Mastering Airway Management: The Ultimate Guide
Comprehensive Notes for EMTs, Paramedics, and Medical Professionals

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I. Introduction to Airway Management
Why Airway Management Matters
- **Primary Survey Priority**: Airway is the **first step** in the ABCDE (Airway, Breathing, Circulation, Disability, Exposure) assessment.
- **Hypoxia Kills**: Without oxygen, brain damage occurs in **4–6 minutes**.
- **Two Critical Processes**:
  1. **Ventilation**: Movement of air in/out of lungs.
  2. **Oxygenation**: Loading O_2 onto hemoglobin for delivery to tissues.

II. Anatomy of the Airway
A. Upper Airway Structures
1. **Nose & Mouth**: Warm, humidify, and filter air.
2. **Pharynx** (Throat):
   - **Nasopharynx**: Filters dust (lined with ciliated mucosa).
   - **Oropharynx**: Contains **epiglottis** (prevents aspiration).
   - **Laryngopharynx**: Connects to esophagus/trachea.
3. **Larynx** (Voice Box):
   - **Thyroid Cartilage** (Adam's apple).
   - **Cricoid Cartilage**: First tracheal ring (used in cricoid pressure during RSI).
   - **Glottis**: Narrowest part of adult airway (vocal cords here).

B. Lower Airway Structures
1. **Trachea**: C-shaped cartilage rings (rigid to prevent collapse).
2. **Bronchi**: Right bronchus is **more vertical** (easier for foreign bodies to lodge here).
3. **Bronchioles**: No cartilage; smooth muscle controls diameter.
4. **Alveoli**: Site of **gas exchange** (O_2 in, CO_2 out).

III. Physiology of Breathing
A. Ventilation vs. Respiration

Term	**Definition**
Ventilation	Mechanical movement of air (inhalation/exhalation).
Oxygenation	O_2 binding to hemoglobin in blood.

| **Respiration** | Gas exchange (O_2/CO_2) at alveoli & tissues. |

B. Mechanics of Breathing
- **Inhalation (Active)**:
  - Diaphragm contracts → Thorax expands → Negative pressure draws air in.
- **Exhalation (Passive)**:
  - Muscles relax → Thorax recoils → Air pushed out.

C. Regulation of Breathing
- **Chemoreceptors**: Monitor CO_2 (primary driver), O_2, and pH.
  - **Hypercapnia** (↑CO_2) → Increases respiratory rate.
  - **Hypoxic Drive** (COPD patients rely on low O_2 to stimulate breathing).

IV. Pathophysiology of Airway Compromise
A. Causes of Airway Obstruction

Type	**Examples**
Mechanical	Tongue (unconscious), foreign body, swelling (anaphylaxis).
Pathological	Asthma (bronchospasm), pneumonia (fluid in alveoli).
Traumatic	Facial fractures, laryngeal trauma.

B. Ventilation/Perfusion (V/Q) Mismatch
- **Normal V/Q Ratio**: 0.8 (80% perfusion, 100% ventilation).
- **Causes of Mismatch**:
  - **Dead Space** (Ventilation without perfusion): Pulmonary embolism.
  - **Shunt** (Perfusion without ventilation): Pneumonia.

V. Patient Assessment
A. Signs of Adequate Breathing
- Rate: **12–20 breaths/min** (adults).
- Rhythm: Regular.
- Chest Rise: Symmetrical.
- SpO_2: **≥94%** on room air.

B. Signs of Inadequate Breathing
- **Tachypnea** (>20/min) or **Bradypnea** (<12/min).
- **Accessory Muscle Use** (neck/rib retractions).
- **Cyanosis**, altered mental status.
- **Abnormal Breath Sounds**:
  - **Stridor** (Upper airway obstruction).

- **Wheezing** (Lower airway obstruction, e.g., asthma).
- **Crackles** (Fluid in alveoli, e.g., pulmonary edema).

