

CPR/AED and Oxygen Administration Review Notes

The Emergency Medical System

- Developed in 1973
- Oversight by National Highway Traffic Safety Administration and Department of Transportation
- EMS System components
 1. Regulation and policy
 2. Resource management
 3. Human resources/training
 4. Transportation
 5. Facilities
 6. Communication
 7. Public information and education
 8. Medical oversight
 9. Trauma system
 10. Evaluation

Links in the Chain of Survival

1. Citizen response
2. Rapid activation
3. First responder care
4. Advanced out-of-hospital care
5. Hospital care
6. Rehabilitation

Levels of Training

Department of Transportation recognizes:

- First responder
- Emergency Medical Technician-Basic (EMT-B)
- Emergency Medical Technician-Intermediate (EMT-I)
- Emergency Medical Technician-Paramedic (EMT-P)

First Responder Characteristics

- Maintains caring and professional attitude
- Controls fears
- Presents professional appearance
- Maintains skills and knowledge
- Stays healthy

- Recognizes and keeps patient's needs as priority

Primary Responsibilities of First Responders

- Ensure safety of self and others
- Gain access to patient
- Identify life-threatening conditions
- Summon more advanced medical personnel when necessary
- Provide care
- Assist more advanced medical personnel

Secondary Responsibilities of First Responders

- Summon additional help
- Control and direct bystanders
- Keep records
- Reassure others at scene

Medical Oversight

- Includes medical director
- Direct medical control
- Indirect medical control
 - Protocols
 - Standing orders

Warning Signs of Stress

- Irritability
- Inability to concentrate
- Difficulty sleeping/nightmares
- Anxiety
- Guilt
- Loss of interest in work

Critical Incident Stress

- Strong emotional reaction that interferes with ability to function
- Can build-up over days, weeks, months, or years
- May require counseling

Possible Dangers at an Emergency Scene

- Crime
- Traffic

- Fire
 - Electricity
 - Water/ice
 - Hazardous materials
 - Unstable structures/vehicles
 - Natural disasters
 - Multiple patients
 - Hostile situations
- Remember that above all else, your **PERSONAL SAFETY** is the most important priority on every scene.

Legal Considerations

- Duty to act – the obligation to provide care while on duty
- Scope of practice – set of skills/knowledge you are allowed to legally perform at your certification level
- Standard of care – the level of care you are expected to provide
- Negligence (Duty, Breach of duty, Cause, Damage) – not performing to standard of care or failing to act results in additional harm to patient
- Good Samaritan Laws – cover people not “on duty” if they try to help someone
- Consent – permission to treat a patient – can be expressed or implied (if under 18 or not fully alert & oriented)
- Refusal of care – patient chooses not to receive care (must be fully alert & oriented to do so)
- Advance directives/DNR orders – written instructions that describe the patient’s medical wishes in the event that they become unable to
- Battery – any unlawful, harmful, or offensive touching of patient without their consent
- Abandonment – once you begin care, you must continue to provide until someone of equal or higher training takes over.
- Confidentiality – cannot share private information about patient with anyone to maintain this confidentiality
- Documentation – what you saw and did should be recorded
- Preserving evidence – crime/rape scenes can have valuable clues around

Obtain consent Before Providing Care

- Identify yourself

- State level of training
- Explain what you observe
- Explain what you plan to do

Occupational Safety and Health Administration (OSHA)

- OSHA regulations protect employees with potential exposure to blood-borne pathogens
- Proper protective equipment is required
- Vaccines or other preventative measures are allowed by OSHA to protect health care employees

Conditions Necessary for Disease Transmission

- Pathogen present
- Sufficient quantity of pathogen to cause disease
- Person vulnerable to the disease
- Transmission at correct entry site

How Pathogens Enter the Body

- Direct contact
- Indirect contact
- Airborne (Droplet)
- Vector-borne

Diseases of Concern

- Tuberculosis
- Meningitis
- HIV
- Herpes
- Hepatitis
- Chicken Pox and other childhood diseases

Exposure Control Plan

- Exposure determination
- Schedules and methods for implementing OSHA standard
- Procedures for evaluation exposures
- Immunizations

