***PAIN***

Pain is categorized according to its cause, location, duration,

and clinical features. The most simplistic categorization

involves differentiating brief-duration (acute) pain from long lasting

(chronic) pain syndromes

the goal of pain

therapy is to reduce peripheral sensitization, thereby decreasing

central stimulation and the amplification associated with

wind-up, spread, and central sensitization.

***Acute Pain***

Pain immediately following an injury to the body is considered

to be *acute pain*, whereas pain lasting beyond the expected

healing time, or persistent pain that does not respond to usual

pain control methods, is defined as *chronic pain*. Acute pain

serves a useful purpose in minimizing the extent of injury by

causing an organism to recoil from a noxious or harmful stimulus.

In most cases, the objective physical findings associated

with acute pain can be localized directly to the site of injury. Injury

to nerves on visceral organ systems can present as diffuse,

poorly differentiated, referred pain.

اینجا دو تا عکس داریم که شدت درد و مشخص میکنه که بعدا در انتخاب دارو کمک می کند.

Effective treatment considers the cause, duration, and intensity

of pain and matches the appropriate intervention to the

situation. The goal of therapy is to eliminate or reduce the

pain to the lowest tolerable intensity and prevent it from recurring,

rather than waiting to treat the pain when it becomes unbearable.

It is also important to consider the clinical

situation when determining analgesic selection or whether the

painful condition requires analgesic therapy. For example, it

would be irrational to use morphine to treat the severe abdominal

cramping pain associated with constipation, because

morphine can worsen the constipation.

Once a pain regimen is initiated, frequent reassessment will determine whether

the goals of therapy are being met and whether

they address any emerging side effects. Drug selection, doses,

routes of administration, and dosing frequency should be adjusted

as needed until the goals of therapy are met. In treating

acute, severe postoperative pain, it may be necessary to begin

with a potent opiate analgesic and then gradually reduce the

dose based on the patient’s clinical response.

***Analgesic selection***

The selection of an analgesic must be individualized for each

patient, depending on the cause and chronicity of the pain

as well as the patient’s age and concomitant medical conditions

that may alter drug response. Furthermore, the clinical

response of the patient dictates future dose adjustment, route,

and desired dosing interval.

***Opioid Analgesics***

In general, opioids are more effective for treating severe pain

than nonopioid analgesics such as NSAIDs, although the range

of potencies is wide with this class of medicines. They are

generally recommended for moderate to severe pain intensity.

Morphine dosage requirements also vary with the severity of

pain, individual perceptions of pain, age, opioid tolerance or

previous exposure, and the presence of concomitant diseases.

Thus, single parenteral analgesic doses of morphine ranging

from 4 to *>*20 mg are used to treat acute pain and parenteral

doses as high as 200 mg/hour have been required to treat end stage

malignant pain in patients who have developed tolerance.

When using opiates to treat severe pain lasting more than a

few days, several phenomena can occur. The terms used to describe

these phenomena are *tolerance, physical dependence,*

and *pseudoaddiction.* Clinicians must understand the differences

and the context in which these phenomena occur to

differentiate between expected developments and drug abuse.

Much of the fear and reluctance to use opioid analgesics result

from misunderstandings of these natural events by clinicians,

patients, and caregivers.

*Tolerance* to the analgesic effects of opiates is a common

physiologic finding that results from neuroadaptation by the

body during chronic use.53 It may be seen after several days

of therapy and can be first recognized by a decrease in the duration

of analgesia. Patients who develop tolerance require an

increase in the opiate dose to achieve the same level of analgesia.

Tolerance to opiates occurs fairly slowly, but should be

anticipated in all patients requiring continuous opiate therapy,

such as critical care patients or patients with chronic painful

conditions. These types of patients should be informed that the

need for increasing doses is an expected occurrence and does

not indicate addiction.

*Physical dependence* is a natural physiologic process that

occurs with chronic opioid administration.53 Signs and symptoms

of physical dependence are summarized in Table 8-4

and are seen only when opiates are stopped abruptly or the

**Table 8-4 Signs and Symptoms of Opiate Physical**

**Dependence**

1. Rhinorrhea (runny nose)

2. Lacrimation (tearing)

3. Hyperthermia, chills

4. Muscle aches (myalgia)

5. Emesis, diarrhea, gastrointestinal cramping

6. Anxiety, agitation, hostility

7. Sleeplessness

Symptoms begin within 6 hours for short-acting opioids (e.g., morphine) and generally

peak in approximately 36–48 hours. Symptoms of abstinence usually subside

within 3 to 7 days (average, 5 days).With methadone, however, abstinence syndrome

develops more slowly, and is less severe, but protracted. Opioid antagonists or mixed

agonist–antagonist drugs can precipitate abstinence in some patients after chronic or

subchronic opioid exposure.

dose is markedly decreased. Physical dependence does not indicate

addiction, and the difference should be made clear to

patients and their caregivers. The symptoms of physical dependence

may be observed in critical care patients who have their

doses of opioid analgesics tapered too rapidly or in patients

requiring chronic opioid therapy who are unable to obtain an

adequate supply of medication or who are undertreated. Unintentional

physical withdrawal can also occur if metabolic

enzyme inducers, such as phenytoin, are added to a chronic

pain regimen. Early symptoms of abstinence can include irritability

and restlessness, and onset occurs within 6 to 24 hours

of the time the last opioid dose was administered. Later, a

person develops chills, sweating, joint and muscle pains, and

gastrointestinal (GI) distress, including emesis and diarrhea

with abdominal cramping. The time of onset is correlated to

the drug’s half-life, to the average doses required by an individual,

and to the pattern and history of opioid dosing. For

example, abstinence induced by tolerance to hydrocodone (a

drug with a short half-life) can be anticipated to develop in

4 to 6 hours after the last dose, whereas with methadone it

may not occur for 24 to 48 hours after the last dose. Similarly,

the abstinence syndrome can last longer when associated

with long-acting agents. For short-acting agents (e.g., hydrocodone

or oxycodone), abstinence may resolve within 48

to 72 hours, whereas for drugs such as methadone, it may last

as long as several days. Mood swings, myalgia, and arthralgia

can persist for as long as several weeks after the last dose of an

opioid.

*Addiction* to opioid analgesics is characterized by a dysfunctional

pattern of use for purposes other than alleviation of

pain. It may involve adverse consequences of opioid use, loss

of control over their use, and preoccupation with obtaining opioids

despite the presence of adequate analgesia. It is important

to realize that tolerance and physical dependence may or may

not be present in addiction and that the presence of tolerance

and physical dependency does not imply addiction. *Pseudoaddiction*

is an important type of behavior that clinicians must

understand and recognize because it can easily be misinterpreted

as addiction.53 Pseudoaddictive behaviors may be seen

in patients with severe, unrelieved pain. These behaviors can

mimic those seen with addiction. Patients become preoccupied

with obtaining opioids; however, their underlying focus is on

finding relief for their pain. Their fear of not having an adequate

amount of medication available to control their pain may result

in medication hoarding. When patients with pseudoaddiction

are provided adequate analgesia, the behaviors that mimic addiction

resolve, the medications are used as prescribed, and the

patient’s daily functioning increases

***Managing Side Effects of Opioid Analgesics***

The most common side effects reported with the use of opioid

analgesics are nausea, vomiting, itching, and constipation.

