

**Sports Medicine Emergency Management
2023 Educational Materials**
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AIRWAY MANAGEMENT IN THE EQUIPMENT-LADEN ATHLETE

Best Practices & Current Care Concepts



THANK YOU!



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 - Ambassador / Instructor- Stop the Bleed
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 - Member- State of Michigan Board of AT / Disciplinary Sub-Committee
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 - Member- Michigan Athletic Trainers' Society (MATs) AT Cares Committee

Disclosures



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- Participants should **ALWAYS** abide by their State license & local protocols & treatments or interventions approved by their medical director or employer at all times.

"It is better to be prepared and not have an opportunity than to have an opportunity and not be prepared!"

Les Brown

EXTREME SIMULATIONS
HYPER REALISTIC SOLUTIONS

Your First Time Should Feel Like Your Second

Learning Objectives

At the conclusion of the program, participants will be able to:

1. Identify the current NATA, Spine Injury in Sport Group (SIGS), and Emergency Medical Services recommendations regarding airway management in the equipment-laden & spine-injured athlete.
2. Identify and discuss the role of an athletic trainer within the interdisciplinary healthcare team to improve patient outcomes.
3. Examine and discuss the current scientific evidence related to the management of airway, breathing, and circulation in the equipment-laden athlete management.
4. Describe and demonstrate skills needed for the effective management of airway, breathing, and circulation in the equipment-laden athlete & the management and removal of protective athletic equipment.
5. Identify the role(s), characteristics, indications, contraindications, and precautions for managing the entire scene by implementing airway and spine injury management techniques and agents in the prehospital setting.
6. Demonstrate the proper sequence and implementation of critical decision-making skills and the current evidence.

What are we talking about?



What are we talking about?



What are we talking about?



Are you prepared?

Is today the day?

- In several forward operating bases during the Afghan and Iraq wars, a sign was posted that read,

“Is today the day?”

- It meant that is today the day you die, get wounded, or have to perform a heroic act in battle to save others?
- I use it in the context that is this the day you may have to save an athlete's or official's life, or their way of life. **Be prepared.**



“The Moment”

- ... at some point in your career

- Life will change instantly!

- Complacency & comfort

Your mental fitness after the event ~~may~~ **WILL** depend on your mental preparation before it occurs!

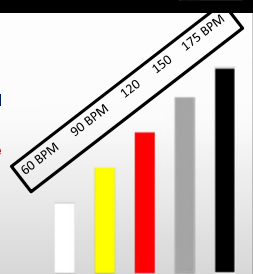
“You are not studying or practicing to pass the exam ...

You are studying / practicing for the day when you are the only thing between the athlete and the grave”

Somebody's Somebody

Stress Response

- **CONDITION WHITE-** Normal Resting HR
- **CONDITION MAIZE-** Fine motor skills ↓
- **CONDITION RED-** Complex motor skills ↓ but peak physical performance ↑ in gross motor; you are strong, faster, & will bleed less
- **CONDITION GRAY-** Cognitive processing ↓; you get tunnel vision, auditory exclusion, time dilation
- **CONDITION BLACK-** System overload, freezing, voiding of bowels & bladder



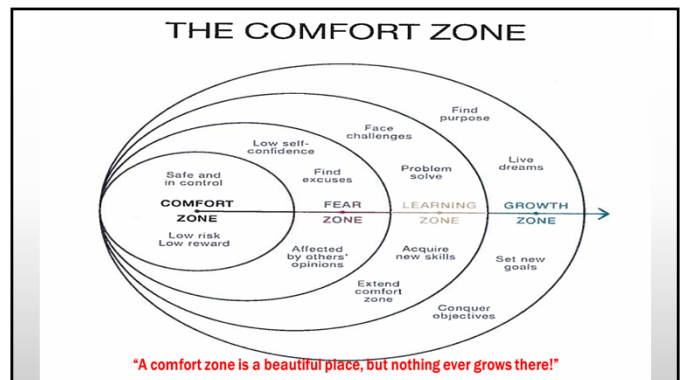


“Calm is Contagious”

Calm is contagious.

As is panic. Staying calm under pressure is an absolute requirement for effective leadership. The team responds to the behavior of its leadership. If managers and leaders fold under pressure so will everyone else. If you can't stay calm, you won't think or communicate clearly. Panic leads to misinformation, reactive behavior and poor decision-making which has a direct impact on efficiency and profitability. When we stay calm, we can project confidence and make the necessary adjustments with the best information at hand.

Biggest Enemy!?



Biggest Enemy

- Thinking something can't / won't happen!
- Not being prepared!

“

Nothing makes me more nervous than people who say, 'It can't happen here.' Anything can happen anywhere, given the right circumstances.

— MARGARET ATWOOD

MARGARETATWOOD.COM

“If it is predictable ... It is manageable!”

Practice vs Games



- **Practices-**
 - Less ATs
 - Usually no physician or EMS
 - More SAs participating
- **College- 162 (91%)**
- **Games-**
 - May have physician(s) and/or more ATs
 - May have standby EMS
 - Higher visibility
 - Less SAs participating simultaneously
- **College- 13 - 16 (9%)**

Overmanage



- **Be intentional** where others are unintentional
- Pay **extraordinary attention to details**
- View what is "typical" or "best practices" as a **baseline** as opposed to an **acceptable standard**
- Pay attention to details to a greater degree that others ignore or undermanage



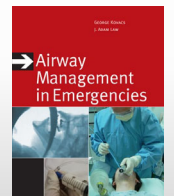
Unique factor in some athletic injuries is that the safety equipment that is designed to protect the athlete ~~can~~ **WILL** become a hindrance to prompt care of the athlete in the event of a serious injury.



What do we know?



- Airway compromise may occur slowly or suddenly or over a period of time creating a situation in which **effective airway management is imperative**
- Airway management is a mechanical skill & should be **MUST BE** mastered by pre-hospital personnel
- Inappropriate and/or insufficient airway management is a leading cause of preventable death following injury (Esposito TJ et al. 1995 / Esposito TJ et al. 1999)



"A Team of Experts is NOT an Expert Team ..."
(AHRQ TeamSTEPPS)

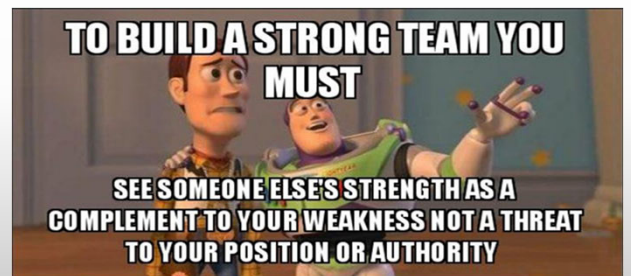
"When patient care is delivered as a series of INDEPENDENT actions, rather than INTERDEPENDENT actions of expert professionals, quality of care & patient safety is likely to be negatively impacted!"