Standard Precautions (BSI) to Prevent Disease Transmission

- Protective equipment – gloves, gown, mask, eyewear

- Personal hygiene practice – wash hands etc.
- Engineering controls – biohazard bags etc.
- Work practice controls – disposing of sharp items (needles) in sharps box

Body Cavities

- Cranial
- Spinal
- Thoracic
- Abdominal
- Pelvic

Anatomical Terms

- Midline
- Anterior, posterior
- Superior, inferior
- Proximal, distal
- Medial, lateral

Scene Size-up

- Scene Safety
- BSI
- Number of patients
- Mechanism of injury/Nature of illness
- Need for ALS

Assessment-Initial Assessment

- Form a general impression
- Assess level of consciousness – obtain consent if conscious
- Assess airway, breathing, circulation – look, listen, feel for 5-10 seconds if unconscious
 - Signs of breathing
 - Movement
 - Coughing
 - Pulse
 - Severe bleeding
 - Skin characteristics

Levels of Consciousness-AVPU

<u>Level</u>	<u>Characteristic Patient Behavior</u>
Alert	Is able to respond you
Verbal	Only responds to verbal commands
Painful	Only responds to a painful stimulus (sternum/clavicle)
Unresponsive	Does not respond

Breathing Emergencies

- Respiratory system works with circulatory system and nervous system to breathe
- Diaphragm and chest muscles contract and relax to inhale and exhale
- Breathing emergencies are detected in the initial assessment
- Respiratory distress often leads to respiratory arrest

Taking Breathing and Pulse Rates, Qualities

- Watch patient's chest rise and fall for 30 seconds, counting each breath in that time. Multiply answer by 2 to get breaths/minute. Note whether breathing is labored, shallow, regular, etc.
- Feel patient's radial pulse for 15 seconds, counting each beat in that time. Multiply answer by 4 to get beats/minute. Note whether pulse is strong, irregular, weak, etc.

Normal breathing and Pulse Rates

- Adult breathing: 12-20 breaths per minute
- Adult pulse: 60-100 beats per minute
- Child breathing: 15-30
- Child pulse: 80-150
- Infant breathing: 25-50
- Infant pulse: 120-150

Asthma

Facts

- Narrows air passages

Triggered by:

- Allergic reaction to pollen/food/a drug/insect drugs
- Emotional stress/physical activity

Signs and symptoms

- Struggling to breathe
- Wheezing when exhaling

Emphysema

Facts

- Lungs lose ability to exchange carbon dioxide and oxygen effectively

Caused by:

- Smoking; usually develops over many years

Signs and symptoms

- Shortness of breath
- Possible coughing, cyanosis, or high fever
- Advanced cases: Restlessness, confusion, weakness

Hyperventilation

Facts

- Rapid breathing upsets body's balance of oxygen and carbon dioxide

Triggered by:

- Fear/anxiety
- Injury to head/severe bleeding/illness
- Asthma
- Exercise

Signs and symptoms

- Shallow, rapid breathing
- Dizziness
- Numbness in fingers/toes

Anaphylaxis (Severe Allergic Reaction)

Facts

- Swelling of air passages restricts breathing

Triggered by:

- Food/insect stings/a drug

Signs and symptoms

- Skin rash
- Tightness in chest/throat
- Swelling of face/neck/tongue

Airway Obstruction

Anatomical

Airway blocked by anatomic structure

- Tongue
- Swollen tissues of mouth and throat

Mechanical

Airway blocked by foreign object

- Food
- Toy
- Fluids

Airway Obstruction

Partial

- Patient can still move air to and from lungs; can cough, speak, breathe

Complete

- Patient is unable to speak, breathe, cough; no air movement

Care for Respiratory Distress

- Have patient rest in comfortable position
- Keep patient from getting chilled or overheated
- Reduce heat; add moisture
- If authorized, help patient take any medications
- Summon more advanced medical personnel
- Monitor vital signs

Key Points of Respiratory Arrest

- Life threatening

- Commonly caused by illness, injury, or choking
- Often preceding by respiratory distress
- Body systems will progressively fail

The Heart

- Right atrium: receives blood from body
- Left atrium: receives blood from lungs
- Right ventricle: pumps blood to lungs
- Left ventricle: pumps blood to body

