

Pharmacology  
and  
Associated Pathways

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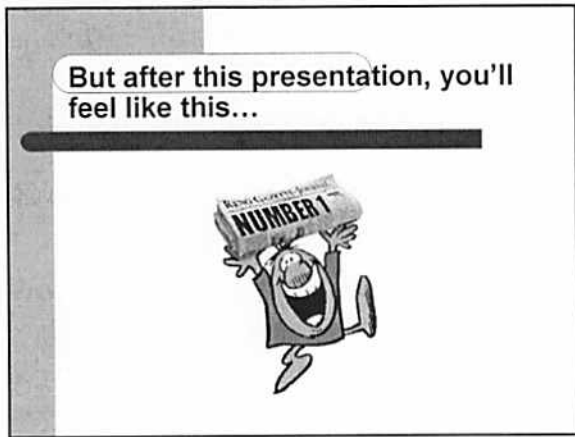
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## Terminology Review

- Heart Failure: The inability of the heart to maintain an output adequate to maintain the metabolic demands of the body.
- Pulmonary Edema: An abnormal accumulation of fluid in the lungs.
- CHF with Acute Pulmonary Edema: Pulmonary Edema due to Heart Failure (Cardiogenic Pulmonary Edema)
- Asthma <http://kidshealth.org/misc/movie/cc/how-asthma-affects.html>

*Respiratory Distress*

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## Respiratory Distress

- What is Respiratory Distress?
- What are medical conditions that cause respiratory distress?

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## Assessing the Patient in Respiratory Distress

In patients with respiratory complaints the following should be assessed:

- Initial set of vital signs
- Respiratory rate
- Respiratory effort
- Level of consciousness
- Speech: able to speak in full sentences
- Positioning
- Skin parameters
- Audible sounds (grunting, gurgling, wheezing)
- LUNG SOUNDS
- Any pain associated with the respiratory distress

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## Assessment

*•How often should a patient with respiratory distress be assessed?*

*•How do you document this information?*

*•Remember: it is important to document BOTH pertinent negative as well as pertinent positive findings*

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## Additional Documentation

- Repeat vital signs and TIMES the VS were done
  - *How often should vital signs be obtained in someone with respiratory distress?*
- Treatment and the TIMES the treatments were done
- Reassessments and the TIMES the reassessments were done
  - *How often should reassessments be performed on the patient in respiratory distress?*

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## Pharmacology Review:

- Oxygen
- Albuterol/Atrovent
- Epinephrine
- Nitroglycerine
- Aspirin

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## Rules to Live By.. when giving medications

- Always **ASSESS** the patient fully **BEFORE** administering **ANY** medication
- Always perform a **SAMPLE** history before administering any medication
- Always check and verify every medication **BEFORE** administering any medication
- Always **DOCUMENT** correctly all medications given
- Always reassess the patient following the administration of medications and **DOCUMENT** that reassessment
- Always **CONTACT MEDICAL CONTROL**

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## Rules of Medication Administration

- RIGHT PATIENT
- RIGHT DRUG
- RIGHT DOSE
- RIGHT ROUTE
- RIGHT TIME

*The 5 R's*

Which of these apply to the field?

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## Documenting Medications

- Document **SAMPLE** history
- Document the **MEDICATION** spelled correctly
- Document the **TIME** the medication was given
- Document the **ROUTE** the medication was given
- Document the Response to the medication
- Document vital signs before and after medications
- Document reassessment of the patients condition
- Document that Medical Control was contacted:  
Hospital Name, ECRN or ECP name

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**OXYGEN**

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**Objectives:**

- Overview of Oxygen Administration
- Indications/Contraindications
- Airway adjuncts and delivery methods
- Administration and Documentation
- Skill station
- Questions/Quiz

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**Oxygen**

Oxygen is the most important **drug** that BLS and ALS providers can give a patient

*Without it, the body's cells die and thus the patient dies.*

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## Oxygen

- Usually stored in seamless, steel cylinders - color GREEN
- Sizes and Capacity:
  - \* "D" 350 L
  - \* "E" 600 L
  - \* "K" 2,000 L
  - \* "M" 3,000 L
- Pressure: 2,000-2,200 psi

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## ADMINISTRATION

- Nasal Cannula: 2-6 lpm; 28-44%
- Basic Mask: 6-10 lpm; 35-60%
- Partial Rebreather: 10 & higher lpm; 60%
- Non Rebreather: 10 & higher lpm; 60-95%
- BVM: 0 lpm 21%
  - 15 w/o reservoir 50%
  - 15 w/reservoir up to 95%
- CPAP 15-25 L