Smartest vs. Smartest Room



TO BUILD A STRONG TEAM YOU MUST

SEE SOMEONE ELSE'S STRENGTH AS A COMPLEMENT TO YOUR WEAKNESS NOT A THREAT TO YOUR POSITION OR AUTHORITY



"School Bus Theory"

- Get the **"RIGHT PEOPLE"** on the bus!
- Make sure the people are in the **"RIGHT SEATS"**
- Make sure the bus is heading in the **"RIGHT DIRECTION"**



=

MOVING FORWARD



Two (2) Things

1. Inter-Professional Practice, Collaboration, & Communication

- Smartest vs Smartest Room
- **"Leave your ego at the door!"**

2. "Pit Crew" Concepts

- "School Bus Theory"

Leadership

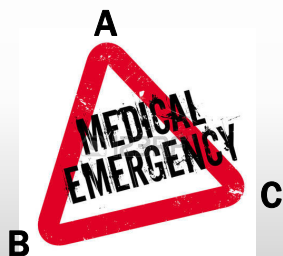
Followship

Relationships

- **Not mutually exclusive**- can be leader one moment & follower next
- **If appropriate relationships are built**, can go from one to other seamlessly & w/o conflict

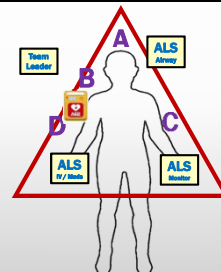
Immediate / Primary Response Team // Critical Care Triangle

(© Sports Medicine Concepts)



- **A-** Airway (open airway)
- **B-** Breathing (O2 / BVM)
- **C-** Circulation / Compressions
- **D-** Defibrillation / Devices
- **E-** EMS (call EMS / wait for EMS)
- **F-** Facility (gates / "wait locations")

Primary / Secondary Response Team



- **A-** Airway (open airway)
- **B-** Breathing (O2 / BVM)
- **C-** Circulation / Compressions
- **D-** Defibrillation / Devices
- **E-** EMS (call EMS / wait for EMS)
- **F-** Facility (gates / "wait locations")

Immediate / Primary Response Team // Critical Care Triangle

(© Sports Medicine Concepts)

- **Fluid & collaborative triangle**
- **Members may be interchanged as circumstances warrant**
- **Categorized according to position, responsibilities, credential, etc.**
- **One person may assume multiple roles or multiple people may assume the same role!**
- **A-Person (Airway / Acute Assessment)-**
 - Position- patient's head
 - **Credentials- TBD**
 - Role Delineation-
 - Assess LOC & CAB
 - Establish & maintain control of in-line stabilization
 - Reposition to cervical neutral as indicated
 - Direct repositioning / transfer / other maneuvers
 - Remove helmet & S/pads as indicated
 - Open airway / secure BVM
 - Transport w/ patient as indicated
 - Team leader (as indicated / if necessary)

Immediate / Primary Response Team // Critical Care Triangle

(© Sports Medicine Concepts)

- **B-Person (Breathing / Evaluation)-**
 - Position- Patient Thorax (Left or Right)
 - **Credentials- TBD**
 - Role Delineation-
 - Hand signals / communication
 - Patient evaluation (as indicated)
 - Checks pulse / breathing
 - Cuts / Prepares jersey, shoulder pads, undergarment for removal
 - Facemask removal
 - Inline stabilization transfer
 - OPA / NPA / Supraglottic airway insertion
 - Squeeze BVM
 - Airway suction (if necessary)
 - Alternates chest compressions with C- and/or D-person as necessary
 - Applies splints / devices as necessary
- **C-Person (Cardiac / Compressions)-**
 - Position- Patient Thorax (Left or Right)
 - **Credentials- TBD**
 - Role Delineation-
 - Hand signals / communication
 - Checks pulse / breathing
 - Cuts / Prepares jersey, shoulder pads, undergarment for removal
 - Facemask removal
 - Chest compressions
 - Applies splints / devices as necessary

Secondary Response Team



• D-Person (Defibrillator / Devices)-

- Position- Sideline ("Numbers Person") → opposite C person
- **Credentials- TBD**
- Role Delineation-
 - Receives hand signals / communication from field
 - Brings AED, Emergency bag(s), splint bag, etc. to the field
 - Sets up AED appropriately
 - Monitors AED / presses shock button when indicated
 - Alternates chest compressions with C-person as necessary
 - "Pack & Fill"
 - Prepares equipment / devices

• E-Person (EMS / Extra)-

- Position- TBD
- **Credentials- TBD**
- Role Delineation-
 - Receives hand signals / communication from field
 - Activates EMS
 - Greets EMS (if necessary and/or appropriate)
 - Drives cart (if necessary)
 - Helps direct location of cart
 - Assists on scene where needed
 - Documents / Records activities (as necessary and/or appropriate)

Secondary Response Team



• F-Person (Facilities / Family)-

- Position- TBD
- **Credentials- TBD**
- Role Delineation-
 - Opens gates / entrances for EMS
 - Stands at wait location(s) and/or directs others to stand at wait locations
 - Directs EMS to scene
 - Greets and/or directs family members
 - Crowd control
 - Assists in other places as needed

• TEAM LEADER-

- Position- Head or Foot of patient
- **Credentials- Physician, AT, or EMS**
- Role Delineation-
 - Manages scene
 - Monitors & directs activities of A - F
 - Hand-off report to EMS
 - Directs transition of care to EMS
 - Communication w/coaches, EMS, etc.

Command Structure



• Operational leadership, hierarchy, & role delineation to facilitate effective interdisciplinary critical care



• Oversight Command Structure-

- Designation of Team leader
- Observe, inform, & direct
- No active procedural role

• Procedural Command Structure-

- Designation of Team Leader
- Observe, inform, & direct while being actively engaged in completion of appropriate critical care tasks

EMS Arrival



1. Cardiac Monitor
2. IV Access / Medications
3. Airway
4. Mechanical CPR / Other Interventions

• EMS Team Leader

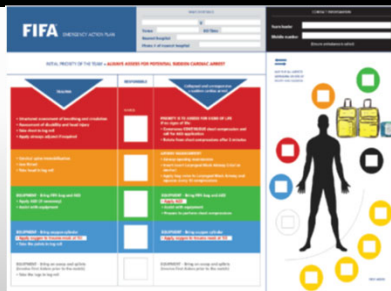


Patterson M et al. Br J Sports Med (2021)



• Standardized protocol

- "set piece" – optimized process where team practices for a predicted scenario
- Each member is designated to perform a role & the accumulation of the roles leads to a goal
- Task focused on key interventions w/o distraction
- Scripted & reproducible process
- "Closed-loop" communication
- Pre-designated "captain" → initial assessment to hands off coordination of the response



"Pit Crew Concepts"



• Systems based approach

- Each person has a specific pre-assigned duty
- Each person is strategically placed to maximize effectiveness
- Each duty is coordinated for efficiency
- As personnel integrate into the system → add interventions
- Frequent practice



Highly Functioning Pit Crew Team



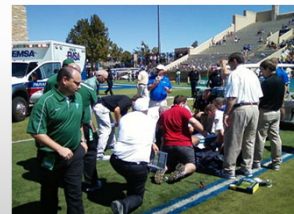
- Preparation
- Equipment Organized to be Efficient



Highly Functioning Pit Crew Team



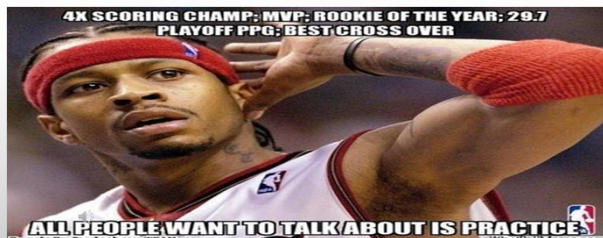
- Team member roles pre-assigned



Highly Functioning Pit Crew Team



- Frequent practice / simulation



"If it's predictable, it's manageable"



Emergency Planning- Personnel



- What personnel are involved in your management of emergency situations?

