PRODUCT MONOGRAPH

C/T LORAZEPAM INJECTION USP

lorazepam

injection, 2 mg / mL

Anxiolytic – Sedative

Sandoz Canada Inc.
110 Rue de Lauzon
Boucherville, QC, Canada
J4B 1E6

Date of Revision: June 24, 2019

Submission Control No.: 226066
PART I: HEALTH PROFESSIONAL INFORMATION

SUMMARY PRODUCT INFORMATION

<table>
<thead>
<tr>
<th>Route of Administration</th>
<th>Dosage Form / Strength</th>
<th>Nonmedicinal Ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intravenous, intramuscular</td>
<td>Injection/ 2 mg/mL</td>
<td>Benzyl alcohol (preservative), polyethylene glycol and propylene glycol.</td>
</tr>
</tbody>
</table>

INDICATIONS AND CLINICAL USE

Lorazepam Injection USP (lorazepam) is indicated for:
- adjunct for the relief of excessive anxiety that might be present prior to surgical interventions.
- initial anticonvulsant medication for the control of status epilepticus.

CONTRAINDICATIONS

Lorazepam Injection USP is contraindicated:
- in patients with myasthenia gravis or acute narrow angle glaucoma.
- in patients with known hypersensitivity to benzodiazepines or any of the excipients (e.g. polyethylene glycol, propylene glycol and benzyl alcohol).
- in intra-arterial injection. Care should also be taken to prevent its extravasation into tissue adjacent to an artery because of the danger of producing arteriospasm resulting in gangrene which may require amputation.

WARNINGS AND PRECAUTIONS

Severe anaphylactic/anaphylactoid reactions have been reported with the use of benzodiazepines. Cases of angioedema involving the tongue, glottis or larynx have been reported in patients after taking the first or subsequent doses of benzodiazepines. Some patients taking benzodiazepines have had additional symptoms such as dyspnea, throat closing, or nausea and vomiting. Some patients have required medical therapy in the emergency department. If angioedema involves the tongue, glottis or larynx, airway...
obstruction may occur and be fatal. Patients who develop angioedema after treatment with a benzodiazepine should not be rechallenged with the drug.

WARNING: RISKS FROM CONCOMITANT USE WITH OPIOIDS
Concomitant use of Lorazepam Injection USP and opioids may result in profound sedation, respiratory depression, coma, and death (see WARNINGS AND PRECAUTIONS - Risks from concomitant use of opioids and benzodiazepines).

- Reserve concomitant prescribing of these drugs for use in patients for whom alternative treatment options are inadequate.
- Limit dosages and durations to the minimum required.
- Follow patients for signs and symptoms of respiratory depression and sedation.

Intravenous injection should be made slowly and with repeated aspiration. Care should be taken to determine that any injection will not be intra-arterial and that perivascular extravasation will not take place.

Partial airway obstruction may occur in heavily sedated patients. Intravenous lorazepam, when given alone in greater than recommended dose, or at the recommended dose and accompanied by other drugs used during the administration of anesthesia, may produce heavy sedation, therefore equipment necessary to maintain a patent airway and to support respiration/ventilation should be available.

General
There is no evidence to support the use of lorazepam injection in coma, shock or acute alcohol intoxication at this time.

As with any premedicant, extreme care must be used in administering lorazepam injection to elderly or very ill patients and to those with limited pulmonary reserve, because of the possibility that apnea and/or cardiac arrest may occur. See WARNINGS AND PRECAUTIONS, Respiratory.

Clinical trials have shown that patients over the age of 50 years may have a more profound and prolonged sedation with intravenous lorazepam.

The addition of scopolamine to injectable lorazepam is not recommended, since their combined effect may result in increased incidence of sedation, hallucination and irrational behaviour.

Risks from concomitant use of opioids and benzodiazepines:
Concomitant use of benzodiazepines, including Lorazepam Injection USP, and opioids may result in profound sedation, respiratory depression, coma, and death. Because of these risks, reserve concomitant prescribing of these drugs for use in patients for whom alternative treatment options are inadequate.