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## Airway Adjuncts

- Airway adjuncts are used when you want to open/maintain an airway and provide oxygen
  - Nasopharyngeal Airway (NPA)
  - Oral Pharyngeal Airway (NPA)
  - Advanced Airway: King Airway

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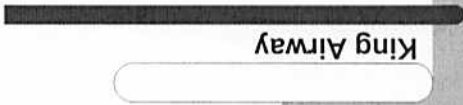
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**King Airway**



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**ORAL PHARYNGEAL AIRWAY (OPA)**



Displaces the tongue away from the posterior pharyngeal wall.

What kind of patients would benefit from an OPA?

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**NASAL PHARYNGEAL AIRWAY (NPA)**



This airway is less likely to stimulate gagging and vomiting because the pliable tube moves and flexes as the patient swallows.

What kind of patients would benefit from a NPA?

## Documenting Oxygen and Airway Adjuncts

- **Oxygen Administration**
  - Time oxygen was administered
  - Amount of oxygen administered
  - The oxygen delivery system used
  - Reassessment of the patient AFTER the administration of oxygen
- **Airway Adjuncts:**
  - Time airway adjunct inserted
  - Type of airway adjunct used
  - Advanced Airway (King) Confirm Placement Lung sounds -> "cm" mark
  - Reassessment of the patient after the use of an airway adjunct

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## Albuterol/Atrovent

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## Objectives:

- Overview of Nebulized Albuterol/ Atrovent administration
- Indications/ Contraindications
- Albuterol/ Atrovent and Nebulizers
- Administration and Documentation
- Skill station
- Questions/Quiz

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### Albuterol/ Atrovent administration

- Region XI EMSS has approved EMS-Basic providers to administer nebulized Albuterol/ Atrovent for patients in respiratory distress due to:
- Asthma
- COPD
- Allergic Reaction

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### Albuterol Sulfate

- Generic Name: Albuterol
- May also be known by -Trade Names: Proventil, Ventolin
- Drug Class: Bronchodilator
- Action: Albuterol dilates bronchial airways by relaxing the surrounding bronchial muscles .

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### Albuterol Sulfate

- Indication: Per the Region XI Standing Medical Orders, Albuterol/ Atrovent is to be administered only for patients who are experiencing an exacerbation of previous diagnosed asthma, exhibiting signs of respiratory distress. (BLS C-1)
  - Caution: *Albuterol is used with caution in patients with coronary artery disease, CHF, or cardiac arrhythmias. Contact medical control for oversight.*
- Food for thought we'll get back to this later.***

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## Albuterol Sulfate

- Side Effects: Albuterol can cause side effects including **palpitations, tachycardia, elevated blood pressure.**
- Food for thought- Would you administer albuterol to a Patient with wheezes and a pronounced history of CHF?
  - Cardiac wheezes v-s asthma

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## Albuterol Sulfate

- Preparation: Albuterol is supplied in unit dose vials of 2.5 mg of Albuterol in 3 ml of Normal Saline.



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## Atrovent

- Generic Name: Ipratropium
- May also be known by Trade Name: Atrovent
- Drug Class: Anticholinergic
- Action: Dries secretions

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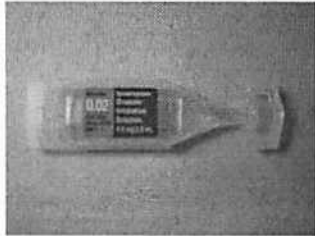
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Atrovent



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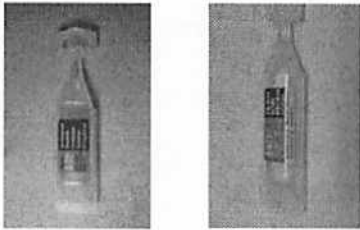
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Can you tell which is which?



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Nebulizers

- Nebulizers are a form of oxygen/medication administration.
- The nebulizer transforms liquid medication into mist, which allows the patient to inhale the medication into the lungs.

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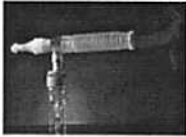
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## Nebulizers

- Nebulizers can be used one of two ways:
  - Standard Nebulizer (hand held)
  - Nebulizer, with mouth piece, and hose.