- Immediate Response
- Before EMS arrives
- Unstable Patient?
- After EMS Arrives?
- Visiting Team?

- What training / equipment do they have?

- Is a coach, strength coach, student, etc. who has trained with ATs & the various equipment & techniques suited for involvement at various times?



Communication



- 5G-
- up / down / across / diagonal / 360°

- "Is it what you said or what they heard?"

- Intentional Communication-
- 1, 2, 3 lift / "Ready to lift, Lift"
- "I have c-spine, you can release"

- Closed-Loop Communication-

- Military origins
- Built to assure transmission & reception of information in an environment where communication can be confusing & pressured

- Process of acknowledging the receipt of information & clarifying w/ the sender of the communicated message that information received is the same as the original, intended information
- Every transmission has a reply / acknowledge receipt

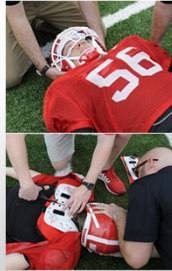
- Standard terminology

Inline Cervical Stabilization

How does your hand placement differ?

- Supine Patient
- Prone Patient
- Combative / Seizures
- Log Roll
- Lift & Slide

- Thumbs pointed towards face, regardless of whether the athlete is prone or supine



Primary Objectives- CAB vs ABC

CABN (© Sports Medicine Concepts)

- Circulation-**
 - Pulse
 - Uncontrolled Hemorrhage
- Airway-**
 - Patent airway
 - Open the airway (Jaw Thrust)
 - Secure / Manage Airway
- Breathing-**
 - Assure adequate ventilation
- Neurological**

ABC-

- Airway** (High Cervical Injury concern)-
 - "C3 / C4- breathe no more"
 - "C3, C4, C5 keep the body alive"

Ability to manage a difficult airway (supraglottic / ETT / RSI / cric)

- Breathing**
- Circulation**

Cervical nerves
"C3,4,5 keeps the diaphragm alive!"

- C1
- C2
- C3
- C4
- C5
- C6
- C7

Primary Objectives

- Exposure & access to vital life functions must be established or easily achieved in a reasonable & acceptable manner**

- Equipment DOES NOT matter!

High-Quality CPR Benchmarks-

- Pulse check (<10 seconds)
- Push hard / fast (100 - 120)
- 2" (5cm) - 2.5" (6cm) depth of compression
- < 10 second delay/disruption
- CCF = 60% - 80%
- AED placement ASAP
- 1 breath every 5 - 6 seconds
- BVM = 500 - 600ml per breath (1/2 squeeze) → chest rise
- Asynchronous breathing w/ advanced airway

BVM Ventilation

- The most important airway skill!**
- Requires practice to master!**
- Always the first response to inadequate oxygenation & ventilation**
- Delays the collapse & urgency to intubate**

- Can be a 1, 2 or 3 person skill ("Pit Crew")**
 - Person 1 → open airway
 - Person 2 → maintain face seal
 - Person 3 → squeeze bag
- Pull the chin into the mask!**
- Do not push the mask down onto the face!**

BVM Ventilation

1-handed EC Clamp-



2-handed C-E



Figure 2. The two-handed C-E technique.

2-handed T-E / V-E



Figure 3. The two-handed V-E technique (also known as the alternative technique).

BVM Ventilation



Mechanical Airways



• Oropharyngeal Airway (OPA)

• Nasopharyngeal Airway (NPA)

- Assists in preventing the tongue from obstructing the back of the throat & thereby helping to preserve the airway

- Improperly placed → pushes the tongue further into the airway, causing blockage



Oropharyngeal Airway (OPA)



• Advantages-

- Helps to secure airway by preventing the tongue from obstructing the back of the throat
- Easy to place

• Disadvantages-

- Gag reflex
- Improperly sized airway can push the tongue further into the airway

• Indications-

- Unresponsive patient w/o gag reflex
- Apneic patient being ventilated w/BVM

• Contraindications-

- Conscious patient
- Intact gag reflex



Oropharyngeal Airway (OPA)



• Sizing-

- Measure level of the teeth to the angle of the jaw

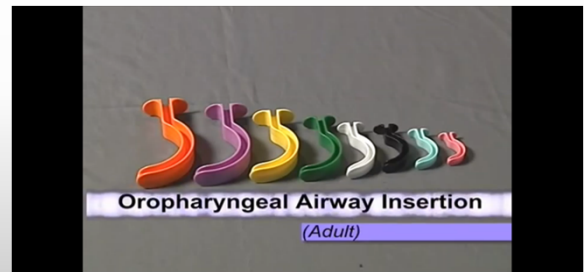


• Insertion Methods-

- Open patient's mouth using crossed-finger (scissor) technique
- Insert OPA upside down along the roof of the mouth
- Rotate the OPA 180 degrees when it touches the back of the mouth
- Continue to advance the airway until the flange is resting on the patient's front teeth



Oropharyngeal Airway (OPA)



Nasopharyngeal Airway (NPA)



• Advantages-

- Helps to secure airway by preventing the tongue from obstructing the back of the throat
- Easy to place
- Can use when patient has an intact gag reflex

• Disadvantages-

- Cannot use with a patient that has facial injuries and/or a suspected skull fracture
- Improperly sized airway can aggravate the cough and/or gag reflex

• Indications-

- Unresponsive patient w/a gag reflex
- Patient will not tolerate an OPA
- Patient has clenched teeth

• Contraindications-

- Suspected skull fracture
- Maxillofacial trauma



Nasopharyngeal Airway (NPA)



• Sizing-

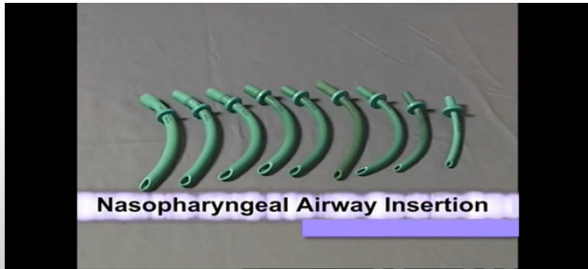
- Measure from tip of nose to the tip of the earlobe or angle of the jaw
- Sizing based on the width of the patient's 5th finger is inaccurate (Roberts K et al 2005)
- Correctly placed → should lie just above (~10mm) the epiglottis (Stoneham MD 1993)
- Too short → fails to separate the soft palate from the pharynx
- Too long → can pass into the larynx & aggravate cough & gag reflexes

• Insertion Methods-

- Lubricate w/water-soluble lubricant
- Insert w/bevel facing septum
- Continue following the natural curvature of the floor of the nasopharyngeal cavity until the flange is resting on the nasal flare
- If resistance is encountered, try the other nostril



Nasopharyngeal Airway (NPA)



Primary Assessment



Breathing-

- ILCOR (2015)-
 - 1 breath every 5 – 6 seconds (<13)
 - Duration of breath should be 1 second
- Do not hyperventilate, especially with a head injury
- Mouth to Mask
- Bag-Valve Mask



Figure 1. The one-handed C-E technique.

Options



- Continuum beyond the basics
→ Advanced Airways
 - Can you mask ventilate
 - Does an NPA help?
 - Do they accept an OPA?
 - Is the patient getting better or worse?
 - Do I need to move the patient?
 - Where is the equipment?
 - How comfortable are you with the skill?

