

Airway Management Outside the Operating Room

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No disclosures

- Case presentations-all anesthesiologist at some point will be involved in these cases
- Review some database
- Closed claims
- More cases

Is this just an academic problem

Survey from the community shows otherwise

Case Presentations

Case 1

- Radiologist placed a PEG in IR with sedation for woman with a huge laryngeal mass
- Patient went apneic
- Anesthesia called late-can't ventilate/can't intubate. Sux was wearing off
- To OR for awake trach

Case 2

- 400 + lbs patient arrives by ambulance to ED
- Combitube in place
- ER doc gives 10 mg of vecuronium-pulls Combitube
- Unable to intubate or ventilate
- Patient had old trach scar
- Anesthesia finally called-blood everywhere, can't visualize anything
- Cut neck at old scar of trach and placed ETT

Case 3

- Called to ED for restrained prisoner with bilateral mandibular and orbital fractures.
- Uncooperative, combative, bloody mouth from unknown source, spitting blood.
- Given ketamine-no help
- Proposal/sux-can't see anything due to blood
- Some air getting in with masking
- Placed intubating LMA-able to ventilate
- Placed ETT thru LMA balloon, placed small ETT
- Switched to larger tube with tube exchanger

Case 4

- Anesthesiologist to radiology to help with patient that was desaturation during MRI
- 80 yo was given fentanyl, versed and phenergan
- Narcan and flumazenil given-still obtunded
- Large mass was noted on neck-no one else noticed
- Patient decompensating-DL done
- Friable large tumor eating through VC, epiglottis and tongue, can't pass ETT
- Masked to OR for emergent trach

Case 5

- Called to floor for patient in respiratory distress
- Patient with traumatic brain injury
- Propofol given difficult to ventilate with mask
- DL done-piece of hot dog stick occluding VC
- Removed with McGills-improved
- Similar situation with other foreign bodies

Case 6

- 12 mo old in ED after sibling gave him a dog biscuit-in respiratory distress, desaturating
- ED had multiple failed intubation attempts
- Sux and roc given-difficult to mask-low sats
- Baby vomiting
- Anesthesia called-belly size of a volleyball
- Passed OG-suctioned stomach
- Easy mask to high 90's, easy DL and tube placement

Case 7

- Anesthesia called to COR 0
- Walked in room-blood everywhere
- Placed yankauer for suction, no help
- Kept yankauer going-boogie with hockey stick placed until felt tracheal rings
- Advanced boogie, placed ETT over

Case 8

- Called to GI-patient became apneic during EGD
- GI unable to ventilate or intubate
- Patient cyanotic and bloody
- Anesthesia goes to head of bed and asks "can we use her trach?"

Case 9

- GI accidentally extubated a known difficult airway patient
- ICU doc and RT tried to reintubate unsuccessfully
- ICU doc tries to FO intubate-unsuccessful
- Anesthesiology finally called
- Grade 2 view with glidescope but bloody
- Yankauer used to suction and placed accidentally through VC
- Passed 9 Fr cook exchange catheter through yankauer
- ETT placed over cook catheter

Emergent Intubations Outside the OR is a Predictor of Airway Complications

Limited Literature On This Topic

REVIEW AVAILABLE ARTICLES

Failed Intubations

- 1 in 2000 in elective cases
- 1 in 300 in OB RSI
- Up to 1 in 50 in ED/ICU

Can't intubate Can't Ventilate (CICV)

- Fewer than 1 in 5000 in elective GA
- Requiring emergency surgical airway (ESA) less than 1 in 50,000 in OR cases
- In ED-CICV requiring ESA 1 in 200

Results of Airway Disasters

- Majority led to death or permanent neurological injury
- ICU 61%
- ED 31%
- OR 14%
- Failure to use capnography contributed to 74% of deaths or permanent neurological injury

Difficult Airways

- Reports 8-12% difficult intubation in the emergent setting versus 5.8% during elective intubations in the OR.
- A 7-fold higher complication rate when encountering difficult airways outside the OR

Surgical Airway

- In two thirds of the claims where an airway emergency occurred a surgical airway was obtained but it was too late to avoid a bad outcome
- A surgical airway to be a successful option it must be instituted early
- Prompt action has been shown to save lives