Opioid analgesics infrequently cause pruritic rashes due to

true allergic-type reactions. In contrast, when administered

parentally they commonly stimulate local histamine release

from mast cells and cause a local wheal, burning, itching, and

erythema at the site of injection. Similarly, systemic release

of histamine after both oral and parenteral administration of

opioids can produce either localized or generalized flushing

and itching. Although histamine related reactions occur frequently

and may be confused with an allergic reaction, true

opioid allergies are infrequent. When they do occur, they are

IgE-dependent.57 Coadministration of diphenhydramine (Benadryl)

or hydroxyzine (Vistaril) prevents histamine-induced

itching and also provides antianxiety effects that may add to

morphine’s analgesic benefit.

***Ketorolac***

For patients with acute severe pain, an opioid

such as oral or parenteral morphine or hydromorphone should

be the first-line agent for pain management. As pain

severity decreases, however, an NSAID may be considered for

treating mild to moderate pain.

Because it is the only available injectable NSAID in the

United States, ketorolac is sometimes used as an alternative

to opioids. Although ketorolac is indicated for the short-term

management of moderate to severe pain. The NSAIDs cause sodium retention and can also block

prostaglandin-induced vasodilation in patients with compromised

renal blood flow. Thus, NSAIDs should be used with

caution in patients with heart failure, hypovolemia, dehydration

or any other conditions that compromise renal blood flow

and increase the risk of developing renal toxicity.

indications:

Short-term (i.e., up to 5 days) management of moderately severe, acute pain that requires analgesia at opiate level in adults.

Management of moderately severe, acute pain in children 2–16 years of age (single IV or IM dose).

Current principles of pain management indicate that analgesics, including ketorolac, should be administered at regularly scheduled intervals, although the drug also has been administered on an as-needed basis (i.e., withholding subsequent doses until pain returns).

***Administration***

Administer IV, IM, or orally in adults; administer IV or IM in children 2–16 years of age.

Initiate therapy in adults with parenteral (IV or IM) ketorolac; oral formulation is used as continuation therapy, as required.[**1**](https://www.drugs.com/monograph/ketorolac-tromethamine.html#r1) [**154**](https://www.drugs.com/monograph/ketorolac-tromethamine.html#r154) Administer IV or IM as a single dose or every 6 hours; administer orally every 4–6 hours.

In children 2–16 years of age, administer as a single IV or IM dose.

Switch patients to alternate analgesic therapy as soon as clinically possible.

##### Rate of Administration

Administer over ≥15 seconds.

#### IM Administration

Administer IM slowly and deeply into the muscle.

### Dosage

Available as ketorolac tromethamine; dosage expressed in terms of the salt.

To minimize the potential risk of adverse cardiovascular and/or GI events, use lowest effective dosage and shortest duration of therapy consistent with the patient’s treatment goals. Adjust dosage based on individual requirements and response; attempt to titrate to the lowest effective dosage.

For breakthrough pain, supplement with low doses of opiate analgesics (unless contraindicated) as needed rather than higher or more frequent doses of ketorolac.

Amp 15 mg/ml

Amp 30 mg/ml

#### Pediatric Patients

##### Pain

###### Single Dose

IV

Children 2–16 years of age: One dose of 0.5 mg/kg (maximum 15 mg).

IM

Children 2–16 years of age: One dose of 1 mg/kg (maximum 30 mg).

<2 years: safety and efficacy not established

#### Adults

> 16 years Weight <50 kg

IV

15 mg as single dose or 15 mg q6h. not to exceed 60 mg/day.

IM

30 mg as single dose or 15 mg q6h. not to exceed 60 mg/day.

> 16 years Weight >50 kg

IV

30 mg as single dose or 30 mg q6h. not to exceed 120 mg/day.

IM

60 mg as single dose or 30 mg q6h. not to exceed 120 mg/day.

### Prescribing Limits

#### Pediatric Patients

##### Pain

Only a single parenteral dose is recommended.

###### Single Dose

IV

15 mg.

IM

30 mg.

#### Renal Impairment

###### Single Dose

IV

15 mg.

IM

30 mg.

#### Hepatic Impairment

Need for dosage adjustment not fully established; evidence in patients with cirrhosis suggests that dosage adjustment may not be necessary.

#### Geriatric Patients

Dosage recommendations are the same as those for patients with moderately increased Scr or for those weighing <50 kg.

#### Warnings

Increased risk of intramuscular hematoma following IM administration in patients receiving anticoagulants.

 Concurrent use with prophylactic low-dose heparin (2500–5000 units every 12 hours), warfarin, or dextrans not studied extensively, but also may be associated with increased risk of bleeding.

Hypertension and worsening of preexisting hypertension reported, Use with caution in patients with hypertension; monitor BP.

Avoid in patients with aspirin triad (aspirin sensitivity, asthma, nasal polyps); caution in patients with asthma.

### Storage

##### Injection

15–30°C; protect from light.

##### **Solution Compatibility**

|  |
| --- |
| **Compatible** |
| Dextrose 5% in sodium chloride 0.9% |
| Dextrose 5% in water |
| Ringer’s injection |
| Ringer’s injection, lactated |
| Sodium chloride 0.9% |

**Incompatible**

Haloperidol lactate

Morphine Sulfate

***Morphine***

Strong analgesic used in the relief of severe, acute pain or moderate to severe, chronic pain (e.g., in terminally ill patients).

### In symptomatic treatment of acute pain, reserve opiate analgesics for pain resulting from severe injuries, severe medical conditions, or surgical procedures, or when nonopiate alternatives for relieving pain and restoring function are expected to be ineffective or are contraindicated.

### Pain (Acute Coronary Syndromes [ACS])

Relief of pain and anxiety related to ACS.

Considered analgesic agent of choice in patients with ST-segment-elevation MI (STEMI).

Considered reasonable in patients with non-ST-segment-elevation (NSTE) ACS who continue to experience pain despite treatment with maximally tolerated anti-ischemic drugs (e.g., nitrates). However, use of morphine should not preclude use of other anti-ischemic drugs with proven benefit.

Patients with acute MI typically exhibit overactivity of the sympathetic nervous system, which adversely increases myocardial oxygen demand via acceleration of heart rate, elevation in arterial blood pressure, augmentation of cardiac contractility, and heightened tendency to develop ventricular tachyarrhythmias. Principal objective in these patients is to administer sufficient doses of an analgesic such as morphine to relieve what many patients describe as a feeling of impending doom.

### *Administration*

Administered  by sub-Q,  IM, or slow IV injection, or by IV infusion.

IM is preferred to sub-Q injection when repeated parenteral doses are necessary, since repeated sub-Q injection causes local tissue irritation, pain, and induration. However, IM administration of opiate analgesics also is discouraged; IM injections can cause pain and are associated with unreliable absorption, resulting in inconsistent analgesia. Some experts state that IV injection or continuous IV or sub-Q infusion provides better comfort and reliability and that repeated IM injection should not be used routinely.

When morphine is administered IV an opiate antagonist and facilities for administration of oxygen and control of respiration should be available.

For IV injection, morphine sulfate should be injected slowly with the patient in the recumbent position. Rapid IV injection may result in an increased frequency of opiate-induced adverse effects; severe respiratory depression, apnea, hypotension, peripheral circulatory collapse, chest wall rigidity, cardiac arrest, and anaphylactoid reactions have occurred following rapid IV injection.

##### ***Dilution***

For continuous IV infusion, morphine sulfate has been diluted to a concentration of 0.1–1 mg/mL in 5% dextrose and administered via a controlled-infusion device; more concentrated solutions have been used in patients whose fluid intake was restricted and/or dosage requirements were high. Morphine sulfate injections containing 25 or 50 mg/mL are intended for preparation of IV infusion solutions and should *not* be administered IV without prior dilution.