Observational studies have demonstrated that concomitant use of opioid analgesics and benzodiazepines increases the risk of drug-related mortality compared to use of opioid analgesics alone. Because of similar pharmacological properties, it is reasonable to expect similar risk with the concomitant use of other CNS depressant drugs with opioid analgesics.
If a decision is made to prescribe Lorazepam Injection USP concomitantly with opioids, prescribe the lowest effective dosages and minimum durations of concomitant use. In patients already receiving an opioid analgesic, prescribe a lower initial dose of Lorazepam Injection USP than indicated in the absence of an opioid, and titrate based on clinical response. If an opioid analgesic is initiated in a patient already taking Lorazepam Injection USP, prescribe a lower initial dose of the opioid analgesic, and titrate based on clinical response. Follow patients closely for signs and symptoms of respiratory depression and sedation (see DRUG INTERACTIONS). Advise both patients and caregivers about the risks of respiratory depression and sedation when Lorazepam Injection USP is used with opioids. Advice patients not to drive or operate heavy machinery until the effects of concomitant use of the opioid have been determined.

Operating machinery or driving motor vehicles: Excessive sedation has been observed with lorazepam at standard therapeutic doses. Therefore, patients on lorazepam should be warned against engaging in hazardous activities requiring mental alertness and motor coordination, such as operating dangerous machinery or driving motor vehicles. See WARNINGS AND PRECAUTIONS, Neurologic.

Dependence/Tolerance
Lorazepam should not be administered to individuals prone to drug abuse. Lorazepam may have abuse potential, especially in patients with a history of drug and/or alcohol abuse.

Caution should be observed in patients who are considered to have potential for psychological dependence. It is suggested that the drug should be withdrawn gradually if it has been used in high dosage.

The use of benzodiazepines, including lorazepam, may lead to physical and psychological dependence. The risk of dependence increases with higher doses and longer term use and is further increased in patients with a history of alcoholism or drug abuse or in patients with significant personality disorders. The dependence potential is reduced when lorazepam is used at the appropriate dose for short-term treatment. In general, benzodiazepines should be prescribed for short periods only (e.g., 2-4 weeks). Continuous long-term use of lorazepam is not recommended.

Although there are no clinical data available for injectable lorazepam in this respect, physicians should be aware that repeated doses over a prolonged period of time may result in limited physical and psychological dependence.

Hepatic/Biliary
The liver is the most likely site of conjugation of lorazepam. When lorazepam injection is used in patients with mild to moderate hepatic disease, the lowest effective dose should be considered since drug effect may be prolonged.

Dosage for patients with severe hepatic insufficiency should be adjusted carefully according to patient response. Lower doses may be sufficient in such patients.
As with all benzodiazepines, the use of lorazepam may worsen hepatic encephalopathy; therefore, lorazepam should be used with caution in patients with severe hepatic insufficiency and/or encephalopathy.

**Neurologic**  
**Excessive Sedation and Impairment of Performance**  
As is true of other similar CNS-acting drugs, patients receiving injectable lorazepam should not operate machinery or engage in hazardous occupations or drive a motor vehicle for a period of 24 to 48 hours. Impairment of performance may persist for greater intervals because of extremes of age, concomitant use of other drugs, stress of surgery or the general condition of the patient.

**Use in Status Epilepticus**  
While lorazepam has been shown to control status epilepticus promptly, it is not recommended for maintenance treatment of epilepsy. After seizures are controlled, agents useful in the prevention of further seizures should be administered. In the treatment of status epilepticus due to acute reversible metabolic derangement (e.g. hypoglycemia, hypocalcemia, hyponatremia, etc.) immediate efforts should be made to correct the specific defect.

Care should be exercised when administering lorazepam to patients with status epilepticus, especially when the patient has received other central nervous system depressants or is severely ill. The possibility that respiratory arrest may occur or that the patient may have partial airway obstruction should be considered. Proper resuscitation equipment should be available.