Challenges for Providers

- Unique inherent challenges outside the OR
- Providers often must act quickly
- Providers are unfamiliar with the patient
- Limited time for assessment
- Lack of resources-equipment and training

Emergent

- Patients are usually hypoxic
- Hemodynamically unstable
- Full Stomachs
- Lacking optimal resuscitation equipment

Complications

- Aspiration 2-4%
- Esophageal intubation 1.6-9%
- Oropharyngeal trauma 0.5-7%
- Higher complications in training centers

Anesthesiologist Calls for Emergent Airways

- ICU ~60%
- Floor ~39%
- ED ~1%, most manage airways themselves and ONLY call anesthesia when too late!!!

Reasons

- Respiratory distress alone ~52%
- Cardiac arrest ~45%
- Airway protection ~2%
- Other ~2%

Drugs

- Induction agents- Etomidate 57%, Propofol 18%
- Muscle relaxant used in 72% with succinylcholine 60%

Equipment Used

- DL
- LMA
- Light Wand
- Bougie
- Video assisted laryngoscope
- Fiberoptic-awake or asleep
- Retrograde wire
- Surgical airway

Self Extubation

- Hemodynamic instability
- Multiple attempts at reintubation due to difficulties
- Significant morbidity and mortality

Aspiration

- More frequent on floor than ICU
- NPO status-most full stomachs
- Equipment available-suction, resuscitation equipment and oxygen
- Training of staff-higher in ICU
- ICU recognizes earlier decompensation

Causes???

- Late identification of problems-awareness
- Lack of necessary equipment
- Lack of experienced personnel
- Poor planning
- Poor communication
- CAPNOGRAPHY

Awareness

- Human factors
- Reduce human error
- Improve human performance which enhances safety
- Anticipate problems and prevent them
- Situational awareness

Case 10-Example

- 5 am call for emergent intubation
- On route, changed to Cor zero
- Patient PEA, apneic-chest compressions, bag/mask ventilation, vomit
- Difficult DL due to vomit-get tube in. All we see with glidescope is green vomit flowing out of esophagus
- COR for 40 minutes about to call off
- ACLS protocol-consider narcan, "he did get a fair amount of Dilaudid..."
- Two doses of narcan-NSR, patient awake pointing to chest pain...

Case 11

- Called to Cor 0
- Patient can't be intubated due to inability to open mouth
- Push succinylcholine-still can't open mouth
- How long has the patient been like this??

Rigor Mortis!!!
Lack of awareness

Prevention???

- Fourth National Audit Project of the Royal College of Anaesthetists and the Difficult Airway Society-NAP4
- Recommendations for a checklist for all remote site emergency airway management
- Checklist has been shown to reduce complications rates
- Concept from success in the aviation industry

Intubation Checklist

- Emergency Rapid Induction Checklist
- Airway equipment with difficult airway cart
- Capnography-carbon dioxide detector filters
- Resuscitation drugs
- Place in all remote areas involved with critically ill patients

- Improves patient safety
- Reduces mortality
- Reduces complications
- Doesn't take any longer
- Less discrepancy with inexperience vs experienced

- Train all ICU and ED staff-assign someone per shift to be responsible and attend airway emergencies/cardiac arrests
- Check daily
- Keep stocked
- Keep photo of all equipment and drugs needed for restocking