For continuous sub-Q infusion, the drug has been diluted to an appropriate concentration in 5% dextrose and administered via a portable, controlled, sub-Q infusion device.

##### ***Rate of Administration***

The rate of continuous IV infusion of the drug must be individualized according to the response and tolerance of the patient.

Rate of IV infusion in neonates generally should not exceed 0.015–0.02 mg/kg per hour.

##### ***Dosage forms***

MORPHINE HCL 10MG/ML AMP

MORPHINE HCL 20MG/ML AMP

MORPHINE SULPHATE 10MG/ML AMP

#### Pediatric Patients

**Moderate to Severe Pain**

IM or Sub-Q

Neonates: 0.05–0.2 mg/kg every 2–4 hours as necessary.

Infants and children: 0.1–0.2 mg/kg every 2–4 hours.

Single pediatric doses should not exceed 10 mg.

IV

Neonates: 0.05–0.2 mg/kg every 2–4 hours as necessary. For continuous IV infusion, 0.025–0.05 mg/kg per hour.

Infants and children: 0.1–0.2 mg/kg every 2–4 hours.

Adolescents >12 years of age: 3–4 mg; may repeat in 5 minutes if needed.

Single pediatric doses should not exceed 10 mg.

#### Adults

###### IV

May administer 2.5–20 mg every 2–6 hours as needed or via continuous infusion at a rate of 0.8–10 mg per hour.

Can be administered at a rate of 2–4 mg every 5 minutes, with some patients requiring as much as 25–30 mg before pain relief is adequate.

###### IM or Sub-Q

May administer 2.5–20 mg every 2–6 hours as needed or via continuous infusion at a rate of 0.8–10 mg per hour.

###### Continuous IV

Initially 0.8–10 mg/hour and then increase to an effective dosage as necessary; an IV loading dose of ≥15 mg can be administered for initial relief of pain prior to initiating continuous IV infusion of the drug.

Maintenance doses have ranged from 0.8–80 mg/hour infused IV, although higher (e.g., 150 mg/hour) maintenance dosages occasionally have been required.

##### **Unstable Angina (Unresponsive to 3 Sublingual Doses of Nitroglycerin)**

###### **IV**

2–5 mg (repeated every 5–30 minutes as needed to relieve symptoms and maintain patient comfort) has been used.

### Prescribing Limits

#### Pediatric Patients

##### Analgesia

###### Moderate to Severe Pain

IV, IM, or Sub-Q

Single pediatric doses should not exceed 15 mg.

***Contraindications***

Respiratory depression in the absence of resuscitative equipment.

Acute or severe bronchial asthma or hypercarbia.

Known or suspected paralytic ileus.

***Warnings***

##### Respiratory Depression

The major toxicity associated with morphine.

Occurs most frequently in geriatric and debilitated patients, and those with conditions accompanied by hypoxia or hypercapnia when even moderate therapeutic doses may dangerously decrease pulmonary ventilation.

May be severe, requiring maintenance of an adequate airway, use of resuscitative equipment, and administration of oxygen, an opiate antagonist, and/or other resuscitative drugs.

Use with extreme caution in patients with COPD or cor pulmonale, and in patients having a substantially decreased respiratory reserve, hypoxia, hypercapnia, or preexisting respiratory depression. In such patients, even therapeutic morphine doses may decrease respiratory drive while simultaneously increasing airway resistance to the point of apnea.

##### **Head Injury and Increased Intracranial Pressure**

The respiratory depressant effects of morphine (with CO2 retention and secondary elevation of CSF pressure) may be markedly exaggerated in the presence of head injury, other intracranial lesions, or preexisting increase in intracranial pressure.

Morphine produces effects (e.g., pupillary changes) that may obscure neurologic signs of further increase in pressure in patients with head injuries.

May interfere with evaluation of CNS function, and respiratory depression produced by the drug may produce cerebral hypoxia and elevated CSF pressure not caused by the injury itself.

Use with extreme caution, if at all, in patients with severe CNS depression, anoxia, hypercapnia, or respiratory depression or those who are especially prone to respiratory depression such as comatose patients or those with head injury, brain tumor, or elevated CSF pressure.

##### **Hypotensive Effects**

Like all opiate analgesics, may cause severe hypotension in individuals whose ability to maintain their BP is compromised by depleted blood volume or concomitant drugs (e.g., phenothiazines, general anesthetics). Consider avoiding concomitant use of vasodilators.

Use the minimal effective dose; patient’s legs should be elevated to decrease the possibility of hypotension.

Use with caution in patients in circulatory shock, since vasodilation produced by the drug may further reduce cardiac output and BP.

##### **Hypersensitivity Reactions**

**Anaphylaxis reported rarely.**

##### **Sulfite Sensitivity**

Some commercially available formulations of morphine sulfate injection contain sulfites that may cause allergic-type reactions, including anaphylaxis and life-threatening or less severe asthmatic episodes, in certain susceptible individuals.

Overall prevalence of sulfite sensitivity in the general population is unknown but probably low; such sensitivity appears to occur more frequently in asthmatic than in nonasthmatic individuals.

### Common Adverse Effects

CNS effects (dizziness, visual disturbances, mental clouding or depression, sedation, coma, euphoria, dysphoria, weakness, faintness, agitation, restlessness, nervousness, seizures, delirium, insomnia) and GI effects (nausea, vomiting, constipation).

#### Onset

Sub-Q: Peak analgesia within 50–90 minutes and maximal respiratory depression within 90 minutes.

IV injection: Peak analgesia within 20 minutes and maximal respiratory depression within 7 minutes.

IM administration: Peak analgesia within 30–60 minutes and maximal respiratory depression within 30 minutes.

analgesia may be maintained up to 7 hours.

##### ***Solution Compatibility***

|  |
| --- |
| **Compatible** |
| Dextrose–Ringer’s injection combinations |
| Dextrose–Ringer’s injection, lactated, combinations |
| Dextrose–saline combinations |
| Dextrose 2.5, 5, or 10% in water |
|  |
| Ringer’s injection |
| Ringer’s injection, lactated |
| Sodium chloride 0.45 or 0.9% |
|  |
| **Variable** |
| Sterile water for injection |

##### ***Drug Compatibility***

Furosemide, Metoclopramide HCl, Ondansetron HCl,

کجاها کتورولاک کنار مورفین استفاده می شود؟ گفتیم موقع تزریق آی وی مورفین به آنتی دوت احتیاج داریم، کجاها و چه مقدار نالوکسان مصرف می شود؟

***References***

***applied therapeutics ( the clinical use of drugs)***

***drugs.com***

***RESPIRATORY DRUGS***

***Introduction***

Definition Respiratory emergencies are medical emergencies characterized by difficulty in breathing or inability to breathe.

In such emergencies : Patient take frequent shallow/irregular or slow breaths.  Immediate medical help/hospitalization required. Patient is extremely agitated. Can be fatal, if not treated.

حالا با این تفاسیر ببینیم چه داروهایی در آمبولانس و به چه نحوی باید مصرف شود؟

# *Albuterol Sulfate (Salbutamol)*

**Class:** Selective beta-2-Adrenergic Agonists

Bronchodilator; relatively selective, short-acting β2-adrenergic agonist

## *Uses for Albuterol Sulfate*

Acute or severe bronchospasm: Symptomatic management or prevention of bronchospasm in patients with reversible, obstructive airway disease (e.g., asthma).

Exercise-induced Bronchospasm (prevention)

Chronic Obstructive Pulmonary Disease: Albuterol sulfate in fixed combination with ipratropium bromide ***(combivent)***: Symptomatic management of reversible bronchospasm associated with COPD in patients who continue to have evidence of bronchospasm despite regular use of an orally inhaled bronchodilator and who require a second bronchodilator.