**Paradoxical Reactions**  
Paradoxical reactions have been occasionally reported during benzodiazepine use (see ADVERSE REACTIONS). Such reactions may be more likely to occur in children and the elderly. Should these occur, use of the drug should be discontinued.

**Psychiatric**  
Lorazepam is not recommended for the use in depressive neurosis or in psychotic reactions. Since lorazepam has a central nervous system depressant effect, patients should be advised against the simultaneous use of other CNS depressant drugs. Patients should also be cautioned not to take alcohol during the administration of lorazepam because of the potentiation of effects that may occur.

Lorazepam is not recommended for the treatment of psychotic or depressed patients. Since excitement and other paradoxical reactions can result from the use of these drugs in psychotic patients, they should not be used in ambulatory patients suspected of having psychotic tendencies.

As with other anxiolytic-sedative drugs, lorazepam should not be used in patients with nonpathological anxiety. These drugs are also not effective in patients with characterological and personality disorders or those with obsessive-compulsive neurosis.

When using lorazepam, it should be recognized that suicidal tendencies may be present and that protective measures may be required.
Pre-existing depression may emerge or worsen during use of benzodiazepines including lorazepam. The use of benzodiazepines may unmask suicidal tendencies in depressed patients and should not be used without adequate antidepressant therapy.

**Renal**
Lorazepam glucuronide is excreted by the kidney. When lorazepam injection is used in patients with mild to moderate renal disease, the lowest effective dose should be considered since drug effect may be prolonged.

**Respiratory**
Use of benzodiazepines, including lorazepam, may lead to potentially respiratory depression. As with any premedicant, extreme care must be used in administering Lorazepam Injection USP to those with limited or otherwise compromised pulmonary reserve (e.g., COPD, sleep apnea syndrome). Use of lorazepam may lead to respiratory depression, apnea and/or cardiac arrest.

**Sensitivity/Toxicity**
There have been rare reports of propylene glycol toxicity (e.g., lactic acidosis, hyperosmolality, hypotension) and polyethylene glycol toxicity (e.g., acute tubular necrosis) during administration of lorazepam injection at higher than recommended doses. Symptoms may be more likely to develop in patients with renal impairment.

**Special Populations**

**Pregnant Women:** Lorazepam should not be used during pregnancy. Several studies have suggested an increased risk of congenital malformations associated with the use of the benzodiazepines during pregnancy (see TOXICOLOGY).

Infants of mothers who ingested benzodiazepines for several weeks or more preceding delivery have been reported to have withdrawal symptoms during the postnatal period. Symptoms such as hypoactivity, hypotonia, hypothermia, respiratory depression, apnea, feeding problems, and impaired metabolic response to cold stress have been reported in neonates born of mothers who have received benzodiazepines during the late phase of pregnancy or at delivery.

Since lorazepam is also a benzodiazepine derivative, its administration is rarely justified in women of childbearing potential. If the drug is prescribed to a woman of childbearing potential, she should be warned to contact her physician regarding discontinuation of the drug if she intends to become or suspects that she is pregnant.

In women, blood levels obtained from umbilical cord blood indicate placental transfer of lorazepam and lorazepam glucuronide. There are insufficient data regarding obstetrical safety of parenteral lorazepam, including use in cesarean section. Lorazepam injection should not be used during pregnancy.

**Nursing Women:** Lorazepam has been detected in human breast milk; therefore it should not be administered to breast-feeding women, unless the expected benefit to the mother outweighs the potential risk to the infant.
Sedation and inability to suckle have occurred in neonates of lactating mothers taking benzodiazepines. Infants of lactating mothers should be observed for pharmacological effects (including sedation and irritability).

**Pediatrics:** LORAZEPAM INJECTION USP is not intended for use in children under 18 years of age. The safety and effectiveness of LORAZEPAM INJECTION USP (lorazepam), in children less than 18 years of age, has not been established (see TOXICOLOGY).