Progression past OPA / NPA



- Why?-
 - Continuum
 - Definitive airway vs OPA / NPA
 - Ability to do asynchronous CPR
 - Ability to ventilate w/facemask removal only vs full equipment removal



Supraglottic Airways



- Indications-
 - Irreversible respiratory arrest (i.e. Narcotic overdose; hypoglycemia)
 - Cardiac arrest
 - Ventilation support with the absence of a gag reflex
 - Contraindications-
 - Gag reflex
 - Pt at risk for aspiration
 - Caustic ingestion
 - Pt size not w/in range
 - Massive thoracic or maxillofacial injuries
 - Greater than 14 – 16 weeks pregnant
- Not all contraindications are absolute

Supraglottic Airways



- Which Airway to Use?-
 - Medical direction
 - What does EMS use?
 - Ease of use
 - Training
- King LTD
- LMA
- iGel
- Air Q

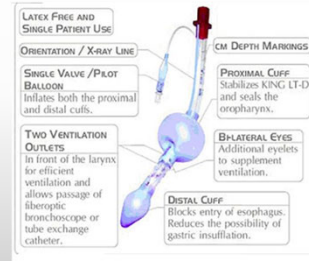


Advanced Airways- Insertion

- Have all equipment ready prior to attempt
- Test cuff inflation system for leaks (if applicable)
- Apply a water-soluble lubricant to the **posterior** distal tip of the device
- Hold airway device in dominant hand at proximal connector
- Use a superior (to patient's head) approach
- Perform a tongue-jaw lift while keeping head in a **neutral** position
 - Head can be slightly extended ("sniffing" position) if needed to facilitate placement



King LTD / LTSD



- Easier to place & use →
 - 1 port
 - 1 tube
 - Does not require extensive skill training
- Can be placed quickly
- Limits gastric inflation & aspiration of vomit
- No interruption of CPR is necessary
- Little or no spinal movement

King LTD / LTSD

			
	SIZE 3	SIZE 4	SIZE 5
COLOR	Yellow	Red	Purple
SIZE	3	4	5
ITEM #	KLTD203	KLTD204	KLTD205
OD	14 mm	14 mm	14 mm
ID	10 mm	10 mm	10 mm
RECOMMENDED PATIENT SIZE	4-5 feet (122-155 cm) in height	5-6 feet (155-180 cm) in height	greater than 6 feet (180 cm) in height
CUFF PRESSURE	60-70 cmH ₂ O	60-70 cmH ₂ O	60-70 cmH ₂ O
MAXIMUM CUFF VOLUME	60 ml	80 ml	90 ml
	Range: 45-60 ml	Range: 60-80 ml	Range: 70-90 ml

King LTD / LTSD- Insertion

1. With the device rotated laterally 45-90 degrees such that the blue orientation line is touching the corner of the mouth, introduce the tip into the mouth & advance behind the base of the tongue
2. As the tube passes under the tongue, rotate the tube back to midline (blue orientation line faces chin)
3. Without excessive force, advance the tube until the connector is aligned with the teeth and/or gums
 - Important that the King airway is advanced all the way



King LTD / LTSD- Insertion



4. Use a syringe to inflate the cuff w/the appropriate volume of air-
 - #3 - 45 - 60 ml
 - #4 - 60 - 80 ml
 - #5 - 70 - 90 ml

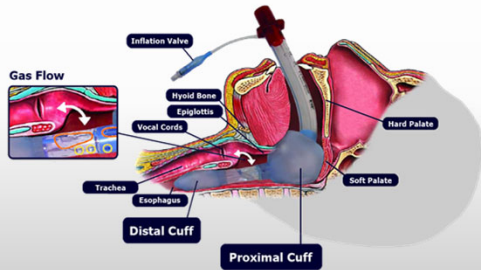


King LTD / LTSD- Insertion

5. Attach BVM & ventilate the patient
6. While ventilating, simultaneously withdraw the tube until ventilation is easy & free flowing (good tidal volume w/minimal resistance)
7. Perform standard evaluation of lung sounds while ventilating
8. Re-adjust cuff inflation as needed
9. Consider securing tube w/tape or ET tube holder
10. Check airway after every movement.



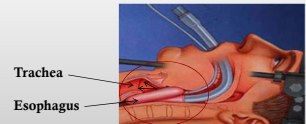
King LTD / LTSD- Insertion



Advanced Airways

Laryngeal Mask Airways-

- Provide "oval seal around the laryngeal inlet" once the LMA is inserted & cuff is inflated
- Lies at the crossroads of the esophagus & trachea once inserted



LMA Insertion

- Step 1: Size selection
- Step 2: Examination of the LMA
- Step 3: Check deflation and inflation of the cuff
- Step 4: Lubrication of the LMA
- Step 5: Position the Airway

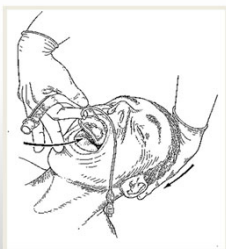


LMA Insertion- Step 1

- Grasp the LMA by the tube, holding it like a pen as near as possible to the mask end
- Place the tip of the LMA against the inner surface of the patient's upper teeth



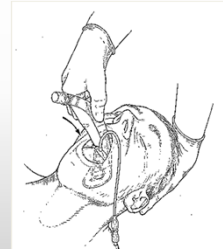
LMA Insertion- Step 2



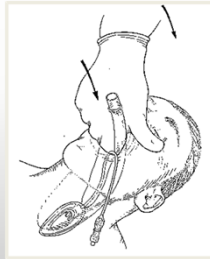
- Under direct vision-
 - Press the mask tip upwards against the hard palate to flatten it out
 - Using the index finger, keep pressing upwards as you advance the mask into the pharynx to ensure the tip remains flattened & avoids the tongue.

LMA Insertion- Step 3

- Keep the neck flexed & head extended
- Press the mask into the posterior pharyngeal wall using the index finger



LMA Insertion- Step 4



- Continue pushing with the index finger
- Guide the mask downward into position

LMA Insertion- Step 5



- Grasp the tube firmly with the other hand
- Then withdraw your index finger from the pharynx.
- Press gently downward with your other hand to ensure the mask is fully inserted.

LMA Insertion- Step 6

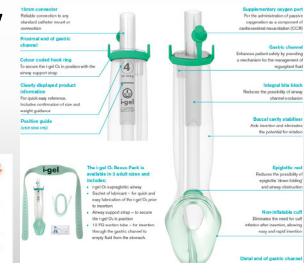


- Connect the LMA to a BVM
- Inflate the mask with the recommended volume of air.
- Do not over-inflate the LMA.
- Do not touch the LMA tube while it is being inflated unless the position is obviously unstable.
- Normally the mask should be allowed to rise up slightly out of the hypopharynx as it is inflated to find its correct position.
- Ventilate the patient while confirming equal breath sounds over both lungs in all fields and the absence of ventilatory sounds over the epigastrium