(***Chronic Obstructive Pulmonary Disease (COPD)***: patients typically present symptoms of chronic bronchitis and emphysema and reactive airway disease. symptoms including the following: cough (usually worse in morning and productive of a small amount of colorless sputum), breathlessness, wheezing)

Albuterol sulfate: Symptomatic management of reversible bronchospasm associated with COPD when given on an as-needed or regular (e.g., 4 times daily) basis, either alone or concomitantly with other inhaled bronchodilators.

* Albuterol sulfate: Administer by oral inhalation via metered-dose inhaler or nebulizer.
* Albuterol sulfate in fixed combination with ipratropium bromide ***(combivent)***: Administer by oral inhalation via metered-dose aerosol inhaler or nebulizer.

***Administration***

Administer inhalation aerosol only with the actuator provided by the manufacturer.

Shake inhaler well before use.

Test-spray inhalation aerosol (3 times for ProAir HFA, 4 times for Ventolin HFA or Proventil HFA) into the air (away from the face) before first use and whenever the inhaler not used for prolonged periods (i.e., >2 weeks). Test spray Ventolin HFA aerosol inhaler whenever dropped.

Avoid spraying aerosols into the eyes.

Exhale slowly and completely and place the mouthpiece of the inhaler well into the mouth with the lips closed around it. Inhale slowly and deeply through the mouth. Actuate aerosol inhaler, hold breath for as long as possible, withdraw mouthpiece, and exhale slowly.

Allow 1 minute to elapse between subsequent inhalations from aerosol inhaler.

***Dosage***

#### Pediatric Patients

##### **Bronchospasm in Asthma**

###### **Oral Inhalation Aerosol (100 mcg/dose-200 dose)**

Children ≥4 years of age: 180 mcg (2 inhalations) every 4–6 hours. Do not increase dosage or dosage frequency. Alternatively, 90 mcg (1 inhalation) every 4 hours may be sufficient.

#### Adults

##### **Bronchospasm in Asthma**

###### **Oral Inhalation Aerosol**

180 mcg (2 inhalations) every 4–6 hours. Do not increase dosage or dosage frequency of orally inhaled albuterol aerosol. Alternatively, 90 mcg (1 inhalation) every 4 hours.

##### **Chronic Obstructive Pulmonary Disease**

###### **Oral Inhalation Aerosol**

Initially, 180 mcg (2 inhalations) 4 times daily in fixed combination with ipratropium bromide (18 mcg per inhalation). If necessary, additional inhalations may be used, with dosage not >12 inhalations in 24 hours.

**Prescribing Limits**

#### Adults

##### **Chronic Obstructive Pulmonary Disease**

###### **Oral Inhalation Aerosol**

Maximum 180 mcg (2 inhalations) 4 times daily in fixed combination with ipratropium bromide (18 mcg per inhalation).

***Contraindications***

* Known hypersensitivity to albuterol or any ingredients in the formulations.
* Known history of hypersensitivity to soya lecithin or related food products such as soybeans or peanuts; atropine and its derivatives; or any other ingredient in the specific formulation (albuterol sulfate in fixed combination with ipratropium bromide).

#### Warnings

##### **Paradoxical Bronchospasm**

Possible life-threatening, acute paradoxical bronchospasm. Frequently occurs with the first use of a new canister or vial (oral inhalation aerosol), but also may occur with orally administered conventional or extended-release tablets.

Discontinue therapy immediately if bronchoconstriction occurs and institute alternative therapy.

##### **Cardiovascular Effects**

Possible clinically important cardiovascular effects, including cardiac arrhythmias (e.g., atrial fibrillation, supraventricular tachycardia, extrasystoles) , increased or decreased BP, and related symptoms. Cautious use recommended in patients with cardiovascular disorders (e.g., coronary insufficiency, cardiac arrhythmias), hypertension, and those with sensitivity to sympathomimetic amines. May require drug discontinuance.

#### Sensitivity Reactions

Immediate hypersensitivity reactions (e.g., urticaria, angioedema, rash, bronchospasm, anaphylaxis, oropharyngeal edema) have been reported. Possible acute bronchospasm.

##### **Pediatric Use**

Safety and efficacy of orally inhaled albuterol sulfate inhalation aerosols not established in children <4 years of age. Safety and efficacy of albuterol sulfate in fixed combination with ipratropium bromide (combivent) not established in pediatric patients <18 years of age.

Safety and efficacy of albuterol conventional not established in children <6 years of age.

##### **Geriatric Use**

No overall differences in safety and efficacy observed between geriatric and younger patients for albuterol sulfate in fixed combination with ipratropium bromide inhalation solution.

Special caution should be used in geriatric patients who have cardiovascular disease. (See Cautions: Cardiovascular Effects.) Cannot rule out possibility that some geriatric patients may exhibit increased sensitivity to the drug.

Substantially eliminated by kidneys; assess renal function periodically since geriatric patients more likely to have decreased renal function. Risk of toxicity greater in patients with renal impairment, including geriatric patients.

### Common Adverse Effects

Albuterol sulfate: Tremor, asthma exacerbation, bronchospasm, nervousness, shakiness, otitis media, nausea, cough, bronchitis, headache, tachycardia/palpitations, muscle cramps, hypokinesia, insomnia, weakness, dizziness, excitement, hyperactivity, increased appetite, flu syndrome, lymphadenopathy, skin/appendage infection, urticaria.

Albuterol sulfate in fixed combination with ipratropium bromide: Bronchitis, upper respiratory tract infection, lung disease, headache, dyspnea, pharyngitis, coughing, chest pain, pain, respiratory disorder, sinusitis, nausea, diarrhea, urinary tract infection, influenza, pneumonia, leg cramps, dyspepsia, constipation, voice alterations, bronchospasm.

#### Onset

Oral inhalation aerosol: Within 5–15 minutes.

اینجا عکس از سالبوتامول و کامبیونت و دائولین بذارم

***Atrovent***

**Generic Name:** Ipratropium Bromide  
**Class:** Antimuscarinics/Antispasmodics

***Indications***

bronchospasm in COPD: maintenance treatment of bronchospasm, including chronic bronchitis and emphysema.

acute asthma exacerbation: Has been used for symptomatic treatment of acute or chronic bronchial asthma; β2-adrenergic agonist bronchodilators generally preferred *initially* for relief of bronchospasm in asthmatic patients.

May be useful as alternative therapy in adults experiencing adverse effects (e.g., tachycardia, arrhythmia, tremor) with a β-adrenergic agonist.

Some clinicians consider ipratropium as *adjunctive* therapy in patients with moderate or severe exacerbations (peak expiratory flow rate ≤80% of predicted) of asthma who fail to respond adequately to β-adrenergic agonists and corticosteroids.

May be useful for prevention or reversal of bronchospasm induced by β-adrenergic blocking agents (e.g., propranolol) in asthmatic patients; β-adrenergic bronchodilators generally ineffective for this indication in such patients.

## *Atrovent Dosage and Administration*

Shake well immediately prior to use. Actuate aerosol inhaler 3 times prior to the initial use or if it has not been used for >24 hours.

Do not use mouthpiece for other aerosol drugs. Exhale slowly and completely and place the mouthpiece of the inhaler well into the mouth with the lips closed around it. To avoid contact of the drug with the eyes and subsequent adverse effects, close eyes during inhalation of aerosol. Inhale slowly and deeply through the mouth while actuating the inhaler. Hold the breath for 10 seconds, withdraw the mouthpiece, and e Allow ≥15 seconds to elapse between subsequent inhalations from the aerosol inhaler.