Pediatric patients may exhibit sensitivity to benzyl alcohol, polyethylene glycol and propylene glycol, components of lorazepam injection (see CONTRAINDICATIONS). The “gasping syndrome”, characterized by central nervous system depression, metabolic acidosis, gasping respirations, and high levels of benzyl alcohol and its metabolite found in the blood and urine, has been associated with the administration of intravenous solutions containing the preservative benzyl alcohol in neonates. Additional symptoms may include gradual neurological deterioration, seizures, intracranial hemorrhage, hematologic abnormalities, skin breakdown, hepatic and renal failure, hypotension, bradycardia, and cardiovascular collapse. Central nervous system toxicity, including seizures and intraventricular hemorrhage, as well as unresponsiveness, tachypnea, tachycardia, and diaphoresis have been associated with propylene glycol toxicity. Although normal therapeutic doses of Lorazepam Injection USP contain very small amounts of these compounds, premature and low-birth-weight infants as well as pediatric patients receiving high doses may be more susceptible to their effects.

Paradoxical reactions have been occasionally reported during benzodiazepine use (see ADVERSE REACTIONS). Such reactions may be more likely to occur in children. Should these occur, use of the drug should be discontinued.

**Geriatrics:** Clinical trials have shown that patients over the age of 50 years may have a more profound and prolonged sedation with intravenous lorazepam.

Elderly and debilitated patients, or those with organic brain syndrome, have been found to be prone to CNS depression after even low doses of benzodiazepines. Therefore, medication should be initiated with very low initial doses in these patients, depending on the response of the patient, in order to avoid oversedation or neurological impairment. An initial dose of 50% is recommended with titration as needed and tolerated.

Extreme care must be used in administering Lorazepam injection to elderly patients, very ill patients, and to patients with limited pulmonary reserve, because of the possibility that under ventilation and/or hypoxic cardiac arrest may occur. Resuscitative equipment for ventilatory support should be readily available.

Paradoxical reactions have been occasionally reported during benzodiazepine use (see ADVERSE REACTIONS). Such reactions may be more likely to occur in the elderly. Should these occur, use of the drug should be discontinued.

In patients for whom prolonged therapy with lorazepam is indicated, periodic blood counts and liver function tests should be carried out.
ADVERSE REACTIONS

Adverse Drug Reaction Overview
The most frequent adverse effects seen with injectable lorazepam are an extension of the central nervous system depressant effects of the drug. Excessive sleepiness and drowsiness are the main side effects; the incidences reported depended on the dosage, route of administration, concomitant use of other central nervous system depressants and the investigators' expectations concerning the degree and duration of sedation.

Respiratory depression and partial airway obstruction have been observed after injectable lorazepam. The extent of respiratory depression is dose dependent.

When injectable lorazepam was given intravenously, patients over 50 years of age had a higher incidence of excessive sedation than patients less than 50 years of age. Restlessness, confusion, depression, crying, sobbing, delirium, hallucinations, dizziness, diplopia have been reported. Hypertension and hypotension have occasionally been observed after injectable lorazepam.

Memory loss may occur when Lorazepam Injection USP is used at therapeutic doses.

Post-Market Adverse Drug Reactions
Reported adverse reactions (by system) are:

Body as a Whole
Angioedema, asthenia, muscle weakness, anaphylactic reactions, change in weight, hypersensitivity reactions, hyponatremia, hypothermia, SIADH;

Cardiovascular
Hypotension, lowering in blood pressure;

Gastrointestinal
Nausea, vomiting, constipation, change in appetite, increase in bilirubin, jaundice, increase in liver transaminases, increase in alkaline phosphatase;

Hematological/Lymphatic
Agranulocytosis, pancytopenia, thrombocytopenia; abnormal hematocrit values have been reported.

