitor for hypoxia
- Capnography
  - Monitor for hypo- or hypercarbia

Post Intubation Management

Prepare

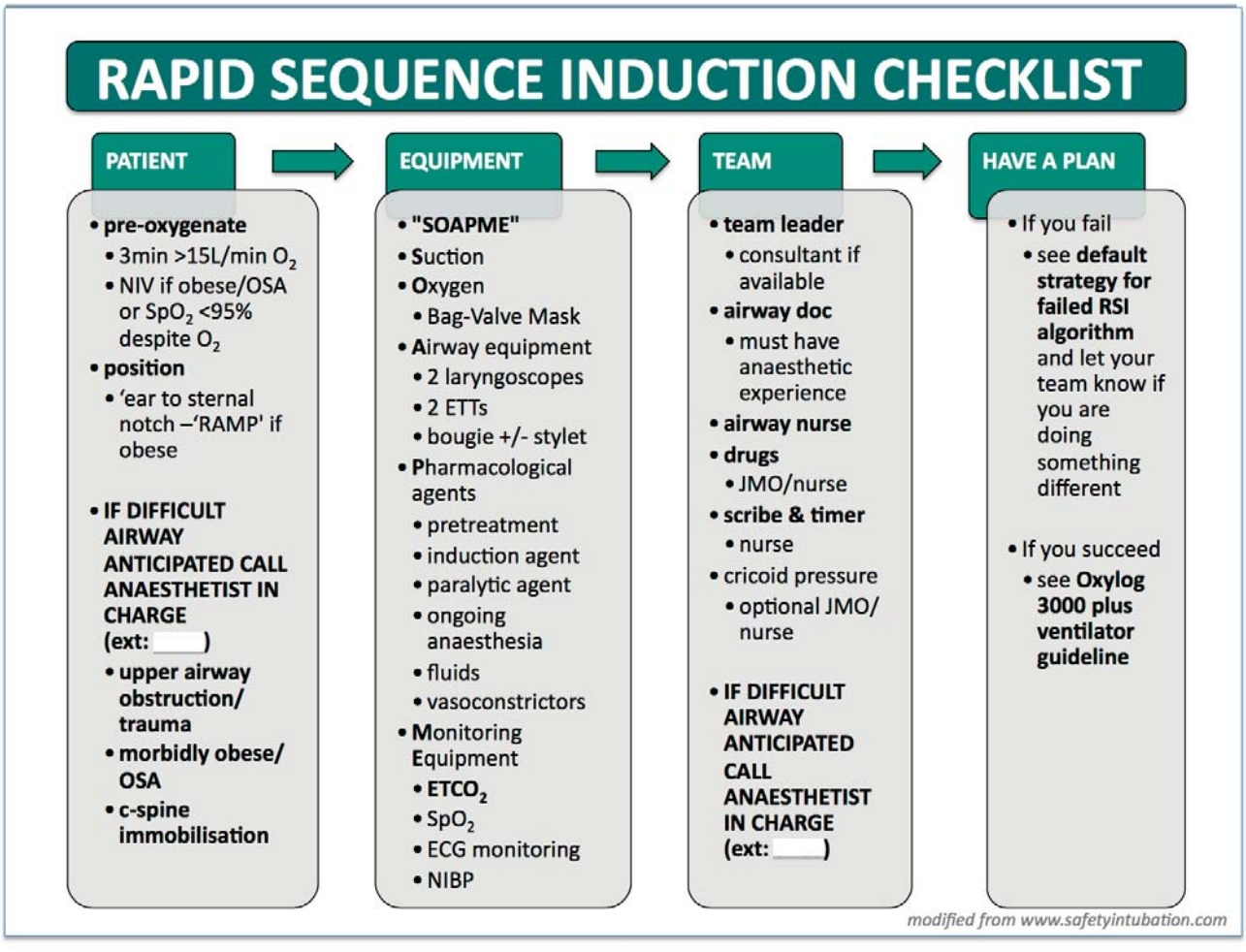
- ventilator settings
- post-intubation sedation and paralysis
- ongoing resuscitation requirements

CONCLUSION

- **Airway management is a very important skill for all clinicians to have**
- **Assess, Reassess and Reassess again**
- **TRAIN! Because your next airway may be difficult**

Acknowledgements

Thanks to my teachers, colleagues and RSI “teams” I worked with and all the powerpoint compilers that gave me ideas.



Rapid Sequence Intubation

Prepare equipment (IV, ECG, oximeter, BVM, suction, ETT)

↓

C-Spine Immobilization p.r.n.

↓

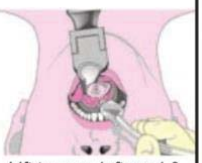
Preoxygenate with 100% O_2

Place Pt. in sniff position: hyperventilate w/O_2

↓

Give Sedative:

- Midazolam 0.1–0.3 mg/kg IV or
- Thiopental 1–3 mg/kg IV or
- Ketamine 1–2 mg/kg IV or
- Etomidate 0.3 mg/kg IV or
- Diazepam 0.2 mg/kg IV (max. 20 mg)



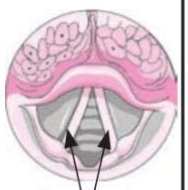
Lift tongue leftward & visualize vocal cords

↓

If Pt. <2 y.o., **give Atropine 0.02 mg/kg IV** (blocks reflex bradycardia)

↓

Give Succinylcholine 1–1.5 mg/kg IV,
***or:* Rocuronium 0.6–1.2 mg/kg IV,**
***or:* Vecuronium 0.1 mg/kg IV**



Vocal cords

↓

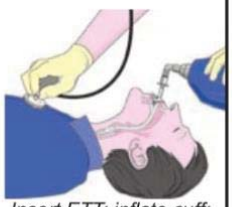
Intubate (apply cricoid pressure p.r.n.)