Wash the mouthpiece in hot running water as needed. If soap is used, rinse mouthpiece thoroughly with plain water.

xhale slowly.

acute asthma exacerbation: 8 actuations (136 mcg) q20 min PRN for 3 hr.

### Contraindications

* Known hypersensitivity to the drug or any other component of the formulation, or to atropine or its derivatives.
* Known hypersensitivity to soya lecithin or related food products, including soybeans and peanuts.

#### Warnings

##### Acute Bronchospasm

Delayed onset of action; *not* indicated for *initial* treatment. Generally should *not* be used *alone* for the management of acute bronchospasm, when a rapid response is required.

#### Sensitivity Reactions

Immediate hypersensitivity reactions, including rash, angioedema of the tongue, lips, and face, urticaria, bronchospasm, oropharyngeal edema, and anaphylactic reaction.

Possible paradoxical bronchospasm.

### Common Adverse Effects

Bronchitis, upper respiratory tract infection, cough, and dryness of the mouth, throat, or tongue with ipratropium aerosol. Adverse effects resulting in discontinuance of nebulized ipratropium most frequently include bronchitis, dyspnea, and bronchospasm.

#### Onset

Bronchodilation evident within 15 minutes following oral aerosol inhalation and within 15–30 minutes following oral inhalation via nebulization.

اینجا عکس از آتروونت بذارم

***Pulmicort***

**Generic Name:** budesonide

## Indications and Usage for Pulmicort Flexhaler

Pulmicort Flexhaler is indicated for the maintenance treatment of asthma as prophylactic therapy in patients six years of age or older.

Limitations of Use:

**•**

Pulmicort Flexhaler is NOT indicated for the relief of acute bronchospasm.

به این دلیل این دارو تو آمبولانس نباید باشه. قبلا بحث بود که باید باشه!!!!!!!!!!

***CARDIAC DISORDERS AND DRUGS***

توضیح انواع آریتمی ها اگر لازم هست دکتر پهلوان پور ارائه می دهند.

***TNG***

(*trinitroglycerin sublingual pearl 0.4 mg, trinitroglycerin sublingual spray 0.4 mg*)

*pharmacology*: relaxes smooth muscle via dose-dependent dilation of arteial and venous beds to reduce both preload and afterload, and myocardial O2 demand. Also improve cronary collateral circulation. lower BP, increase HR, occasional paradoxial bradycardia.

*Dosage and Indications (pearl)*

Angina Pectoris (acute relief): 0.3-0.6 mg q5min up to 3 times, use at first sign of angina. prompt medical attention needed if no relief. dissolve under tongue or in buccal pouch, do not rinse mouth or spit for 5 minutes after administration.

Angina Pectoris (prophylaxis)

(Angina Pectoris: is the result of myocardial ischemia caused by an imbalance between myocardial blood supply and oxygen demand. it is a common presenting symptom (typically chest pain) among patients with coronary artery disease (CAD). signs and symptoms: retrosternal chest discomfort (pressure, heaviness, squeezing, burning, or chocking sensation

pain localized primarily in the epigastrium, back, neck, jaw or sloulders

pain precipitated by exertion, eating, expsure to cold, or emotional stress, lasting for about 1-5 minutes and relieve by rest or nitroglycerin.

pain intensity that does not change with respiration, cough or change in position)

***Common adverse effects***

headache, hypotension, tachycardia, dizziness, blurred vision, flushing, nervousness, xerostomia

***Contraindications***

Early myocardial infarction , severe anemia, increased intracranial pressure, and known hypersensitivity to nitroglycerin

Recent use (within several days) of PDE-5 inhibitors ( sildenafil & tadalafil) may cause dangerously low hypotension

Narrow angle glaucoma

Acute circulatory failure or shock

*Dosage and Indications (spray)*

1-2 sprays PRN for angina, may repeat q3-5 min not to exceed 3 sprays in 15 minutes.

spray onto or under tongue, do not inhale expectorate or rinse mouth for 5-10 minutes.

seek medical attention if pain persists after 3 doses in 15 minutes.

***Amiodarone***

**Class:** Class III Antiarrhythmics

Delays repolarization by prolonging the action potential duration and effective refractory period in cardiac tissue.

Amp 150 mg/3ml به همراه عکس آمپول

( the basis of classifacation of Antiarrhythmic agents is the grouping of agents according to their general effects.

Class I: Fast sodium (Na) channel blockers: Ia, Ib (-[Lidocaine](http://reference.medscape.com/drug/lidocaine-cv-lidopen-342302): depress phase 0 selectively in abnormal/ischemic tissue, shorten repolarization), Ic

Class II: Beta blockers

Class III: Potassium (K) channel blockers: [Amiodarone](http://reference.medscape.com/drug/pacerone-cordarone-amiodarone-342296) (prolongs phase 3; also acts on phases 1, 2, and 4)(QT prolongation)

Class IV: Slow calcium (Ca) channel blockers

* Class V: Variable mechanism ([Adenosine](http://reference.medscape.com/drug/adenocard-adenoscan-adenosine-342295)
* [Digoxin](http://reference.medscape.com/drug/lanoxin-digoxin-342432))

***Indications***

**Ventricular Arrhythmias**

Used during cardiac arrest for treatment of refractory (i.e., unresponsive to CPR, defibrillation, and a vasopressor [e.g., epinephrine]) VF or pulseless VT. Considered the preferred antiarrhythmic drug for this use in current ACLS guidelines in adults; ***lidocaine*** may be used as an alternative. In pediatric patients, current evidence supports use of either amiodarone or lidocaine.

Also may be used for treatment of wide-complex tachycardias during periarrest period; included in current ACLS guidelines for both adult and pediatric tachycardia.

**Supraventricular Tachyarrhythmias**

برای آمبولانس همون اندیکاسیون اول کافیه یا اینم باید بیاد؟

## *Amiodarone Hydrochloride Dosage and Administration*

### *General*

Administer lowest effective dosage to minimize the risk and occurrence of adverse effects.

Adjust dosage carefully according to individual requirements and response and the general condition and cardiovascular status of the patient. Adjustment of maintenance dosage is difficult due to variable absorption and elimination of amiodarone; dosage reduction or temporary withdrawal or discontinuance of the drug may be required.

When dosage adjustment is necessary, close monitoring for an extended period of time is recommended.

Clinical and ECG monitoring of cardiac function, including appropriate ambulatory ECG monitoring (e.g., Holter monitoring) and/or programmed electrical stimulation (PES), as appropriate, is recommended.

#### IV Administration

Administer in 3-phase sequence: rapid loading phase, slow loading phase, and maintenance infusion phase.

Dilute amiodarone hydrochloride concentrate prior to administration by IV infusion.

##### ***Dilution***

For the first rapid loading infusion or for supplemental infusions, add 3 mL of amiodarone hydrochloride concentrate to 100 mL of 5% dextrose, resulting in a final concentration of 1.5 mg/mL.

For the slow loading infusion and maintenance infusion, add 18 mL of amiodarone hydrochloride concentrate to 500 mL of 5% dextrose, resulting in a final concentration of 1.8 mg/mL. For subsequent maintenance infusions, solutions containing a final amiodarone hydrochloride concentration of 1–6 mg/mL may be used.

##### ***Rate of Administration***

For treatment of ventricular arrhythmias in adults, 15 mg/minute for 10 minutes (rapid loading phase), then 1 mg/minute for 6 hours (slow loading phase), then 0.5 mg/minute (initial maintenance phase) for 18 hours; infuse supplemental doses of 150 mg over 10 minutes (at a rate of 15 mg/minute). Initial (rapid) loading infusion rate should not exceed 30 mg/minute. Monitor initial rate of infusion closely; do not exceed recommended rate. (See Hypotension under Cautions.)