Nervous System and Special Senses (benzodiazepine effects on the CNS are dose dependent, with more severe CNS depression with higher doses)
Anterograde amnesia, drowsiness, fatigue, sedation, ataxia, confusion, depression, unmasking of depression, dizziness, change in libido, impotence, decreased orgasm, extrapyramidal symptoms, tremor, vertigo, visual disturbances (including diplopia, and blurred vision), dysarthria/slurred speech, headache, convulsions/seizures, amnesia, disinhibition, euphoria, coma, suicidal ideation/attempt, impaired attention/concentration, balance disorder, paradoxical reactions
(including anxiety, agitation, excitation, hostility, irritability, aggression, rage, sleep disturbances/insomnia, sexual arousal, hallucinations), psychomotor agitation. Paradoxical reactions may be more likely to occur in children or the elderly

Respiratory
Respiratory depression, apnea, worsening of sleep apnea, worsening of obstructive pulmonary disease, and ear, nose and throat disturbances;

Renal
Abnormal renal function tests.

Skin
Allergic skin reactions, alopecia, rash.

Local Effects
Pain at the injection site, a sensation of burning, and redness in the same area have been reported after intramuscular administration of injectable lorazepam. Pain in the immediate postinjection period and redness at the 24-hours observation period also have been reported after intravenous administration of injectable lorazepam.

DRUG INTERACTIONS

Drug-Drug Interactions
If lorazepam is to be used together with other drugs acting on the CNS, careful consideration should be given to the pharmacology of the agents to be employed because of the possible potentiation of drug effects. The benzodiazepines, including lorazepam, produce additive CNS depressant effects when administered with other CNS depressants such as barbiturates, antipsychotics, sedative/hypnotics, anxiolytics, antidepressants, narcotic analgesics, sedative antihistamines, anticonvulsants, anesthetics and alcohol.

Opioids
Due to additive CNS depressant effect, the concomitant use of benzodiazepines, including Lorazepam Injection USP, and opioids increases the risk of profound sedation, respiratory depression, coma, and death. Reserve concomitant prescribing of these drugs for use in patients for whom alternative treatment options are inadequate. Limit dosages and durations of concomitant use of benzodiazepines and opioids to the minimum required. Follow patients closely for respiratory depression and sedation (see Serious Warnings and Precautions box, WARNINGS - Risks from concomitant use of opioids and benzodiazepines).

There have been reports of apnea, coma, bradycardia, heart arrest, and death with the concomitant use of lorazepam injection and haloperidol.

Concomitant use of clozapine and lorazepam may produce marked sedation, excessive salivation, and ataxia.
Concurrent administration of lorazepam with valproate may result in increased plasma concentrations and reduced clearance of lorazepam. Lorazepam dosage should be reduced to approximately 50% when co-administered with valproate.

Concurrent administration of lorazepam with probenecid may result in a more rapid onset or prolonged effect of lorazepam due to increased half-life and decreased total clearance. Lorazepam dosage needs to be reduced by approximately 50% when co-administered with probenecid.

Administration of theophylline or aminophylline may reduce the sedative effects of benzodiazepines, including lorazepam.

Lorazepam injection, like other injectable benzodiazepines, also produces depression of the CNS when administered with alcohol, phenothiazines, barbiturates, MAO inhibitors and other antidepressants. When scopolamine is used concomitantly with injectable lorazepam, an increased incidence of sedation, hallucinations and irrational behaviour has been observed.

When lorazepam injection is used IV as the premedicant prior to regional or local anesthesia, the possibility of excessive sleepiness or drowsiness may interfere with patient cooperation to determine levels of anesthesia. This is most likely to occur when a dose greater than 0.05 mg/kg is given and when narcotic analgesics are used concomitantly with the recommended dose.

**DOSAGE AND ADMINISTRATION**

**Dosing Considerations**

Equipment necessary to maintain a patent airway should be immediately available prior to intravenous administration of lorazepam.

Anxiety and tension associated with the stresses of everyday life usually do not require treatment with anxiolytic drugs.