Signs and Symptoms of Heart Attack

- Persistent chest pain or discomfort
- Breathing difficulty
- Changes in pulse rate
- Pale, bluish, or moist skin
- Nausea, vomiting
- Sweating
- General ill appearance

Care for Heart Attack

- Stop patient's activity
- Have patient rest in a comfortable position
- Summon more advanced medical personnel
- Be calm and reassuring
- Monitor breathing and pulse, look for changes in victim's appearance/behavior
- Administer supplemental oxygen if it is available and you are trained

Cardiopulmonary Resuscitation (CPR)-Background

- Cardiac arrest occurs when heart stops beating or beats too irregularly or weakly to circulate blood effectively
- Patient will have no breathing, no pulse and will be unconscious
- Causes of cardiac arrest: cardiovascular disease, drowning, suffocation, electrocution, respiratory arrest, poisoning, allergic reactions, stroke, and other types of brain damage
- CPR must be started and ALS be called as soon as possible
 - CPR is only effective for a short period of time
 - Effectiveness of CPR decreases the longer the victim goes without pulse

- Defibrillation is usually needed for best chance of survival
- Patients of cardiac arrest often do not survive
- Chest compressions help circulate oxygen-rich blood to vital organs, such as the heart and brain

Cardiopulmonary Resuscitation (CPR)-Basics

- Compressions are done in the middle of the chest (on the lower half of the sternum, above the xiphoid process)
- Put the heel of your hand on the patient's chest, then, put your other hand on top so that your fingers interlace and you can compress the chest with both hands.
- For compressions, lock your arms and have your shoulders over the patient's chest. This allows you to push with more of your body instead of just your arms.

When to Stop CPR

- Patient's heart begins beating
- **Defibrillator arrives**
- Scene becomes unsafe
- A valid DNR order is presented
- Someone of equal or higher training takes over
- You are too exhausted to continue
- More advanced medical personnel order you to stop

Care for Adult Respiratory Distress/Arrest and Cardiac Arrest

- Enter scene to find an adult choking.
- Perform scene size-up.
- Introduce yourself to the patient and get consent.
- Perform initial assessment.
- If patient is choking, tell him to keep coughing.
- If patient is wheezing, turning blue, and/or not getting air into his body, give 5 back blows and then 5 abdominal thrusts (the Heimlich maneuver).
- Continue this until patient's airway is cleared or patient goes unconscious.
- A patient who goes unconscious becomes a new patient; therefore you must perform a new initial assessment → Look, listen, feel again 5-10 seconds.

- If patient is not breathing, check in mouth for foreign objects → do a finger sweep if you see something.
- Then, check to see if there's an airway by tilting the head back, lifting the chin, and giving 2 slow exploratory breaths. If these 2 do not go in, reposition the airway (retilt) then give 2 more breaths.
- If these don't go in then there's no airway → do 5 chest compressions (chest thrusts) to generate pressure to force open the airway. Check mouth after this and do finger sweep if you see something. Give 2 exploratory breaths to check airway (reposition and do 2 more if these don't go in). Repeat compressions, look in mouth, exploratory breaths until breaths go in → airway is present.
- Once airway is present, check breathing and pulse. If patient has a pulse but is not breathing, perform rescue breathing (1 breath per 5 seconds). After 24 breaths (~2 minutes), reassess the patient's breathing and pulse.
- If patient still has a pulse but no breathing, continue rescue breathing and keep reassessing every 24 breaths (2 minutes). If patient has no breathing and no pulse, perform Cardiopulmonary Resuscitation (30 compressions and 2 breaths). After 5 cycles (~2 minutes), reassess the patient's breathing and pulse. If patient still has no breathing and no pulse, resume CPR and keep checking patient's status every 5 cycles (~2 minutes).

Care for Adult Respiratory Distress/Arrest and Cardiac Arrest

If you are performing CPR and someone asks to help, first get their level of certification (without stopping CPR). You may only be helped by someone with your level of certification or higher (CPR-PR is minimum; CPR for the community is not acceptable). If the person is qualified, finish your compression/breath cycle and move to the head. Check breathing and pulse, and if both are absent say, "No breathing, no pulse, resume CPR". Your new partner will give the compressions, and you will give the breaths. Reassess patient's breathing and pulse about every 2 minutes (5 cycles adult, 10 for child/infant). Check quality of partner's compressions by feeling the carotid pulse. If person giving compressions becomes tired, he can count his cycle as "Switch, 2, 3, 4...30". Then, you give 2 breaths and move to the patient's chest. Your partner will move to the patient's head. Person at head must reassess patient's breathing and pulse, and then tell you to resume CPR.