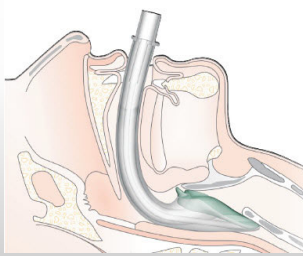
iGel



- 2nd generation LMA type supraglottic airway
- Soft, gel-like, non-inflatable cuff
- Integral bite block
- Not necessary to insert fingers or thumbs into the patient's mouth during the insertion process
- 3 adult sizes-
 - Size 3- 30-60kg (65-130 lbs)
 - Size 4- 50-90kg (110-200 lbs)
 - Size 5- 90+kg (200+ lbs)



iGel



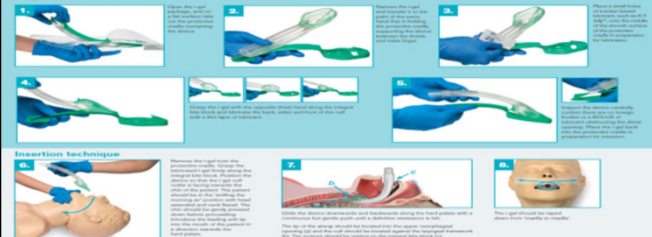
- Must be lubricated prior to use
- Pt should always be in the "sniffing the morning air" position prior to insertion
- Leading edge of tip should follow the hard palate on insertion
- Excessive air leak is primarily due to either sub-optimal depth of insertion
- After insertion, device should be taped down from maxilla to maxilla

iGel- Insertion



The i-gel® supraglottic airway - adult sizes

Preparations for use



Using the i-gel O₂ Resus Pack

Preparation for use

1. Lubricate the i-gel O₂ Resus Pack for your patient.
2. Remove the i-gel O₂ Resus Pack from its packaging. Do not touch the i-gel O₂ Resus Pack with your hands. Do not touch the i-gel O₂ Resus Pack with your hands. Do not touch the i-gel O₂ Resus Pack with your hands.
3. Remove the i-gel O₂ Resus Pack from its packaging. Do not touch the i-gel O₂ Resus Pack with your hands. Do not touch the i-gel O₂ Resus Pack with your hands. Do not touch the i-gel O₂ Resus Pack with your hands.
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Insertion technique

5. Insert the i-gel O₂ Resus Pack into the patient's mouth. Do not touch the i-gel O₂ Resus Pack with your hands. Do not touch the i-gel O₂ Resus Pack with your hands. Do not touch the i-gel O₂ Resus Pack with your hands.
6. Insert the i-gel O₂ Resus Pack into the patient's mouth. Do not touch the i-gel O₂ Resus Pack with your hands. Do not touch the i-gel O₂ Resus Pack with your hands. Do not touch the i-gel O₂ Resus Pack with your hands.
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Air Q Airway

The tethered connector avoids misplacing the connector.

New Blocker Channel accepts NG Tubes for managing the esophagus.

Built up Mask Seal for improved seal.

Elevation Ramp: Facilitates intubation. Directs the ET tube towards the laryngeal inlet.

Removable Color Coded Connector: Allows intubation through the airway tube with any standard ET tubes. Color Coding into the standard for Masked Laryngeal Airways.

Integrated Bite Block: Easier to place. Reinforces the tube. Eliminates the need for separate bite block.

- Available in 1/2 sizes to fit a broader range of patients
- Integrated bite block
- Able to suction through airway blocker channel
- Removable connector allows for intubation through it & Air-Q removal after intubation
- Sizes-

Instructions For Use:			
Size	Weight	Intubation Volume	Inflation Pressure
4.5	70-100 kg	± 14 ml	± 80 cm H ₂ O
5.5	80-110 kg	± 12 ml	
6.5	90-120 kg	± 10 ml	

Air Q Airway- Insertion

1. Lubricate the back & front ridges of the mask cavity
2. Open the patient's mouth & elevate the tongue using a mandibular lift
3. Place the front portion of the Air-Q between the base of the tongue & soft palate
4. Pass the Air-Q into position by applying inward & downward pressure using the curvature of the airway
5. Check position- Incisors between 2 horizontal marks
6. Inflate the airway with 2cc - 5cc of air
 - Firm bounce on the pilot balloon
7. Head in neutral position
8. Ventilate patient
9. Verify ventilation

"Bridging the Gap"

- Airway-**
 - Who is responsible for the Airway?
- Equipment Considerations**
 - Limit movement of patient once advanced airway is in place
 - Airway technician → assumes commands to move
 - Always roll pt towards airway / technician if necessary to move
- Airway Equipment-**
 - OPA, NPA, & BVM
 - Supraglottic Airways
 - Endotracheal Intubation
 - RSI
 - Surgical Airway

Supplemental Oxygen

- Indications-**
 - Altered mental status
 - Cardiac distress or arrest
 - Drug overdose
 - Fractures
 - Head, chest, & abdominal trauma
 - Respiratory arrest (<12 rpm / >20 rpm)
 - Respiratory distress
 - Shock
 - Cerebrovascular accidents
- Precautions-**
 - Cylinders should be regularly inspected & stored in an upright position
 - Handle oxygen cylinders w/care
 - Do not smoke, have open flames, or use anything flammable near the oxygen equipment
 - Make sure that the regulator is properly seated & tight
 - If defibrillating, make sure that no one is touching or is in contact w/the victim or resuscitation equipment

Supplemental Oxygen

- Nasal Cannula-**
 - Most common
 - Delivers constant flow
 - Delivers 24% - 46% O₂
 - As flow rate increases from 1 L/min to 6 L/min → FIO₂ increases from 0.24 to 0.46
 - 1 = up to 24%
 - 2 = up to 28%
 - 3 = up to 32%
 - 4 = up to 36%
 - 5 = up to 40%
 - 6 = up to 46%
 - Rate > 6 L/min → variable FIO₂ & need humidification
- Simple Mask-**
 - Flow rate 6 - 10 L/min
 - Must maintain flow rate of at least 6 L/min to maintain inspired O₂ concentration & prevent rebreathing of CO₂
 - Lateral perforations allow exhaled CO₂ to escape
 - Delivers 35% - 60% O₂
 - 6 L/min = 35%
 - 7 L/min = 41%
 - 8 L/min = 47%
 - 9 L/min = 53%
 - 10 L/min = 60%

Supplemental Oxygen



- Non-Rebreather Mask-**
 - Face mask + O₂ reservoir + exhalation port
 - Pt inhales O₂ from bag & exhaled air escapes through flutter valves
 - Highest possible FIO₂ w/o intubation
 - Inflate reservoir bag prior to placing on pt.
 - Flow rate must be sufficient to keep the reservoir bag 1/3 to 1/2 inflated at all times
 - Delivers up to 100% oxygen-
 - 6 L/min = 55 - 60%
 - 8 L/min = 60 - 80%
 - 10 L/min = 80 - 90%
 - 12 L/min = 90%
 - 15 L/min = 90 - 100%
- AMBU Bag / BVM-**
 - Provides ~ 500ml per breath
 - W/o supplemental oxygen = 21% oxygen
 - Flow rate = 15 L/min
 - Delivers up to 100% oxygen



Supplemental Oxygen



Oxygen Delivery Equipment		
Device	Flow Rate in Liters/minute	Percent FIO ₂ delivered
nasal cannula	1	25%
	2	28%
	3	33%
	4	37%
	5	41%
	6	45%
Simple Face Mask	6	35%
	7	41%
	8	45%
	9	53%
	10	60%
Nonrebreather Mask	10-15	80%-100%*
		* Both flaps removed results in lower (85%-95%) FIO ₂
		* One flap removed results in higher (95%-100%) FIO ₂
		* Both flaps in place results in maximum (95%-100%) FIO ₂
Venturi Mask (venti-mask)		
	Blue	24%
	White	28%
	Orange	31%
	Yellow	35%
	Red	40%
	Green	45%

Oxygen Therapy		
Device	Flow Rate	Percent FIO ₂ delivered
Nasal cannula	1-6 L/min	25%-45%
Simple face mask	6-10 L/min	35%-45%
Nonrebreather mask	10-15 L/min	80%-100%
Venturi mask	4-10 L/min	24%-45%

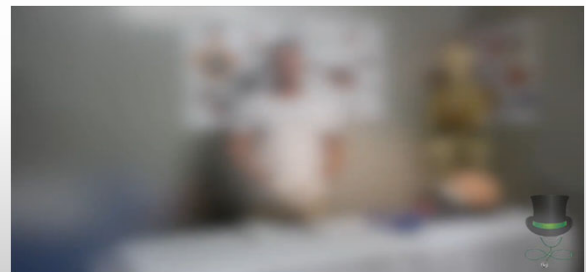
Suction



- Appropriately size suction catheter
- Hyper oxygenate BEFORE each suction pass
- Insert catheter to pre-measured depth
- Apply suction on withdrawal of catheter
- Limit suctioning to 15 seconds
- Discontinue if HR ↓ by 20, ↑ by 40, SPO₂ decreases < 90%, or if arrhythmias are produced



Suction



Does the presence of protective equipment affect chest compressions?