The dosage and duration of therapy of Lorazepam Injection USP must be individualized and carefully titrated in order to avoid excessive sedation or mental and motor impairment. Doses of other central nervous system depressant drugs should ordinarily be reduced.

As with other anxiolytic sedatives, short courses of treatment with the lowest effective dose should usually be the rule for the symptomatic relief of disabling anxiety in patients and the initial course of treatment should not last longer than one week without reassessment of the need for a limited extension.

**Recommended Dose and Dosage Adjustment**

**Excessive Anxiety Prior to Surgical Procedures: Adults** – Usually 0.05 mg/kg to a maximum of 4 mg total, given intramuscularly (2 to 3 hours before surgery). As with all premedicant drugs, the dose should be individualized.
When a rapid onset of action is required, lorazepam may be given intravenously, 15 to 20 minutes before surgery. The usual intravenous dose is 0.044 mg/kg or 2.0 mg total, whichever is smaller.

Intravenous doses in excess of 2 mg should be restricted to patients of unusual size. A dose of 2 mg should not ordinarily be exceeded in patients over 50 years of age.

**Status Epilepticus: Adults** – The usual recommended initial dose of lorazepam is 0.05 mg/kg up to a maximum of 4 mg given by slow intravenous injection. If seizures are terminated, no additional Lorazepam Injection USP is required. If seizures continue or recur after a 10 to 15 minute observation period, an additional intravenous dose of 0.05 mg/kg may be administered. If the second dose does not result in seizure control after another 10 to 15 minute observation period, other measures to control status epilepticus should be employed. A maximum of 8 mg total only, of Lorazepam Injection USP, should be administered during a 12 hour period.

**Dose Discontinuation**
The risk of withdrawal and rebound phenomena is greater after abrupt discontinuation; therefore the drug should be discontinued gradually. Withdrawal symptoms can appear following cessation of recommended doses after as little as one week of therapy. Abrupt discontinuation of lorazepam should be avoided and a gradual, dose-tapering schedule followed after extended therapy.

Symptoms reported following discontinuation of benzodiazepines include: headache, anxiety, tension, depression, insomnia, restlessness, confusion, irritability, sweating, rebound phenomena, dysphoria, dizziness, derealization, depersonalization, hyperacusis, numbness/tingling of extremities, hypersensitivity to light, noise and physical contact/perceptual changes, involuntary movements, nausea, vomiting, diarrhea, loss of appetite, hallucinations, delirium, convulsions/seizures, tremor, abdominal cramps, myalgia, agitation, palpitations, tachycardia, panic attacks, vertigo, hyperreflexia, short-term memory loss, and hyperthermia. Convulsions/seizures may be more common in patients with pre-existing seizure disorders or who are taking other drugs that lower the convulsive threshold, such as antidepressants.

**Administration**
When given intramuscularly, Lorazepam Injection USP, undiluted, should be injected deep into a muscle mass.

Lorazepam Injection USP can be used with atropine sulfate, narcotic analgesics, other parenterally used analgesics, commonly used anesthetics and muscle relaxants. The use of scopolamine with Lorazepam Injection USP is not recommended since this combination has been associated with a higher incidence of adverse reactions.

Immediately prior to intravenous use, Lorazepam Injection USP must be diluted with an equal volume of compatible solution. When properly diluted the drug may be injected directly into a vein or into the tubing of an existing intravenous infusion. The rate of injection should not exceed 2 mg/minute. Parenteral drug products should be inspected visually for particulate
matter and discoloration prior to administration. Do not use if solution is discoloured or contains a precipitate.

Lorazepam Injection USP is compatible for dilution purposes with the following solutions:
0.9% Sodium Chloride Injection, USP
5% Dextrose Injection, USP

Directions for Dilution for IV Use: Aspirate the desired amount of Lorazepam Injection USP into the syringe, then slowly aspirate the desired volume of diluent. Pull back slightly on the plunger to provide additional mixing space. Immediately mix contents thoroughly by gently inverting the syringe repeatedly until a homogenous solution results. Do not shake vigorously since this will result in air entrapment.