- If you are second responder to a CPR call, make sure that an ambulance has been called before you help with CPR.

Respiratory Distress in Infants or Children

- Infants: respiratory rate > 60 per minute
- Children: respiratory rate > 30/40 per minute
- Nasal flaring
- Use of neck muscles and muscles between and below margin of the ribs to aid breathing
- Stridor
- Cyanosis
- Altered mental status
- Grunting

Child Rescue Breathing and CPR

Follow same steps as for adults, with a few exceptions:

- If you arrive on scene and a parent is with the child, send them to call for ALS.
- If the parent insists on staying while you treat the child, explain what you're doing.
- If you are alone, then you can wait until after 2 minutes of life-saving techniques before calling for ALS (it's better to have someone call right away).
- Rescue breathing is 1 breath every 3 seconds.
- You can use one or two hands for compressions – one hand does compressions and one rests on child's forehead.
- Compressions are only 1 to 1.5" deep.
- Compression to breath ratio is 15:2 for 2 person.
- Everything is done more gently – Heimlich, etc.

Infant Respiratory Distress/Arrest and Cardiac Arrest

Steps are similar to adult/child with several differences:

- Do 5 back blows and then 5 chest compressions (chest thrusts). Back blows are with heel of hand in between shoulder blades; chest thrusts are done with 2 fingers just below the nipple line. Hold baby at a 45° angle downward during this stage, so that gravity assists your efforts in clearing the airway. Continue back blows/chest thrusts until baby starts breathing or goes limp and then reassess as a new patient as explained before.
- Again, for 2-person infant CPR, place baby on hard surface. One person places hands around baby with both thumbs on the center of

baby's chest to perform compressions. Other responder uses an infant BVM to give breaths.

Differences Between Adult, Child, Infant Rescue Breathing and CPR

	Adult	Child	Infant
Rescue Breaths: seconds	1:5 24 ~ 2mins	1:3 40 ~ 2mins	1:3 40 ~ 2mins
Pulse	Carotid	Carotid	Brachial
Rate	100 comp/min	100 comp/min	100 comp/min
Compression depth	1.5" – 2"	1" – 1.5"	0.5" – 1"
Hands	2 hands	1 or 2 hands	2 fingers
CPR	30:2	30:2	30:2
Compressions: breaths (1 person)	5 cycles (~ 2mins)	5 cycles (~ 2mins)	5 cycles (~ 2mins)
CPR	30:2	15:2	15:2
Compressions: breaths (2 person)	5 cycles (~ 2mins)	10 cycles (~ 2mins)	10 cycles (~ 2mins)

For adults: must call ALS when patient loses consciousness

For children/infants: must call ALS after 2 minutes of life-saving techniques

- If parent/bystander is on scene, send him/her to call immediately

Criteria for a Resuscitation Mask

- Transparent, pliable
- One-way valve
- 15 mm or 22 mm coupling assembly
- Able to deliver supplemental oxygen
- Able to withstand extreme temperatures
- Easily assembled and used

Bag-Valve Mask

- Bag is self-inflating
- Valve is one-way to draw air into bag
- Mask is similar to resuscitation mask
- Delivers 21% oxygen instead of 16% by mouth to mouth (or mask to mouth)
- 2 person skill

Steps for Suctioning

- Turn head to side or roll body if head, neck, or back injury suspected
- Open patient's mouth
- Measure distance of insertion – (corner of mouth to earlobe)
- Insert suction device into back of mouth
- Retract slowly making circular motions
- Suction for no more than 15 seconds at a time

Inserting an Oral Airway (OPA - oropharyngeal airway)

– unconscious patients with no gag reflex

- Select airway of proper size – measure corner of mouth to earlobe
- Open patient's mouth
- Insert airway with curved end along tongue
- Advance airway gently until resistance is felt
- Rotate airway ½ turn – so that device secures the tongue – prevents it from rolling back to block airway
- Flange should rest on lips

- can be inserted with curved end along the roof of the mouth for children so you don't have to rotate it ½ turn.