C. Pulse Oximetry & Capnography

Parameter	**Normal Range**	**Clinical Significance**
SpO_2	94–100%	<90% = Hypoxia.
$EtCO_2$	35–45 mmHg	<35 = Hyperventilation.
		>45 = Hypoventilation.

VI. Basic Airway Techniques

A. Opening the Airway

1. **Head Tilt-Chin Lift**:
   - For **non-trauma** patients.
2. **Jaw-Thrust**:
   - For **suspected spinal injury**.

B. Airway Adjuncts

Device	**Indications**	**Contraindications**
OPA	Unconscious, no gag reflex.	Conscious patients.
NPA	Semi-conscious, gag reflex intact.	Facial trauma, nasal bleeding.

C. Suctioning

- **Catheter Types**:
  - **Yankauer (Rigid)**: For oral secretions.
  - **French (Flexible)**: For nasal/narrow spaces.
- **Time Limit**:
  - **Adults**: ≤15 sec.
  - **Peds/Infants**: ≤10 sec.

VII. Oxygen Therapy

A. Delivery Devices

Device	**Flow Rate**	**FiO_2**	**Use Case**
Nasal Cannula	1–6 L/min	24–44%	Mild hypoxia.
Non-Rebreather	10–15 L/min	85–90%	Severe hypoxia/trauma.
Venturi Mask	Varies	24–50%	COPD (precise FiO_2).

B. Hazards of Oxygen
- **Fire Risk**: O_2 accelerates combustion (no smoking!).
- **Oxygen Toxicity**: Prolonged high FiO_2 → Free radical damage.

VIII. Advanced Airway Management
A. Bag-Mask Ventilation (BMV)
- **1-Person Technique**: Challenging (focus on seal).
- **2-Person Technique**: More effective (one seals mask, one squeezes bag).
- **Ventilation Rates**:
  - **Adults**: 1 breath/6 sec.
  - **Peds**: 1 breath/3 sec.

B. Endotracheal Intubation (ETI)
1. **Preoxygenate**: 100% O_2 for 3 mins.
2. **B.E. MAGIC Steps**:
   - **B**ag-mask.
   - **E**valuate airway.
   - **M**anipulate position.
   - **A**ttempt laryngoscopy.
   - **G**lide tube.
   - **I**nflate cuff & **C**onfirm placement.
3. **Confirmation**:
   - **$EtCO_2$**, bilateral breath sounds, chest rise.

C. Supraglottic Airways (SGA)
- **Examples**: LMA, King LT.
- **Use**: When ETI fails or unavailable.

IX. Special Scenarios
A. Pediatric Airway
- **Anatomy Differences**:
  - Larger tongue, narrower trachea.
  - **Cricoid Ring** is narrowest part (vs. glottis in adults).
- **Ventilation**: Use **peds-sized BMV** (avoid overinflation).

B. Tracheostomy Emergencies
- **Obstruction**: Suction or replace tube.
- **Ventilation**: Use pediatric mask over stoma.

C. Foreign Body Airway Obstruction (FBAO)

- **Conscious Adult**: Abdominal thrusts.
- **Unresponsive**: Start CPR + check mouth.

X. Key Algorithms & Mnemonics
A. DOPE for Tube Displacement
- **D**isplacement.
- **O**bstruction.
- **P**neumothorax.
- **E**quipment failure.

B. SOAPME for RSI Prep
- **S**uction.
- **O**xygen.
- **A**irway equipment.
- **P**harmacology.
- **M**onitors.
- **E**TT/syringe.

XI. Final Tips for Mastery
1. **Practice Skills**: BMV, suctioning, OPA/NPA insertion.
2. **Know Your Equipment**: O_2 tanks, laryngoscope blades (Mac vs. Miller).
3. **Stay Calm Under Pressure**: Airway emergencies require rapid, precise action.