FB Equipment & Chest Compressions



- Waninger KN et al. Clin J Sports Med (2014)-
 - Chest compression depth significantly decreased (15%) when performed over football S' pads
 - No effect on chest compression rate or adequate chest wall recoil
- Lynall RC Med Sci Sports Exere (2014)-
 - Adequate chest compressions precluded over S' pads
 - Chest compressions were deeper when performed under S' pads, pads played, or pads removed
 - % of adequate compressions was lowest when S' pads were left in place
- Mihailik JP et al. Prehosp Emerg Care (2016)
 - Chest compressions over football S' pads resulted in lowest compression depth & compromised delivery of adequate compressions compared to direct compressions on chest (under S' pads / pads lifted; pads played)
 - CPR was accomplished most effectively (↑ mean compression depth & rate) w/ S' pads entirely removed
 - Playing S' pads is an alternative strategy provided they are not displaced superiorly & compromise the airway
- Del Rossi G et al. Resuscitation (2011)-
 - Presence of athletic equipment delays initiation of CPR
 - Exposing chest added 24.4s (± 7s) to the initiation of chest compressions
 - Delivering chest compressions over pads enables more accurate compressions (hand placement) & more often to an adequate depth
 - Chest wall recoil was better in pads OFF condition

Lax Equipment & Chest Compressions



- Clark MD et al. J Athl Train (2018)-
 - Chest compression quality (mean depth, adequate depth %, recoil %) was compromised by presence of lacrosse S' pads
 - Lacrosse S' pads should be lifted or removed for CPR
- Boergers RJ et al. J Athl Train (2018)-
 - Presence of lacrosse S' pads does not inhibit the ability to administer chest compressions w/ adequate rate & depth (>50mm)
 - With appropriate training to improve hand placement, lacrosse S' pad may be left in place during CPR

Does the presence of equipment and/or a chinstrap affect BVM use / quality ventilations?



Chinstrap & Ventilations



- Mihailik JP et al. Prehosp Emerg Care (2016)-
 - ATs were able to deliver significantly ↑ ventilation volumes & ↑ % of adequate volume in non-chinstrap conditions
 - Chinstraps pose a barrier to establish & maintain a proper seal & inhibits an adequate jaw thrust
- Clark MD et al. J Athl Train (2018)-
 - Chinstrap in place resulted in ↓ mean ventilation volume & % of optimal volume ventilations in lacrosse athlete
- Bowman TG et al. J Athl Train (2018)-
 - Lacrosse helmet chinstrap inhibited quality ventilations (rate & volume) when using a mask device
 - King Airway allowed quality ventilations w/ chinstrap in place
 - If KA is not available, helmet may need to be removed
- Delaney JS et al. J Athl Train (2011)-
 - Chin straps interfere w/ access to the mandible angle & proper BVM use

Chinstrap & Ventilations



- Once a chinstrap is cut or removed, is the head secured within the helmet?
 - w/o a chinstrap, the head is free to move w/in the helmet, eliminating any effectiveness the helmet may have had in limiting cervical spine motion
- Mihailik JP et al. Clin J Sport Med (2008)-
 - Despite manual stabilization of helmet, head experienced sagittal movement inside helmet
- Silva KJ et al. J Athl Train Supplement (2015)-
 - Despite manual stabilization of helmet, head experienced sagittal movement inside helmet



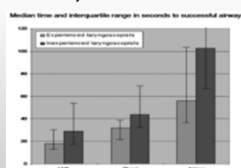
Football Equipment & Ventilations



Does the presence of equipment affect BVM use / quality ventilations?



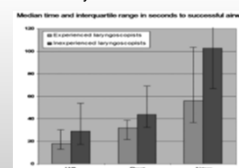
- Burkey S et al. Clin J Sport Med (2011)-
 - 93% success rate for ET intubation
 - 99% success rate for LMA
 - Time to airway was faster with LMA vs ETI



Football Equipment & Ventilations



- Mihailik JP et al. Prehosp Emerg Care (2016)-
 - ATs were able to deliver significantly ↑ ventilation volumes & ↑ % of adequate volume in non-chinstrap conditions
 - Chinstraps pose a barrier to establish & maintain a proper seal & inhibits an adequate jaw thrust
 - BVM ventilation > pocket mask ventilation
 - ATs should consider including BVM as part of their EAP & train non-medical assistants on how to squeeze bag
- Burkey S et al. Clin J Sport Med (2011)-
 - 93% success rate for ET intubation
 - 99% success rate for LMA
 - Time to airway was faster with LMA vs ETI



Lax Equipment & Ventilations

- Clark MD et al. J Athl Train (2018)-
 - FM removed / chinstrap in place = ↓ mean ventilation volume & ↓ % of optimal ventilations vs FM & chinstrap removed or helmet removed conditions
 - FM & chinstrap or entire helmet should be removed to deliver ventilations**
 - BVM ventilations = > mean ventilation volume vs. pocket mask

Table 2: Ventilation Outcome Measures

Outcome Measure	Ventilation Condition (Mean ± SD)						Comparison					
	Facemask Removed and Chinstrap in Place		Facemask and Chinstrap Removed		Helmet Removed		Equipment Condition		Ventilation Method		Interaction	
	Bag-Valve Mask	Pocket Mask	Bag-Valve Mask	Pocket Mask	Bag-Valve Mask	Pocket Mask	F	P	Effect Size*	F	P	Effect Size*
No. of ventilations	23.5 ± 4.8	18.7 ± 7.0	24.5 ± 5.0	22.1 ± 3.9	23.6 ± 3.8	22.4 ± 3.4	6.124	.003	0.414	25.002	<.001	0.575
Volume, mL	307.6 ± 85.3	341.9 ± 103.4	364.7 ± 91.7	403.4 ± 182.0	389.4 ± 88.2	347.2 ± 198.1	44.435	<.001	1.323	9.590	.002	0.586
Optimal volume, %	45.3 ± 40.6	35.3 ± 25.0	50.0 ± 17.0	57.2 ± 36.3	53.5 ± 20.2	51.6 ± 38.4	23.791	<.001	1.038	23.772	<.001	0.671

* Compares the helmet-removed and facemask-and-chinstrap-removed conditions with the chinstrap-in-place condition, collapsing across ventilation methods.
 * Compares the bag-valve mask with the pocket mask, collapsing across equipment conditions.