Inserting a Nasal Airway (NPA – nasopharyngeal airway)

– conscious AND unconscious patients with no facial trauma or suspected head/neck/ back injury

- Select airway of proper size - measure earlobe to tip of nose
- Lubricate nasal airway – water based lubricant
- Insert nasal airway into right nostril with bevel toward middle (septum) of nose
- Advance airway gently, until flange rests on nose

- both OPA/NPA secure and maintains the airway, preventing the tongue or other obstruction from blocking it.

Oxygen Tank Assembly

Check tank for green color and yellow diamond label to insure that the tank contains oxygen (green) and is medical grade (yellow diamond – look for “U.S.P” written on it). **NEVER** allow tank to stand upright without support.

- Remove O-ring (seals and maintains pressure in tank).

- Crack tank by turning the handle ¼ turn and back.
- Put on regulator.
- Turn handle 1 full turn to open the tank
- Check the oxygen level in tank by reading value on regulator (if below 500 psi, do not use – needs to be refilled).
- Turn knob on regulator quickly to 25 and back to zero to get out dust out of regulator.
- Attach breathing device (nasal cannula, non-rebreather mask, bag-valve mask, or resuscitation mask) to regulator.
- LAY DOWN tank and monitor oxygen levels.
 - For non-rebreather (NRB) masks: cover valve between mask and reservoir bag for a few seconds until the reservoir bag is ½ to ¾ inflated with oxygen. Then put NRB on patient and increase oxygen level if reservoir bag gets very empty.

Oxygen Delivery Devices

Device	Common Flow Rate	Oxygen Concentration	Function
Nasal cannula	1-6 L/min	24-44%	Breathing patients only
Resuscitation	6-15 L/min	35-55%	Breathing and nonbreathing patients
Bag-valve-mask	15+ L/min	90+%	Breathing and nonbreathing patients
Nonrebreather mask	10-15 L/min	90+%	Breathing patients only

Precautions During Oxygen Delivery

- Do not operate around flames/sparks
- Do not stand cylinder upright
- Do not use grease/oil/petroleum products to lubricate
- Check that oxygen is flowing before placing device on victim

Operating an AED

- Confirm cardiac arrest
- Turn on device

- Clear patient's chest
- Attach device to victim
- Make sure NOBODY is touching patient – “everyone stand clear”
- Analyze rhythm
- Deliver shock, if indicated
- Shock or no shock – just do 5 cycles (~2 mins) of CPR
IMMEDIATELY – no need to look, listen, feel again
- AED will reanalyze (then indicate if shock is needed) after every 5 cycles (~2 minutes) of CPR – only one shock at a time between giving CPR - give up to 3 shocks then call for medical direction to get consent to give more.

Precautions for Using an AED

- If you have a child <8 years or <55lbs:
 - Use pediatric AED – if unavailable....
 - Use pediatric PADS with an adult AED – if unavailable...
 - Use adult pads with adult AED – if this doesn't fit on the chest of the child (i.e. there's overlap of pads)...
 - Place one adult pad on chest and one on back (try to position so heart will be between them)
- Stand clear of patient when analyzing and defibrillating
- Do not defibrillate in water
- Do not defibrillate on metal surface
- Do not place pads over pacemaker – must be at least 1” away
- Remove any nitroglycerin patches (using gloves) before defibrillating
- Do not use cell phones within 6 ft of AED – it may interrupt analysis
- Do not clean chest with alcohol pads
- Do not analyze or defibrillate in moving vehicle

These are helpful videos (you can use Quicktime to play them by changing “wmv” to “mov” in the link):

- 1 - <https://www.instructorscorner.org/Redcross/video/consciouschoking2-broadband.wmv>
- 2 - <https://www.instructorscorner.org/Redcross/video/unconsciouschoking2-broadband.wmv>
- 3 - <https://www.instructorscorner.org/Redcross/video/CPR2-broadband.wmv>
- 4 - <https://www.instructorscorner.org/Redcross/video/aed2-broadband.wmv>
- 5 - <https://www.instructorscorner.org/Redcross/video/Oxygen-broadband.wmv>