Now you're ready to dominate airway management! 🚑💨

Airway Management Cheat Sheet
Quick Reference for EMTs & Paramedics

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1. Airway Anatomy
Upper Airway
- **Nose/Mouth** → **Pharynx** (Naso/Oro/Laryngo) → **Larynx** (Glottis, Vocal Cords).
- **Key Landmark**: **Cricoid Ring** (Narrowest in peds).

Lower Airway
- **Trachea** → **Bronchi** → **Bronchioles** → **Alveoli** (Gas Exchange).

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2. Opening the Airway

Technique	**Indication**	**Steps**
Head Tilt-Chin Lift	Non-trauma patients.	1. Forehead back, chin up.
Jaw-Thrust	Suspected spinal injury.	2. Lift jaw forward (no head tilt).

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3. Airway Adjuncts

Device	**Indication**	**Size Guide**
OPA	Unconscious, no gag reflex.	Corner of mouth → Earlobe.
NPA	Semi-conscious, gag intact.	Nostril → Earlobe.

Contraindications:
- OPA: Gag reflex.
- NPA: Facial trauma, epistaxis.

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4. Oxygen Delivery

Device	**Flow Rate**	**FiO_2**	**Best For**
Nasal Cannula	1–6 L/min	24–44%	Mild hypoxia.
Simple Mask	6–10 L/min	40–60%	Moderate hypoxia.
Non-Rebreather	10–15 L/min	85–90%	Severe hypoxia/trauma.
Venturi Mask	Varies	24–50%	COPD (precise FiO_2).

Rule: Always humidify if O_2 >4 hours.

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5. Bag-Mask Ventilation (BMV)
- **Rate**:
  - Adults: **1 breath/6 sec** (10/min).
  - Peds: **1 breath/3 sec** (20/min).
- **Volume**: Chest rise (avoid gastric distention).
- **2-Person BMV**: One seals mask, one squeezes bag.

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6. Intubation (ETI)

B.E. MAGIC Steps

1. **B**ag-mask preoxygenate (3 mins).

2. **E**valuate airway (Mallampati, thyromental distance).
3. **M**anipulate position (Sniffing for adults, flat for peds).
4. **A**ttempt laryngoscopy:
   - **Blade Choice**: Mac (curved) vs. Miller (straight).
5. **G**lide tube (watch cords).
6. **I**nflate cuff & **C**onfirm:
   - **$EtCO_2$** (35–45 mmHg), bilateral breath sounds.

Tube Depth:
- Adults: **23 cm** at teeth (men), **21 cm** (women).
- Peds: **Age/2 + 12** (oral).

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7. Supraglottic Airways (SGA)
- **LMA/King LT**: Use if ETI fails.
- **Insertion**: Lubricate, glide along hard palate.

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8. Pediatric Tips
- **Head Position**: Neutral (infants), slight sniffing (older kids).
- **Tube Size**: **Age/4 + 4** (uncuffed), **Age/4 + 3.5** (cuffed).
- **Compressions**: 2 fingers (infants), 1 hand (children).

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9. Special Scenarios
Foreign Body Airway Obstruction (FBAO)

Conscious Adult	**Unresponsive**
5 Abdominal Thrusts.	Start CPR + check mouth.

Tracheostomy Emergencies
- **Obstructed?** Suction or replace tube.
- **Ventilate**: Use peds mask over stoma.

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10. Critical Mnemonics
DOPE (Tube Displacement)
- **D**isplacement.
- **O**bstruction.
- **P**neumothorax.

- **E**quipment failure.

SOAPME (RSI Prep)
- **S**uction.
- **O**xygen.
- **A**irway kit.
- **P**harmacology.
- **M**onitors.
- **E**TT/syringe.

Quick Troubleshooting

Problem	**Solution**
No chest rise with BMV	Reposition airway, check seal.
↓ SpO_2 post-intubation	DOPE check + auscultate.
High $EtCO_2$ (>45 mmHg)	Increase ventilation rate.