Use volumetric infusion pump. Do *not* use drop-counter infusion sets; may result in underdosage.

***Dosage***

Available as amiodarone hydrochloride; dosage expressed in terms of the salt.

#### Pediatric Patients

##### ***Ventricular Arrhythmias***

***Pediatric Resuscitation***

Refractory VF or pulseless VT: 5 mg/kg as a rapid bolus. May repeat twice up to 15 mg/kg (maximum single dose of 300 mg).

To minimize pediatric exposure to DEHP, may infuse a loading dose of 5 mg/kg given in 5 divided doses of 1 mg/kg (each dose infused over 5–10 minutes).

#### Adults

Total initial dosage during first 24 hours is approximately 1000 mg.

**IV Dosage Over First 24 Hours**

|  |  |
| --- | --- |
| Loading Phase | Initial rapid loading phase: 150 mg administered at rate of 15 mg/minute (i.e., over 10 minutes) |
| Maintenance Phase | First maintenance phase: 540 mg administered at rate of 0.5 mg/minute (i.e., over 18 hours) |

دیگه بعد 24 ساعت بدرد تکنسین آمبولانس نمیخوره

### *Prescribing Limits*

#### Pediatric Patients

##### ***Ventricular Arrhythmias***

###### **IV**

Maximum single dose: 300 mg, up to a total dose of 15 mg/kg.

#### Adults

##### Ventricular Arrhythmias

###### IV

Mean daily doses >2.1 g are associated with an increased risk of hypotension.

#### Geriatric Patients

Select dosage with caution, usually starting at low end of dosage range, because of possible age-related decrease in hepatic, renal, and/or cardiac function and concomitant disease and drug therapy; however, dosage requirements generally similar in geriatric and younger adults.

Use caution with high dosages due to increased susceptibility to drug-induced bradycardia and conduction disturbances.

### *Contraindications*

* Cardiogenic shock. Severe sinus node dysfunction resulting in marked sinus bradycardia (unless a functioning pacemaker is present).
* Second- or third-degree AV block (unless a functioning pacemaker is present). (See Effects on Cardiac Conduction under Cautions.)
* Bradycardia that has caused syncope (unless a functioning pacemaker is present).
* Known hypersensitivity to amiodarone or any ingredient in the formulation, including iodine.

#### Warnings

Use with caution, if at all, in patients with preexisting pulmonary disease (e.g., chronic obstructive disease, reduced pulmonary diffusion capacity ); poorer prognosis if pulmonary toxicity develops in such patients.

Carefully assess respiratory symptoms and rule out other causes of respiratory impairment (e.g., CHF, pulmonary embolism, malignancy, infectious causes) before discontinuing therapy.

##### ***Arrhythmogenic Effects***

Possible worsening of existing arrhythmias or occurrence of new arrhythmias. Monitor for QTc prolongation during IV infusion of ***amiodarone.***

##### ***Hypotension***

Hypotension associated with IV therapy; mean daily IV dosages >2.1 g associated with increased risk of hypotension. Hypotension may be refractory in some cases, resulting in death. Monitor initial rate of infusion closely; do not exceed recommended rate. (See Rate of Administration under Dosage and Administration.)

Hypotension (possibly severe) reported during open-heart surgery (during and/or following cardiopulmonary bypass) in amiodarone-treated patients.

Large amounts of benzyl alcohol (e.g., 100–400 mg/kg daily) have been associated with toxicity in neonates; each mL of amiodarone hydrochloride injection contains 20.2 mg of benzyl alcohol.

***Common Adverse Effects***

IV administration: hypotension.

***Storage***

#### Parenteral

##### Injection Concentrate

20–25°C; protect from light and excessive heat. Store ampuls in carton to protect from light until used. Light protection not necessary during administration.

|  |
| --- |
| **Compatible** |
| Dextrose 5% in water |

***Lidocaine as an alternative for Amiodarone***

***Dosage & Indication***

Acute management of ventricular arrhythmias (acute MI)

adult

1-1.5 mg/kg slow IV bolus over 2-3 minutes.

May repeat doses of 0.5-0.75 mg/kg in 5-10 minutes up to 3 mg/kg total if refractory VF or pulseless VT

Continuous infusion: 1-4 mg/min IV after return of perfusion.

Administer 0.05 mg/kg bolus reassess infusion if arrhythmia reappears during constant infusion

pediatric patients

Bolus: 0.5-1 mg/kg IV not to exceed 100 mg, follow with contiuous infusion, if delay between bolus and start of infusion is>15 minutes administer a second bolus q5-10 min to 5 mg/kg

continuous infusion: 20-50 mcg/kg/min IV

لیدوکایین چون قرار نیست بیاد تو آمبولانس فقط دوز بندیش مطرح شد و دیگر هیچ!

***Epinephrine and Atropine Overview***

تفاوت بین آمپول اپی نفرین 1:1000 و 1:10000 چیست؟ دوز بندیش به همراه آتروپین

آمپول اپی نفرین 1:1000 غلظتش 1 میلی گرم در 1 میلی لیتر است و 1:10000 غلظتش 0.1 میلی گرم در میلی لیتر. غلظت اول را نمیشه آی وی زد فقط داخل عضله یا ساب کوتانوس، دومی رو میشه آی وی زد. فقط از لارج وین ترجیحا بیمار سی وی داشته باشه. چون وازوکانستریکشن میده. تزریقش تو عروق کوچک باعث ایسکمی اون عروق میشه. پس غلظت 1 بیشتر برای شوک های آنافیلاکسی و واکنش های حساسیتی و به عنوان برونکودیلاتور در موارد شدید آسم کاربرد داره و غلظت 0.1 برای شوک سپتیک و کاربردهای قلبی (قبلا تنها غلظت 1 در بازار بوده که نمی شده مستقیم تو رگ زد و حتما باید با 10 سی سی نرمال سالین رقیق میشده و بعد آهسته وریدی بزنن که سخت بوده)

## *Indications for Epinephrine*

### *Sensitivity Reactions*

Drug of choice in the emergency treatment of severe acute anaphylactic reactions, including anaphylactic shock.

Used to relieve anaphylactic symptoms (e.g., urticaria, pruritus, angioedema, hypotension, respiratory distress) caused by reactions to drugs, contrast media, insect stings, foods (e.g., milk, eggs, fish, shellfish, peanuts, tree nuts), latex, or other allergens; also used for idiopathic or exercise-induced anaphylaxis.

Administer immediately by IM injection as soon as anaphylaxis is diagnosed or strongly suspected.

Administration by IM injection preferred, mainly because of safety considerations. However, IV administration may be necessary in extreme situations (e.g., anaphylactic shock, cardiac arrest, unresponsive or severely hypotensive patients who have failed to respond to multiple IM injections). Close hemodynamic monitoring is recommended during IV administration.

Also used for its vasopressor effects in the treatment of anaphylactic shock and cardiac arrest associated with anaphylaxis.

Manage cardiac arrest secondary to anaphylaxis with standard ACLS measures; consider alternative vasoactive drugs (e.g., vasopressin, norepinephrine) in patients who do not respond to epinephrine. Consider other interventions (e.g., antihistamines, IV corticosteroids) as clinically indicated.

Risk of paradoxical response to epinephrine in patients receiving β-adrenergic blocking agents; consider glucagon and/or ***ipratropium*** for treatment of anaphylaxis in these patients.