Annex A: RSI Checklist

EMERGENCY RAPID SEQUENCE INDUCTION CHECKLIST			
Prepare Team	Prepare Patient	Prepare Drugs & Equipment	Prepare for RSI / Potential difficulty
<p><input type="checkbox"/> Do we need more help or support?</p> <p>2nd on-call: BLEEP 3617 PAR nurse: BLEEP 3164 Anest practioner: EXT 42110 Cons on-call: via switch</p> <p><input type="checkbox"/> Is the team happy with their designated role?</p> <p>Team leader (Intubator) Drug administration Circuit pressure (trained) Assistant Manual in line stabilization</p>	<p><input type="checkbox"/> Is the patient's position optimal?</p> <p>Further pillows HELP pillow/ramp</p> <p><input type="checkbox"/> Are any difficulties predicted from airway assessment?</p> <p>Mask ventilation Laryngoscopy Aspiration risk (TNGT)</p> <p><input type="checkbox"/> Is the haemodynamic status optimal?</p> <p>Fluid bolus Vasopressor bolus Vasopressor infusion</p> <p><input type="checkbox"/> Is pre-oxygenation optimal?</p> <p>FiO₂ > 0.85 Reservoir delivery system Consider CPAP/NIV</p>	<p><input type="checkbox"/> Is there appropriate access & monitoring?</p> <p>ECG NIBP (or) IBP Oxygen Saturation Capnography (attached) Venous access (working)</p> <p><input type="checkbox"/> Are all drugs prepared, labelled & doses checked?</p> <p>Pre-medication (e.g. opioid) Induction agent Muscle relaxant Vasopressor(s) Maintenance infusion</p> <p><input type="checkbox"/> What is the airway plan?</p> <p>A = e.g. Conventional RSI? B = e.g. Bag-mask with oral airway/wake? C = e.g. LMA or ETT? D = e.g. Cricothyrotomy?</p>	<p><input type="checkbox"/> Is the appropriate equipment available for plans A-D?</p> <p><input type="checkbox"/> Is all equipment ready and checked?</p> <p>Tilting trolley/bed Suction (working & to hand) Ambubag/Mapleson C circuit Oral & Nasal airways Laryngoscopes (x2/checked) Appropriate blade size/type ET tubes (x2/checked) ET tube tie/tape & syringe Bougie (to hand) LMA or Gel Difficult airway trolley Portable ventilator (checked)</p> <p><input type="checkbox"/> Is everyone happy to proceed?</p> <p>(Processed only if unanimous 'yes')</p>

This Checklist is not intended to be a comprehensive guide to preparation for induction. Consult your HIC team members.
 Produced for the Department of Anaesthesia & Intensive Care Medicine, Derriford Memorial Hospital.
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2 of 3 Annex B: Airway management / emergency drugs bags



Drugs Bag Inventory

1ST ON-CALL ANAESTHETIST IS RESPONSIBLE FOR CHECKING CONTENTS AT THE START OF EVERY SHIFT

STORE IN ITU'S DRUGS FRODGE REPLENISH CONTENTS AFTER USE

Sussamethonium 330mg, Atiracurium 2x50mg, Atropine 2x500mcg, Cisatracurium 200mg, Neostigmine 2.5mg, Metaraminol 2x5mg, Phenylephrine 2x30mg, Metoprolol 5mg, Amiodarone 2x150mg

Thiopentone 100mg, Propofol 1% 300mg, Etomidate 20mg, Rocuronium 2x50mg

Alfentanil 50mg, Magnesium 5g, Calcium Chloride 10mmol

Mivacurium, Sufentanil, Atropine, Adrenaline
 Propofol 1% for infusion
 Narco

Adult Advanced Airway Bag Invento

RSI checklist (external)

Self-inflating (ambu) bag-valve-mask (loose, main compartment)

Intubation, "Plan A" Kit: (main compartment)

Waters (Mapleson C) Circuit
 Face mask size 4 + 5
 ETT Size 6.0 + 7.0 + 8.0

Yankeur sucker
 Suction catheter
 Suction tubing

2x laryngoscope handles + batteries
 MacIntosh blade size 3 + 4
 20ml syringe, tube tie + tape, KY jelly

Adult Easicap filter

Difficult Intubation Kit: (main compartment)

Stylet
 Gum-elastic bougie 15Ch
 Magill's forceps (top-flap)
 Scissors (top-flap)
 Airtrac adult male + female (blue + green)
 Cook airway exchange catheter (side pouch)

Failed Intubation, "Plan C" Kit: (main compartment)

OP airways (green, orange, red)
 NP airways (Size 6,7,8)
 i-gel (Size 3,4,5)

3 of 3

Failed Ventilation, "Plan D" Kit: (L side pouch)

Needle cricothyroidotomy kit: (taped together)

- 3x 14g cannulas
- 10ml syringe
- Prep'd insufflation apparatus (oxygen tubing + 3-way tap)