OVERDOSAGE

In post-marketing experience, overdose with lorazepam has occurred predominantly in combination with alcohol and/or other drugs.

Symptoms: With benzodiazepines, including lorazepam, symptoms of mild overdosage include drowsiness, mental confusion and lethargy. In more serious overdoses, symptoms may include ataxia, hypotonia, hypotension, hypnosis, Stages I to III coma, and, very rarely, death. Symptoms can range in severity and include, in addition to the above, dysarthria, paradoxical reactions, CNS depression, respiratory depression, and cardiovascular depression.

Treatment: In the case of an oral overdose, if vomiting has not occurred spontaneously and the patient is fully awake, emesis may be induced with syrup of ipecac 20-30 mL (where there is risk of aspiration, induction of emesis is not recommended). Gastric lavage should be instituted as soon as possible and 50-100 g of activated charcoal should be introduced to and left in the stomach.

Lorazepam is poorly dialyzable. Lorazepam glucuronide, the inactive metabolite, may be highly dialyzable.

General supportive therapy should be instituted as indicated. Vital signs and fluid balance should be carefully monitored. An adequate airway should be maintained and assisted respiration used as needed. With normally functioning kidneys, forced diuresis with intravenous fluids and electrolytes may accelerate elimination of benzodiazepines from the body. In addition, osmotic diuretics such as mannitol may be effective as adjunctive measures. In more critical situations, renal dialysis and exchange blood transfusions may be indicated. Published reports indicate that intravenous infusion of 0.5 to 4 mg of phystostigmine at the rate of 1 mg/minute may reverse symptoms and signs suggestive of central anticholinergic overdose (confusion, memory disturbance, visual disturbances, hallucinations, delirium); however, hazards associated with the use of phystostigmine (i.e., induction of seizures) should be weighed against its possible clinical benefit.
The benzodiazepine antagonist flumazenil may be used in hospitalized patients as an adjunct to, not as a substitute for, proper management of benzodiazepine overdose. The physician should be aware of the risk of a seizure in association with flumazenil treatment, particularly in long-term benzodiazepine users and in cyclic antidepressant overdose.

For management of a suspected drug overdose, contact your regional Poison Control Centre.

**ACTION AND CLINICAL PHARMACOLOGY**

**Mechanism of Action**
Lorazepam is an active benzodiazepine with a depressant action on the central nervous system. It has anxiolytic and sedative properties which are of value in the symptomatic relief of pathologic anxiety in patients with anxiety disorders giving rise to significant functional disability but is not considered indicated in the management of trait anxiety.

Lorazepam has also been shown to possess anticonvulsant activity.

**Pharmacokinetics**

**Absorption:** Lorazepam is rapidly absorbed after oral administration, with mean peak plasma concentrations of free lorazepam at 2 hours (range between 1-6 hours). Following intravenous administration, peak plasma levels are reached within minutes, whereas following administration by the intramuscular route, peak plasma levels occur between 60 to 90 minutes. After sublingual administration, peak plasma levels occur at 60 minutes. By the intramuscular route, the absorption half-life values of lorazepam average 12 and 19 minutes, whereas by the oral route, there is an additional lag period averaging 15 and 17 minutes. Bioavailability was shown to be identical by all routes of administration.

**Metabolism:** Lorazepam is rapidly conjugated to a glucuronide which has no demonstrable psychopharmacological activity and is excreted mainly in the urine. Very small amounts of other metabolites and their conjugates have been isolated from urine and plasma.

**Excretion:** The serum half-life of lorazepam ranges between 12 to 15 hours, while that of the conjugate varied between 16 to 20 hours. Most of the drug (88%) is excreted in the urine, with 75% excreted as the glucuronide. At the clinically relevant concentrations, approximately 85% of lorazepam is bound to plasma proteins.

Anterograde amnesia, a lack of recall of events during period of drug action, has been reported and appears to be dose-related.