### *ACLS and Cardiac Arrhythmias*

### ACLS (Advanced cardiac life support, or advanced cardiovascular life support, often referred to by its abbreviation as "ACLS", refers to a set of clinical algorithms for the urgent treatment of [cardiac arrest](https://en.wikipedia.org/wiki/Cardiac_arrest), [stroke](https://en.wikipedia.org/wiki/Stroke), [myocardial infarction](https://en.wikipedia.org/wiki/Myocardial_infarction), and other life-threatening cardiovascular emergencies)

Used for its α-adrenergic effects to increase blood flow and facilitate return of spontaneous circulation (ROSC) during cardiac arrest. Principal benefits of the drug result from increases in aortic diastolic blood pressure and in coronary and cerebral blood flow during resuscitation.

High-quality CPR and defibrillation are the only proven interventions to increase survival to hospital discharge in ACLS. Other resuscitative efforts, including drug therapy, are considered secondary and should be performed without compromising the quality and timely delivery of chest compressions and defibrillation.

Principal goal of pharmacologic therapy during cardiac arrest is to facilitate ROSC, and epinephrine is the drug of choice for this use.

ACLS guidelines state that administration of epinephrine may be reasonable in adults with VF or pulseless VT resistant to initial CPR attempts and at least one defibrillation shock; optimal timing of administration (particularly in relation to defibrillation) not known and may vary based on patient-specific factors and resuscitation conditions. In adults with asystole or pulseless electrical activity (PEA), epinephrine may be administered as soon as feasible after onset of cardiac arrest.

Also may be used in the postresuscitation period to optimize BP, cardiac output, and systemic perfusion after ROSC.

Used during the periarrest period for treatment of symptomatic bradycardia in adults; although not a first-line drug, may be considered in patients who are unresponsive to atropine or as a temporizing measure while awaiting availability of a pacemaker.

Also used in the emergency treatment of infants and children with bradycardia and cardiopulmonary compromise (with a palpable pulse) when bradycardia persists despite ventilation, oxygenation, and chest compressions.

Drugs are rarely needed during resuscitation of neonates; because hypoxemia and inadequate lung inflation are common causes of bradycardia, establishing adequate ventilation is the most important corrective measure in these patients.

Also has been used in the treatment of syncope resulting from AV nodal block. However, permanent pacemaker implantation is the treatment of choice for third-degree and advanced second-degree AV nodal block (complete heart block).

### *Septic Shock*

Used for treatment of hypotension associated with septic shock, generally as a second-line agent. The Surviving Sepsis Campaign International Guidelines for Management of Sepsis and Septic Shock recommend norepinephrine as the first-line vasopressor of choice in adults with septic shock; if adequate BP not achieved, epinephrine may be added.

Should *not* be used in cardiogenic shock (because it increases myocardial oxygen demand) or in hemorrhagic or traumatic shock.

### *Bronchospasm*

Also has been used IV for treatment of severe asthma exacerbations; however, no evidence that the drug improves outcomes compared with selective inhaled β2-adrenergic agonists.

## *Epinephrine Dosage and Administration*

Usually administered parenterally (by IM, sub-Q, or IV injection or by continuous IV infusion).

Select appropriate concentration and route of administration carefully; serious adverse effects (e.g., cerebral hemorrhage) have occurred after concentrated solutions of epinephrine intended for IM administration were administered IV. Generally administer IV only in extreme situations (e.g., septic or anaphylactic shock, cardiac arrest, or when patient is unresponsive to multiple IM injections). Always use dilute solutions of epinephrine (e.g., 0.1 mg/mL) when administering IV. Commercially available epinephrine solutions for IM or sub-Q injection are more concentrated (1 mg/mL) and should not be administered IV without dilution.

Solutions of epinephrine have been applied topically to the skin, mucous membranes, or other tissues for local hemostasis.

Injections containing 1 mg/mL may be administered IM or sub-Q; avoid IM injections in the buttock. When epinephrine is used for the treatment of anaphylaxis, inject into anterolateral aspect of thigh; injection into or near smaller muscles (i.e., deltoid muscle) not recommended because of possible differences in absorption.

Extreme caution recommended when epinephrine is administered by direct IV injection since risk of overdosage and adverse cardiovascular effects is substantially higher; administer slowly and with close hemodynamic monitoring.

During cardiac resuscitation, may administer IV into a central or peripheral line. CPR should not be interrupted for placement of a central line. After administration through a peripheral line, flush with 20 mL of IV fluid and elevate extremity to ensure drug delivery into central compartment. To minimize risk of necrosis, administer continuous IV infusions into a large vein. Avoid catheter tie-in technique to avoid stasis and increased local concentrations of the drug.Take care to avoid extravasation because local necrosis may result.

***Dosage***

#### Pediatric Patients

##### ***Sensitivity Reactions***

###### **Anaphylaxis**

IM or Sub-Q

0.01 mg/kg (0.01 mL/kg of a 1-mg/mL solution) (up to 0.3–0.5 mg per dose depending on patient weight); repeat every 5–15 minutes as needed. Some clinicians state that doses may be repeated at 20-minute to 4-hour intervals depending on severity of the condition and patient response.

IV

If necessary, initial dose of 0.01 mg/kg (0.1 mL/kg of a 0.1-mg/mL solution) may be administered. If repeat doses are required, initiate a continuous IV infusion at a rate of 0.1 mcg/kg per minute; increase gradually to 1.5 mcg/kg per minute to maintain BP.

##### Pediatric Advanced Life Support (PALS)

###### IV or IO

Neonates: Usual IV dose is 0.01–0.03 mg/kg (0.1–0.3 mL/kg of a 0.1-mg/mL solution). Higher doses not recommended because of risk of exaggerated hypertension, decreased myocardial function, and worsening neurologic function.

Pediatric patients: Usual IV/IO dose is 0.01 mg/kg (0.1 mL/kg of a 0.1-mg/mL solution), up to a maximum single dose of 1 mg, repeated every 3–5 minutes as needed. Lack of survival benefit and potential harm from routine use of higher doses, particularly in cases of asphyxia. However, may consider high-dose epinephrine in exceptional circumstances (e.g., β-adrenergic blocking agent overdose).

For postresuscitation stabilization in pediatric patients, usual dosage is 0.1–1 mcg/kg per minute by IV/IO infusion; adjust based on patient response. Low-dose infusions (<0.3 mcg/kg per minute) generally produce predominantly β-adrenergic effects, while higher-dose infusions (>0.3 mcg/kg per minute) result in α-adrenergic vasoconstriction.

For emergency treatment of infants and children with bradycardia and cardiopulmonary compromise (with a palpable pulse), may give 0.01 mg/kg (0.1 mL/kg of a 0.1-mg/mL solution) by IV/IO injection, repeated every 3–5 minutes as needed.

##### Septic Shock

###### IV

If epinephrine is used in pediatric patients, some clinicians have recommended an infusion rate of 0.05–0.3 mcg/kg per minute, titrated to effect.

When therapy is discontinued, decrease infusion rate gradually (e.g., by reducing every 30 minutes over a 12- to 24- hour period).

##### Bronchospasm

###### IV

Neonates: 0.01 mg/kg by slow IV injection has been recommended.

Infants: Initially, 0.05 mg by slow IV injection; may repeat every 20–30 minutes as needed.

#### Adults

##### ***Sensitivity Reactions***

###### **Anaphylaxis**

IM or Sub-Q

Usual dose is 0.2–0.5 mg (0.2–0.5 mL of a 1-mg/mL solution); repeat every 5–15 minutes as needed.