↓

NCLEXQuiz.com

Inflate Cuff;
Verify Tube Placement:

- **Check Chest Expansion**
- **Check Lung Sounds**
- **Fogging of tube**
- **Apply CO_2 Detector**
- **Secure with ETT holder & C-collar**



Insert ETT; inflate cuff; check breath sounds

DEFAULT STRATEGY FOR FAILED RSI IN ADULTS

Plan A: initial tracheal intubation plan

direct laryngoscopy

- **RSI CHECKLIST**
- pre-oxygenate
- position: 'ear to sternal notch'- 'RAMP' if obese
- paralysis & sedation for all
- cricoid pressure for all initially but release if poor view and apply External Laryngeal Manipulation
- bougie for all

succeed → **tracheal intubation** verify with $ETCO_2$

- **maximum 2 attempts in 2 mins**
- re-oxygenate if SpO_2 <90% with 2 person BVM + OPA + NPA
- **CALL ANAESTHETICS IF PLAN A FAILS (ext: 3186)**

fail ↓

Plan B: secondary tracheal intubation plan

video laryngoscopy

- as difficult airway, maximise laryngeal view by avoiding cricoid pressure and by using External Laryngeal Manipulation

succeed → **tracheal intubation** verify with $ETCO_2$

- **maximum 2 attempts in 2 mins**
- re-oxygenate if SpO_2 <90% with 2 person BVM + OPA + NPA

fail ↓

Plan C: maintenance of oxygenation/ ventilation

LMA

- avoid cricoid pressure

improved oxygenation → **contact anaesthetics (ext:) for fibreoptic intubation**

- **maximum 2 attempts in 2 mins**
- plan D if SpO_2 <75%

fail ↓

Plan D: rescue techniques for "can't intubate can't ventilate" situation

scalpel/ finger/ tube cricothyroidotomy

scalpel — finger — tube

modified from www.das.co.uk

Management of unanticipated difficult tracheal intubation in adults

2015

Plan A: Facemask ventilation and tracheal intubation

Optimise head and neck position
Preoxygenate
Adequate neuromuscular blockade
Direct / Video Laryngoscopy (maximum 3+1 attempts)
External laryngeal manipulation
Bougie
Remove cricoid pressure
Maintain oxygenation and anaesthesia

If in difficulty → call for help

Succeed → Confirm tracheal intubation with capnography

Declare failed intubation

Plan B: Maintaining oxygenation: SAD insertion

2nd generation device recommended
Change device or size (maximum 3 attempts)
Oxygenate and ventilate

Succeed →

STOP AND THINK
Options (consider risks and benefits):
1. Wake the patient up
2. Intubate trachea via the SAD
3. Proceed without intubating the trachea
4. Tracheostomy or cricothyroidotomy

Declare failed SAD ventilation

Plan C: Facemask ventilation

If facemask ventilation impossible, paralyse
Final attempt at facemask ventilation
Use 2 person technique and adjuncts

Succeed → Wake the patient up

Declare CICO

Plan D: Emergency front of neck access

Scalpel cricothyroidotomy

Post-operative care and follow up
- Formulate immediate airway management plan
- Monitor for complications
- Complete airway alert form
- Explain to the patient in person and in writing
- Send written report to GP and local database

This flowchart forms part of the DAS Guidelines for unanticipated difficult intubation in adults 2015 and should be used in conjunction with the text.

Maintain a 'sterile cockpit environment' when communicating the airway plan to the team, ideally through use of a 'call and response' checklist otherwise one of these two mnemonics will help:

SOAPME

O2 MARBLES

O2 MARBLES is an alternative for the equipment and planning:

- **O**xygen
- **M**asks (NP, NRB, BVM); **M**onitoring
- **A**irway adjuncts (e.g. OPA, NPA, LMA); **A**sk for help and difficult airway trolley
- **R**SI drugs; **R**esus drugs
- **B**VM; **B**ougie
- **L**aryngoscopes; **L**MA
- **E**TTs; **E**TCO2
- **S**uction; **S**tate Plan

SOAPME

- **S**uction
  at least one working suction, place it between mattress and bed
- **O**xygen
  NRBM and BVM attached to 15 LPM of O2, preferably with nasal prongs for apneic oxygenation
- **A**irways
  7.5 ET tube with stylet fits most adults, 7.0 for smaller females, 8.0 for larger males, test balloon by filling with 10 cc of air with a syringe
  Stylet – placed inside ET tube for rigidity, bend it 30 degrees starting at proximal end of cuff (i.e. straight to cuff, then 30 degree bend)
  Blade – Mac 3 or 4 for adults – curved blade
  Miller 3 or 4 for adults – straight blade
  Handle – attach blade and make sure light source works
  Backups – ALWAYS have a surgical cric kit available!
  have video laryngoscope, LMA and bougie at bedside
- **P**re-oxygenate – 15 LPM NRBM
- **M**onitoring equipment/Medications
  Cardiac monitor, pulse ox, BP cuff opposite arm with IV
  Medications drawn up and ready to be given
- **E**nd Tidal CO2