Lax Equipment & Ventilations

- Bowman TG et al. J Athl Train (2018)-
 - Helmet chinstrap inhibited quality ventilations (rate & volume) when using a mask device**
 - King Airway allowed quality ventilations w/chinstrap in place
 - If KA is not available, helmet may need to be removed**

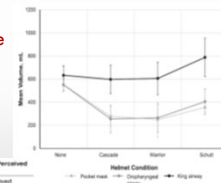


Table: Descriptive Statistics of Helmet Conditions and Airway Management Devices for Ventilation, Volume, and Rating of Perceived Difficulty Scores, Mean ± SD

Helmet Condition	Ventilation Rate, ventilations/min			Mean Volume, mL			Rating of Perceived Difficulty Score		
	PM	CFA	KA	PM	CFA	KA	PM	CFA	KA
No helmet	5.0 ± 1.2	5.3 ± 1.1	5.3 ± 1.2	354.1 ± 105.3	360.0 ± 106.4	402.7 ± 105.0	1.8 ± 1.0	1.8 ± 0.9	1.3 ± 0.8
Chinstrap helmet	3.0 ± 2.2	2.8 ± 2.8	5.2 ± 0.9	277.6 ± 149.3	294.0 ± 201.6	387.1 ± 217.1	4.0 ± 2.3	4.1 ± 2.5	1.3 ± 0.7
Full helmet	2.8 ± 1.6	2.6 ± 2.3	5.2 ± 0.8	264.5 ± 151.9	294.1 ± 199.0	389.2 ± 204.0	4.2 ± 2.3	3.5 ± 1.7	2.0 ± 1.4
Warrior helmet	2.8 ± 2.8	2.5 ± 2.5	5.0 ± 0.7	249.3 ± 205.9	287.2 ± 215.9	405.7 ± 248.8	2.6 ± 1.4	2.1 ± 1.5	1.3 ± 1.9

Abbreviations: KA, King airway; CFA, oral pharyngeal airway; PM, pocket mask.
 * PM: Leland Medical, Wapington Falls, NY; CFA: Dynarex Corporation, Champaign, NY; KA: King Systems Corporation, Noblesville, IN.
 * Cascade P (Cascade, Inc., Liverpool, NY); Schutt Station (STX LLC, Baltimore, MD); and Warrior Evo (Warrior Inc., Boston, MA).

Lax Equipment & Ventilations

- Davis MP et al. UNC Masters' Thesis (2017)-
 - Removal of chinstrap limits the effectiveness the helmet would have on stabilizing the cervical spine
 - Lacrosse helmet should be entirely removed in the case of a suspected cervical spine injury in which airway access must be established

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Bridging the Gap

- Considerations-
 - ALS vs BLS care
 - Patient status
 - Sport / Equipment
 - Facemask removal vs helmet & shoulder pad removal
 - Airway devices
 - Available trained personnel
 - Methods
 - Mechanical CPR use



Bridging the Gap

- Highest priority is maintenance of CAB
- Access to airway should be obtained prior to transport / movement **regardless of airway status**
- Tools & **trained personnel** should be available for facemask removal and/or equipment removal
- TEAM** must carefully weigh all factors & make educated decisions on what best fits into their individual situations



- "There is no such thing as always and NEVER!"

Dr. James Andrews, MD

- Black & White vs. Gray
 - Every emergency situation & every patient is different
 - Individual circumstances must dictate appropriate actions



What do we know? (SISG, 2019)



- No studies that have directly examined patient outcomes
- No statistically-significant differences in static cervical alignment or dynamic cervical motion when comparing full equipment to no equipment
- Removal of American football helmet alone = greater cervical lordosis
- Removal of helmets w/o concurrent removal of S' pads may result in malalignment of cervical spine.
- Removal of helmets & S' pads creates small, statistically significant amount of spinal movement.
 - It is unknown what degree of cervical spine motion during equipment removal is clinically significant.
- Alignment of the cervical spine is statistically equivalent when the helmet & S' pads are on vs. when they have been removed.

What do we know? (SISG, 2019)



- Equipment design influences speed & motion involved in removal
- Deflation of helmet bladder does not seem to ↓ motion or difficulty of helmet removal, but does ↑ removal time
- Specific sport matters-
 - Football
 - Ice Hockey
 - Lacrosse
 - Baseball / Softball
 - Field Hockey
 - Extreme Sports
- No evidence that helmet fit (proper or improper) is a significant factor in c-spine immobilization
- Removal of ice hockey helmet prior to prone logroll may ↓ c-spine motion
 - Studies have not formally compared techniques or outcomes based on the number of people involved.
- Insufficient data to determine and/or make a conclusion about the number of people necessary to remove equipment

Equipment Removal



- The highest priority is maintenance of CAB & maintaining cervical alignment.
- When deemed necessary and appropriate by onsite medical personnel, protective equipment (helmet and shoulder pads) *MAY* be removed prior to transport while minimizing cervical spine motion
 - Trained personnel should remove helmet & S' pads from athletes with compromised CAB or ↓ LOC
 - If the athlete is found w/the helmet off & S' pads in place, then the head should be supported to maintain cervical spine alignment.
- Athlete height & weight, make / model, & condition of equipment, & type of immobilization devices available should all be considerations when deciding whether to remove helmet & S' pads prior to transport.
- In cases where the conditions to remove the equipment on the field are not present (e.g., status of the injured athlete, insufficient personnel, etc.), removal should occur in the hospital setting
- Trained medical personnel on-site should employ clinical judgment & discretion in determining the number of people necessary to safely remove equipment
 - Number of trained personnel to remove helmet / S' pads depends on the technique used, athlete size, & equipment present

"Bridging the Gap"



- 2 Schools of Thought-
 - Remove only that equipment which is in the way of your critical care task completion
 - Carotid Pulse / CPR / AED
 - Airway Management
 - Breathing
 - Complete equipment removal
 - Resources / Training
 - When to Remove
 - How to Remove
 - Time (< 30-45 seconds)
 - Other variables (e.g. weather)
- "There is no such thing as always & never!"
 - Every emergency situation & every patient is different
 - Individual circumstances must dictate appropriate actions
- Doesn't matter which school of thought you subscribe to, the most important piece is that you practice!

NO Pulse



- Critical Care Task Approach-
 - Cut Jersey & bi-valve shoulder pads
 - Immediately start compressions
 - Attach AED / Monitor when available
 - IV access when available
 - Remove equipment concurrently during compressions OR Remove facemask and/or helmet to deliver breaths and/or insert an advanced airway
 - "Pack & Fill" once helmet is removed
 - Apply cervical collar when appropriate
 - Remove equipment when moving to spineboard / stretcher
- Equipment Removal Approach-
 - Cut Jersey & bi-valve shoulder pads
 - Prepare helmet for removal
 - Remove helmet & shoulder pads
 - Begin compressions
 - Attach AED / Monitor
 - IV access when available
 - Apply cervical collar when appropriate
 - Move to spineboard / stretcher when appropriate

+ Pulse / No Breathing



- Critical Care Task Approach-
 - Remove facemask and/or helmet to deliver breaths and/or insert an advanced airway
 - "Pack & Fill" once helmet is removed
 - Deliver breaths via BVM
 - Cut Jersey & bi-valve shoulder pads when available
 - Attach AED / Monitor when available
 - IV Access when available
 - Remove equipment when moving to spineboard / stretcher
 - Apply cervical collar when appropriate
- Equipment Removal Approach-
 - Cut Jersey & bi-valve shoulder pads
 - Prepare helmet for removal
 - Remove helmet & shoulder pads
 - Insert an advanced airway (as appropriate)
 - Deliver breaths via BVM
 - Attach AED / Monitor when available
 - IV access when available
 - Apply cervical collar when appropriate
 - Move to spineboard / stretcher when appropriate