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## Nebulizers



Nebulizer, with mask connected



Can be used with non-rebreather mask as well

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## Albuterol/Atrovent Administration

- Per the Region XI Standing Medical Orders, Albuterol is to be administered only for patients who are experiencing an exacerbation of previous diagnosed asthma, exhibiting signs of respiratory distress. (BLS C-1)
- DO NOT DELAY CARE
- Request ALS, if available
- Contact Medical Control for transport decision

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### Albuterol/Atrovent Administration

- Perform initial patient assessment.
- Assure open airway, and adequate breathing and circulation. **If the patient has a compromised airway, do not administer albuterol.**

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### Albuterol /Atrovent Administration

- Administer high concentration oxygen.
- Place patient in the Fowler's (seated at 45 degrees) or high Fowler's (Seated at 90 degrees) sitting position.
- Do not allow patient to exert themselves in any way.
- **Assess vital signs, ability to speak in complete sentences, accessory muscle use, wheezing, patient's assessment of breathing difficulties and DOCUMENT THESE FINDINGS!**
- Begin transport of patient on the stretcher.

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### Albuterol/Atrovent Administration

- Obtain and verify one dose of Albuterol and one dose of Atrovent.
- **DOUBLE CHECK YOUR MEDS**
- Administer one (1) unit dose Albuterol 2.5mg in 3ml / Atrovent 0.5 mg in 2.5ml via nebulizer at a rate of 6 liters per minute.
- Do not delay transport to complete administration of the medication.

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### Albuterol/Atrovent Administration

- Re-assess vital signs, ability to speak in complete sentences, accessory muscle use, wheezing, patient's assessment of breathing difficulties.
- If patient's symptoms persist, CONTACT MEDICAL CONTROL for a second administration of nebulized Albuterol **"ONLY"**.

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### Albuterol/Atrovent Administration

- Continue to monitor and reassess patient's vital signs and breathing.
- Record all patient care information, including the patient's medical history and all treatment provided on a Prehospital Care Report (PCR).

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### Documenting Albuterol/Atrovent

- Time of the treatment
- Correct spelling of the drugs and the DOSE
- Response to the treatment
- Reassessment of the patient
- Contact with Medical Control

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**Continuous Positive  
Airway Pressure-CPAP**



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**Objectives:**

- Overview of CPAP
- The EMT's role
- Indications/Contraindications
- CPAP masks
- Skill station

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**What do I do?**

- Assist the paramedic
- Be familiar with how to help the paramedic put the CPAP device on
- Look for indications/contraindications and tell the paramedic
- Monitor VS and inform the paramedic of any changes

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## CPAP - Introduction

- CPAP is a non-invasive procedure that is easily applied and can be easily discontinued without untoward patient discomfort.
- CPAP is an established therapeutic modality, recently introduced into the prehospital setting.
  - "like squeezing water out of a sponge"
- In the primary phase CPAP application in cardiogenic pulmonary edema, thus far, appears to be beneficial to patient outcome.

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## Key Points of CPAP

- CPAP has been successfully demonstrated as an effective adjunct in the management of pulmonary edema secondary to congestive heart failure.
- CPAP may prove to be a viable alternative in many patients previously requiring endotracheal intubation.

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## Important Points

- Pulmonary edema patients, properly selected, quickly improve with CPAP in a matter of minutes.
  - CPAP is to CHF like glucopaste is to hypoglycemia.
- Visual inspection of chest wall movement demonstrates improved respiratory excursion.

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## Important Points (cont.)

- COPD and Asthmatic patients do **NOT** respond predictably to CPAP.
  - They have a higher risk of complications such as pneumothorax, and thus should **not** be treated in the field with CPAP



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## Indications

- Pulmonary Edema

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## Absolute Contraindications

- Age < 10
- Respiratory or Cardiac Arrest
- Agonal Respirations
- Severely depressed LOC
- Systolic Blood Pressure < 90
- Pneumothorax
- Major Trauma, esp. head injury with increased ICP or significant chest trauma
- Facial Anomalies (e.g. burns, fractures)
- Vomiting

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## Complications

- Hypotension : report frequent vital signs to the paramedic
- Pneumothorax : report any changes in breathing patterns to the paramedic

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## Epinephrine



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## Epinephrine

- Often called "Epi" or adrenaline
- Trade Names:
  - **Primatene Mist**  
- Aerosol, inhalation 0.22 mg of epinephrine per spray