Surgical cricothyroidotomy kit: (taped together)

- Scalpel
- Cuffed tracheostomy tube 6.0
- KY jelly
- Scissors
- Gauze swabs (pack of 5)
- 20 ml syringe

Ancillaries: (R side pouch)

Adult filter
 NG tube
 Catheter mount
 Non-rebreathe mask + tubing

Remote Site Airway Emergencies

- Are among the most difficult and associated with the highest risks
- Delays or complications are very detrimental and potentially avoidable
- Mainly due to lack of available appropriate drugs, equipment or trained staff

Off Site Closed Claims

- A quarter involved tube changes
- Almost half were non surgical patients
- Post op patients need for reintubation were for neck swelling causing respiratory compromise-post: neck fusion, thyroidectomy, central line...

- Claims for care off site were all associated with death/BD versus OR disasters have less morbidity and mortality
- Poor outcome due to the lack of operating room resources-standard airway management equipment and no immediate availability of healthcare providers skilled in airway management.
- There was no difference in the proportion of payments made, or the median payment between perioperative and outside location claims.

Difficult Airway Claims

- Perioperative Claims 87%
- Outside locations 13%
- Worst outcomes outside locations

Table 2. Outcomes and Liability in Difficult Airway Claims (n = 179)

	Perioperative (n = 156), n (%)	Outside Location (n = 23), n (%)
Outcome		
Death	71 (46%)*	20 (87%)*
Brain damage	19 (12%)	3 (13%)
Airway injury†	50 (32%)*	0 (0%)*
Pneumothorax	7 (4%)	0 (0%)
Aspiration pneumonitis	3 (2%)	0 (0%)
Nerve injury	3 (2%)	0 (0%)
Emotional distress/ fright	3 (2%)	0 (0%)
Awake during surgery	1 (1%)	0 (0%)
Liability		
Less than appropriate anesthetic care	74 (47%)	10 (43%)
Payment made	99 (63%)	13 (57%)
Payments in 1999 dollars, median (range)	\$271,250 (\$2,240-8,540,000)	\$305,000 (\$49,050-2,010,000)

Case 12

- Emergent intubation in patient is severe respiratory distress
- Tachypneic
- Sat on 6l nasal cannula 74%
- Sitting straight up in bed

Quick History

- 63 yo AFF
- Obese-70", 156 kg; BMI 50
- Severe pulmonary HTN
- CHF
- COPD
- CVA-?residual
- Gout

Home medications

- Advair 2 puffs BID
- HCTZ 12.5mg PO q day
- Lisinopril 5mg PO q day
- Magnesium Hydroxide 400mg PO BID
- Fentanyl patch 25mcg/hr transdermal

PRN Medications

- Acetaminophen
- Albuterol
- NTG
- Oxycodone

TTE

- RV severely dilated with moderately reduced systolic function
- Dilated IVC with interatrial septum bowing, increase RAP
- PAP systolic-65mmHg
- LV cavity small with nl EF>55%

Admission

- Sepsis of unknown origin
- CHF exacerbation
- Altered mental status

Labs

- K 5.9
- Cr 1.39
- WBC 28
- H/H 8.6/29.7

Concerns

- Difficult intubation-obesity, unable to do complete exam due to uncooperative
- Difficult bag/mask and quick desaturation-obesity, COPD, CHF, inability to lay flat-no reserve
- Can't pre-oxygenate-altered mental status refusing mask. Decreased FRC
- Can't use succinylcholine due to high K, history of CVA with unknown residual issues
- Non depolarizer-unknown NPO status, concern for ventilation/intubation

Patient somewhat breathing on her
OWN

*Large concern of taking away any respiratory
drive*

What was done

- Was able to get a non rebreather mask
- Precedex started 0.5ug/kg/hr increases to 1ug/kg/hr using assumed ideal body weight
- Layed patient down
- Awake DL a with Mac 4, quick view of closed VC, unable to pass ETT- coughing
- Felt a bit more comfortable added 2 mg Versed
- Another DL ETT placed as VC opened
- +ETCO2, BBSE

Conclusion

- Hospital needs a solid plan
- Train necessary personnel
- Have proper equipment
- Call anesthesia early