IV

In extreme circumstances (e.g., anaphylactic shock, cardiac arrest, or no response to initial IM injections), IV administration may be necessary.

Usual IV dose is 0.1–0.25 mg (1–2.5 mL of a 0.1-mg/mL solution); repeat every 5–15 minutes as necessary.

Alternatively, may administer as a continuous infusion at a rate of 2–15 mcg/minute; titrate based on severity of the reaction and clinical response.

###### Cardiac Arrest

IV or IO

ACLS guidelines recommend 1 mg every 3–5 minutes by IV/IO injection.

Higher doses (e.g., 0.1–0.2 mg/kg) do not provide any benefits in terms of survival or neurologic outcomes compared with the standard dose (1 mg) and may be harmful.

Optimal timing of administration, particularly in relation to defibrillation, not known and may vary based on patient-specific factors and resuscitation conditions. In adults with asystole or PEA, may administer as soon as feasible after onset of cardiac arrest based on studies demonstrating improved survival to hospital discharge and increased ROSC when the drug is administered early during course of treatment for a nonshockable rhythm.

For postresuscitation stabilization, usual IV dosage is 0.1–0.5 mcg/kg per minute; adjust based on patient response.

###### Bradycardia:

IV

For symptomatic bradycardia, initial IV infusion rate of 2–10 mcg/minute has been recommended; adjust according to patient response.

##### Septic Shock

###### IV

Manufacturer suggests IV infusion of 0.05–2 mcg/kg per minute. May increase infusion rate by 0.05–0.2 mcg/kg per minute every 10–15 minutes to achieve desired BP goal. Duration of therapy or total dose required not known; treatment may be necessary for several hours or days until the patient's hemodynamic status improves.

When therapy is discontinued, decrease infusion rate gradually (e.g., by reducing every 30 minutes over a 12- to 24-hour period).

##### Bronchospasm

###### Sub-Q

For severe asthma, 0.3–0.5 mg (0.3–0.5 mL of a 1-mg/mL solution) may be administered every 20 minutes for 3 doses. Alternatively, may administer 0.01 mg/kg (using a 1-mg/mL solution) divided into 3 doses of approximately 0.3 mg each, given at 20-minute intervals.

###### IV

0.1–0.25 mg (1–2.5 mL of a 0.1-mg/mL solution) injected slowly.

### *Prescribing Limits*

#### Pediatric Patients

##### ***Sensitivity Reactions***

###### **Anaphylaxis**

IM or Sub-Q

Maximum for pediatric patients: 0.3–0.5 mg of epinephrine per dose depending on weight.

##### Pediatric Resuscitation

###### IV/IO

Maximum single dose of 1 mg.

##### ***Bronchospasm***

###### Sub-Q

Maximum for pediatric patients ≤12 years of age: 0.3–0.5 mg per dose.

#### Adults

##### Sensitivity Reactions

###### Anaphylaxis

IM or Sub-Q

Single doses should not exceed 0.5 mg.

|  |
| --- |
| **Compatible** |
| Dextrose–Ringer’s injection combinations |
| Dextrose–Ringer’s injection, lactated, combinations |
| Dextrose 5% in Ringer’s injection, lactated |
| Dextrose–saline combinations |
| Dextrose 5% in sodium chloride 0.9% |
| Dextrose 2.5, 5, or 10% in water |
|  |
| Ringer’s injection |
| Ringer’s injection, lactated |
| Sodium chloride 0.9% |
| Sodium lactate 1/6 M |
| **Incompatible** |
|  |
| Sodium bicarbonate 5% |
| **Incompatible** |
| Aminophylline |

# *Atropine*

## *Indications for Atropine*

***ACLS and Bradyarrhythmias***

Used in ACLS for management of symptomatic bradycardia. Reverses cholinergically mediated decreases in heart rate, systemic vascular resistance, and BP.

Considered initial drug of choice in adults with unstable bradycardia (e.g., that accompanied by altered mental status, cardiac ischemia, acute heart failure, hypotension, or other signs of shock).

In pediatric advanced life support (PALS), used for treatment of bradycardia secondary to increased vagal activity or primary AV block when bradycardia persists despite adequate oxygenation, ventilation, and CPR (if indicated).

Used in patients with MI who develop symptomatic or hemodynamically unstable sinus bradycardia. Other uses in MI setting include treatment of sustained bradycardia and hypotension associated with nitroglycerin use, and treatment of nausea and vomiting associated with morphine use.

Use cautiously in the presence of acute myocardial ischemia or MI because heart rate is a major determinant of myocardial oxygen requirements.

## *Atropine Dosage and Administration*

### *Administration*

Administer by sub-Q, IM, or direct IV injection. IV administration preferred for treatment of severe or life-threatening muscarinic effects.

Administer by direct IV injection.

Occasionally has been administered by IV infusion[**†**](https://www.drugs.com/monograph/atropine.html#unlbl-use) for management of muscarinic poisoning

Preferably give IV injections rapidly because slow injection may cause a paradoxical slowing of the heart rate.

#### Pediatric Patients

###### Premedication for Bradycardia in Emergency Intubation

IV

Infants and children: AHA recommends a preintubation dose of 0.02 mg/kg (with no minimum). Although minimum dose of 0.1 mg was previously recommended because of concerns about paradoxical bradycardia, current evidence suggests that minimum dose not necessary.

##### PALS and Bradyarrhythmias

###### IV

Infants and children with symptomatic bradycardia secondary to increased vagal activity or primary AV block: 0.02 mg/kg; repeat once if needed.

PALS guideline recommends minimum dose of 0.1 mg and maximum single dose of 0.5 mg.

Larger doses may be required in special resuscitation situations (e.g., organophosphate toxicity or exposure to nerve gas agents) and smaller doses (i.e., <0.1 mg) may cause paradoxical bradycardia.

#### Adults

##### ACLS and Bradyarrhythmias

###### Bradycardia

IV

For symptomatic bradycardia, AHA recommends initial dose of 0.5 mg; may repeat every 3–5 minutes up to 3 mg. Doses <0.5 mg may cause paradoxical slowing of heart rate.

### Prescribing Limits

#### Pediatric Patients

##### PALS and Bradyarrhythmias

###### Bradycardia

Infants and children: AHA recommends maximum single dose of 0.5 mg.

#### Adults: IV

Maximum total dose of 3 mg recommended.

|  |
| --- |
| **Compatible** |
| Sodium chloride 0.9% |
| **Compatible** |
|  |
| Furosemide |
|  |
| Sodium bicarbonate |
|  |

# *Charcoal, Activated*

***Mechanism of Action***

Adsorbs a variety of drugs and chemicals (eg, physical binding of a molecule to the surface of charcoal particles. desorbtion of bound particles may occur unless the ratio of charcoal to toxin is extremely high.

***Indications***

overdose, poisoning

1g/kg, 25-100g PO

alternatively 10 g charcoal/1 g drug ratio

minimum dose: 25 g

commonly used with ***Sorbitol*** 25 g, multiple dose regimen 25 g PO q2hr or 50 g q4hr without sorbitol.

Do not give sorbitol after first dose do to risk for severe diarrhea. use aqueous solution.

May place into ice to improve taste, mix 1:3 soda for pediaterics

***Common Adverse Effects***

black stool, constipation

***Contraindications***

intestine obstruction, unprotected airway(aspiratin may occur), caustic ingestion

Vomiting may occur

***Charcoal Dosage forms***

Tab 250 mg, SUSP 300 g/240ml, SUSP 50g

***Sorbitol Dosage forms***

sorbitol 5 g sachet, sorbitol oral solution

***The End***