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## Objectives:

- Overview of EpiPen Administration
- Indications/Contraindications
- EpiPens
- Administration and Documentation
- Skill stations
- Questions/Quiz

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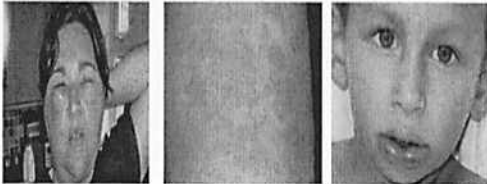
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## Epinephrine

- Indications



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## Epinephrine

- Indications
  - The auto-injectors and prefilled syringes are intended for immediate **self-administration** in patients who are at increased risk for anaphylaxis, including individuals with a history of anaphylactic reactions.
  - Auto-injectors and prefilled syringes are for immediate use and are not a substitute for immediate medical attention.

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## Assessment and documentation for patient with allergic reaction/anaphylaxis

- Routine assessment and documentation  
**PLUS:**
  - Onset of symptoms
  - Possible allergen (peanuts, bee sting etc)
  - Presence or absence of swelling.
  - Presence or absence of hives/itching
  - Sensation of throat "closing"

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## Epinephrine

- Contraindications
  - There are no absolute contraindications to use in a life-threatening situation.
  - Cautions would include:
    - Pt who self administered,
    - Pt over the age of 50 y/o,
    - Hypertensive,
    - Tachycardic.
    - *Why?*

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## Epinephrine

- Alpha and Beta receptors 
- Why is this important to know as EMT's?*
- **Alpha**-Vasoconstrictor-It quickly constricts blood vessels.
- **Beta 1**- Increases blood pressure and heart rate
- **Beta 2**- Bronchodilator-It relaxes smooth muscles in the lungs to improve breathing

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### How is epinephrine handled?

- Follow SMO's for administration.
- Accidental injection into the hands or feet may result in loss of blood flow to the affected area and will require immediate treatment in the Emergency Department (ED)
- After using the EPIPEN, it should be placed in the Sharps container.

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### EpiPen

- Epinephrine available as an auto injector is called an EpiPen



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### EpiPen

- An EpiPen comes in TWO different doses:
- Always verify the medication and the dose
  - EpiPen 0.3 mg (over approx.66 lbs.)
  - EpiPen Jr. 0.15 mg (under approx 66 lbs.)



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## Administration

- The EpiPen is administered into the large outer thigh muscles
- After injecting make sure the auto injector stays in for a count of 10 seconds
- Massage the area after the administration to facilitate getting the drug into the circulation



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## Do I document this?

- **YES!**
  - Even if the patient self administered the epinephrine, it needs to be documented. If the patient self administered the EpiPen PRIOR to your arrival how would you document that?
  - If the patient self administered the epinephrine while you were on scene
  - *Time of auto injection*
  - *Site of auto-injection*
  - *Patients response to the medication*
  - *All treatment rendered by you before or after the use of the EpiPen*

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## Allergic Reaction and/or Anaphylaxis

- RMC
- Secure and maintain airway
- **Request ALS assistance**
  - Facial swelling, wheezing, or tongue swelling?
  - **Yes-** You may utilize the Epi-pen
    - If wheezing, administer Albuterol
  - **No-** Contact medical control for further medical direction and transportation decisions

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## Adverse Reactions

- **Cardiovascular**

Angina; *cardiac arrhythmias including fatal ventricular fibrillation*; excessive and/or rapid rise in BP; palpitations.



- **CNS**

Anxiety; apprehension; cerebral hemorrhage; dizziness; fear; headache; hemiplegia; restlessness; subarachnoid hemorrhage; tremor; weakness.



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## Epinephrine is the treatment of choice for allergic reactions...