Equipment Management- Ice Hockey

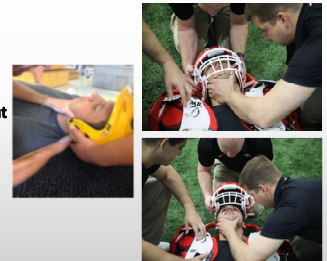


- ↑ lordosis w/helmet removal & c-spine displacement w/removal of ice hockey helmet (LaPrade RF et al 2000 / Metz CM et al 1998 / Prinson RK et al 1995)
 - Ice hockey helmets should not be removed
- Presence of ice hockey helmet (whether properly fit or not) resulted in ↑ movement (Mihalik JP et al 2008)
 - When an ice hockey helmet is stabilized, the head within it is not
 - Recommend helmet & face shield removal prior to movement to rigid immobilization device
- “Bridging the Gap”-
 - On Ice vs. off Ice
 - Airway access
 - Shoulder pad type
 - Position player vs goalie

Anterior – Posterior Stabilization Technique



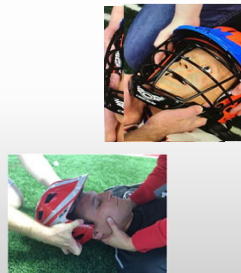
- “Collar Method”
- Side position
- Top hand- grips the chin & jaw, controlling rotation
- Bottom hand- cradles c-spine & occiput
 - May ↑ pain due to deformity & contact area
- Top forearm may rest upon athlete’s chest to provide additional control
- Weight of head may cause “rebound effect” when clearing the ears



Medial – Lateral Stabilization Technique



- “Bilateral Mastoid Cupping” Method
- Side position or straddle position
- 1 hand around each mastoid process & “cup head in hands”
- Can use forearms against chest as counterforce
- Can be limited by cheek pads and/or small hands
- Weight of head may cause “rebound effect” when clearing the ears



Equipment Removal



- Communication (“Be Intentional”)-
 - “I have c-spine; you can release”
 - “about to clear the ears” → “ears clear”
 - “helmet clear”
 - “pads clear”
 - “ready to lift / roll / lower / slide ... lift / roll / lower / slide” vs. “1, 2, 3 lift”
- CLOSED LOOP COMMUNICATION



Helmet Removal



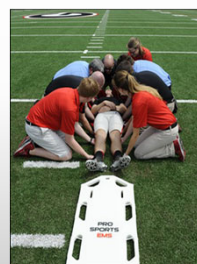
- (A) transfers control of c-spine to (B)
 - Count off transfer
- (A) removes helmet (& s’ pads if applicable) & resumes control of c-spine
 - Pause & count off as you clear the ears
- “Pack & Fill” if necessary



Shoulder Pad Removal



- Flat Torso
- Elevated Torso / Torso-Tilt-
 - 3-person vs 4-person
- BI-valve Pads (“Rip Kord”)
 - Log Roll
 - 8-person lift
 - “Over the Head”





"Pit Crew Equipment Removal"

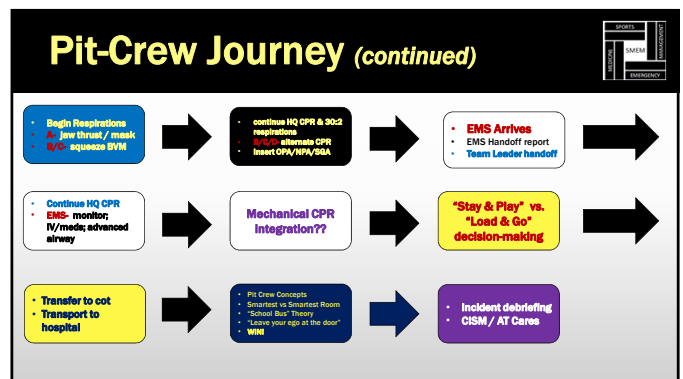
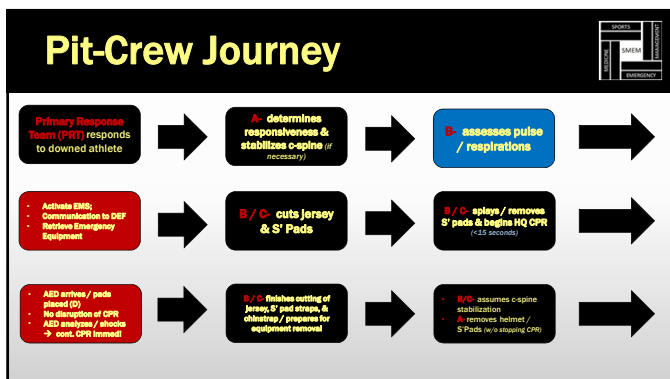
- Head (A)**
 - Inline stabilization
 - Commands
 - Helmet & S' Pad removal
- Position #1 (B)**
 - Midline jersey cut
 - Shoulder / axilla cuts
 - Chinstrap / Jaw Pads
 - Inline stabilization transfer
- Position #2 (C)**
 - Midline S' pads cut
 - Shoulder / axilla cuts
 - Chinstrap / Jaw pads
- Position #3 (D)**
 - Towel
 - Cervical collar

"Pit Crew CPR Approach"

- Head (A)**
 - Inline stabilization
 - Jaw thrust
 - Board positioning
 - Commands
- Position (B)**
 - Evaluation / Pulse & Breathing Check
 - Compressions
 - Torso / Hips lift
- Position (C)**
 - Compressions / AED
 - Torso / Hips lift
- Position #4-**
 - Retrieve AED
 - EMS Call
 - Airway / BVM
 - Shoulders Lift
- Position #5-**
 - Airway / BVM
 - ALS (Airway / Monitor / Drugs)
 - Shoulders Lift
- Position #6-**
 - ALS (Monitor / Drugs)
 - Legs lift

"Pit Crew CPR Approach"

- Position #7-**
 - ALS (Monitor / Drugs)
 - Legs Lift
- Position #8-**
 - If necessary
 - Assist where needed
 - Legs / Feet lift
- Position #9-**
 - If necessary
 - Assist where needed
 - Legs / Feet lift
- Board-**
 - Prepares spineboard
 - Places straps
 - Slide
- Incident Commander-**
 - "Code Runner"
 - Documentation
 - Transportation
 - Facility



Clinical Bottom Line



- When confronted with a CSI athlete, personnel have options with regards to the management, transfer, & immobilization of the athlete.
- "There is no such thing as ALWAYS & NEVER"**
 - Every emergency situation & every patient is different
 - Individual circumstances must dictate appropriate actions
- Regardless of the situation, relentless preparation & planning, consistent training, and an understanding of the benefits & drawbacks of each technique & device is imperative.

Take Home Messages



- TEAM** Approach
 - Leadership / Followership / Relationships
 - "Leave Your Ego At The Door"
 - "Know Your Role"
- Mental Rehearsal
 - "Expect the Unexpected"
- "Stressful Practice"**
- TEAM** must carefully weigh all factors & make educated decisions on what best fits into their individual situations



"In times of stress, you will always fall to the level of your training, not rise to the level of your expectations"

**DON'T PRACTICE
UNTIL YOU GET IT
RIGHT. PRACTICE
UNTIL YOU CAN'T
GET IT WRONG.**

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Questions?

THANK YOU

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