Region XI BLS C-3



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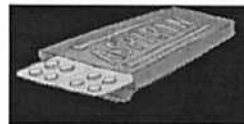
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## Aspirin



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## Objectives:

- Overview of Aspirin Administration
- Indications/Contraindications
- Administration and Documentation
- Questions/Quiz

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## Aspirin

- Abbreviated ASA
- Class: Anti platelet, Anti-Inflammatory Agent, Anti pyretic, Analgesic



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## Aspirin

- Indications
  - Cardiac chest pain

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Aspirin

- Contraindications
  - Aspirin allergy
  - Clotting/Bleeding disorders
  - GI bleeding
  - Active Peptic Ulcer
  - Decrease gag reflex
  - Third trimester pregnancy
  - Rx Coumadin, Warfarin, Heparin, or other blood thinners such as Plavix or Lovenox
  - Patient has already taken ASA prior to EMS arrival
  - Trauma

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Aspirin

- Dose
  - 2 (81mg) tablets chewed and swallowed

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Aspirin

- Mechanism of Action
  - Inhibits platelet aggregation (clumping)
  - "De-stickers" platelets
  - Blood-thinning, anti-clotting
- Effects
  - Prevents further clotting
  - Has no effect on existing clot

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Aspirin

- Side Effects
  - GI bleeding
  - Heartburn
  - Nausea/vomiting
  - Wheezing

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Precaution

- Aspirin can cause gastrointestinal upset and bleeding
- Use ASA with CAUTION in patients who report allergies to the non-steroidal anti-inflammatory (NSAID) class drug.
- Examples: Motrin, ibuprofen, Advil

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Documentation of ASA

- Time the ASA was given
- Dose of the ASA given
- Contact with Medical Control

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**NITROGLYCERIN**



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**Objectives:**

- Overview of Nitroglycerin Administration
- Indications/Contraindications
- Administration and Documentation
- Questions/Quiz

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**Description**

- Description
  - Nitroglycerin is a potent smooth muscle relaxant used in the treatment of angina pectoris; cardiac chest pain.

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## Mechanism of Action

- Nitroglycerin is a rapid smooth muscle relaxant that dilates the coronary arteries. As a result there is increased coronary blood flow and improved perfusion to the myocardium, which should help alleviate some of the pain and damage to the heart.

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## Indications

### • Indications

- Cardiac Chest Pain
  - Region XI BLS B-1

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## Contraindications



- BP < 100mm Hg
- Pt. has already taken maximum dose of three doses (1.2mg).  
CONTACT MEDICAL CONTROL IF THE PATIENT HAS  
TAKEN THE MAXIMUM DOSE FOR FURTHER DIRECTION
- Pt who has used Viagra, Levitra within 24 hours, Cialis within  
48 hrs
- *Are men the only ones who take these drugs?*
  - NO! These drugs are used to treat pulmonary hypertension  
- so women may also be on them

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Nitroglycerin

- Dose-tablet or spray
  - 0.4mg sublingual (1/150 gr) tab/ or 1 spray SL
  - Allow pill to dissolve under the tongue. Instruct the patient not to swallow or bite the pill
  - May repeat at 5 minute intervals up to 3 doses (1.2mg)

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Nitroglycerin

- Side Effects
  - Hypotension
  - Tachycardia
  - Headache
  - Dizziness

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Nitroglycerin

- Nitroglycerin must be kept in an air tight dark bottle otherwise it loses its effectiveness
- When stored properly patients given NTG may complain of a headache or a burning sensation under their tongue

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### Patient with suspected chest "pain" requires a pain assessment

- When obtaining the history with someone having cardiac chest pain remember to assess:

- O- Onset...*When did your pain begin. resting?*
- P- Provokes...*What caused your pain?*
- Q- Quality...*Can you describe your pain?*
- R- Radiates...*Do you feel your pain anywhere else?*
- S- Severity...*On 1-10 scale how bad is your Pain?*
- T- Time...*What time did your pain begin?*

....and just what do you do with this information?

Document your findings!

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### Suspected Cardiac Patient with Chest Pain

BLS: - Provide initial medical care

1. Special considerations:

Carefully inquire of patient's use of Viagra, Levitra within 24 hours, Cialis within 48 hrs. May potentiate the effects of nitrates.

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### Suspected Cardiac Patient with Chest Pain

- **Baby Aspirin** 2 mg tablets chewed and swallowed unless contraindicated.
- May assist the patient with their own **NITROGLYCERINE** if patient has not taken the maximum dose **NITROGLYCERINE**, assist the patient to administer 1 table of **NITROGLYCERINE** 0.4mg SL if the BP>100mg Hg systolic. The **NITROGLYCERINE** may be repeated with the guidance of medical control. Maintain the patient in a reclining position.



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***Additional Information***

- AS WITH ANY MEDICATION REASSESS VITAL SIGNS AFTER ADMINISTRATION.
- Blood pressure should always be monitored during nitroglycerin administration
- REASSESS PATIENT FREQUENTLY FOR ANY CHANGE.

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