**STORAGE AND STABILITY**
Refrigerate between 2 and 8°C. Protect from light. Do not use if solution is discoloured or contains a precipitate. Discard within 28 days of initial use.
SPECIAL HANDLING INSTRUCTIONS

As with all parenteral drug products, intravenous admixtures should be inspected visually for clarity, particulate matter, precipitation, discoloration and leakage prior to administration whenever solution and container permit. Discard unused portion.

DOSAGE FORMS, COMPOSITION AND PACKAGING

Each mL of sterile solution contains: Lorazepam 2 mg, benzyl alcohol 0.02 mL (2% v/v) as preservative, polyethylene glycol 0.203 mg (20.3% w/v) and propylene glycol.

Lorazepam Injection USP is available in 2 mL (filled with 1 mL of drug product) multidose glass vials, boxes of 10.
PART II: SCIENTIFIC INFORMATION

PHARMACEUTICAL INFORMATION

Drug Substance

Proper name: Lorazepam

Chemical name: 7-chloro-5-(o-chlorophenyl)-1,3-dihydro-3-hydroxy-2H-1,4-benzodiazepin-2-one

Molecular formula and molecular mass: \( C_{15}H_{10}Cl_{2}N_{2}O_{2} \) and 321.16 g/mol

Structural formula:

![Structural formula of Lorazepam]

Physicochemical properties:

Description: White to off-white crystalline powder. Odourless. Practically insoluble in water, very slightly soluble in ethanol 96%; slightly soluble in chloroform, sparingly soluble in methylene chloride, propylene glycol and ethyl acetate.

Melting Point: 166-168°C

pK\textsubscript{a}:

pK\textsubscript{1}=13 and pK\textsubscript{2}=11.5
DETAILED PHARMACOLOGY

Lorazepam is a benzodiazepine with CNS depressant properties. In laboratory animals, it produces disinhibitory, sedative, anticonvulsant, muscle relaxant, ataxic and hypnotic effects.

Studies with lorazepam in rats demonstrated a decrease in treadmill avoidance without modifying the escape response, an increase in responding during the shock schedule in the conflict test, an increase in incorrect responses in a discrimination test, and a reduction of conditioned suppression if lorazepam was given prior to the fear conditioning trial, while increasing conditioned suppression, if given prior to re-testing. These effects were observed at doses from 0.05 to 20 mg/kg IP. In some of the tests, diazepam was also used with similar results obtained at approximately 2-5 times the lorazepam dose.

Lorazepam was the most potent of several benzodiazepines tested in affecting state-dependent learning in trained, hungry rats rewarded with sweetened milk and conditioned to simple fear responses by mild electric shock. While 70-75% inhibition of conditioned fear was achieved with intraperitoneal doses of 0.9 mg/kg of lorazepam on the training day, 2.7 mg/kg of diazepam and 5 mg/kg of either chlordiazepoxide or oxazepam were required to obtain similar results. Consistent with state-dependent learning interpretations, a second injection of lorazepam administered to rats just prior to being tested for fear retention fully reinstated the conditioned suppression response.

Daily intraperitoneal injections of lorazepam, diazepam, oxazepam, chlordiazepoxide, scopolamine, or amobarbital, after initially interfering with feeding behaviour, later facilitated it. Following fear conditioning of the animals, all of the drugs, with the exception of scopolamine, increased conditioned suppression in the retention test. These repeated dose experiments, which permit tolerance of depressant side effects to develop, make it unlikely that benzodiazepines or amobarbital increase conditioned suppression retention through some depressant side effect.

In rats, fear-conditioned by electric shocks of different intensities, lorazepam increased retention-test drinking latencies of strongly shocked rats more than it did those of rats given shocks of intermediate or weak intensities.

In mice, lorazepam prevented pentylenetetrazol-induced convulsions at low doses (ED50 0.07 mg/kg PO), while much higher doses (0.5-5.0 mg/kg PO) were required to raise the threshold to electroshock-induced convulsions. It was demonstrated that lorazepam was more potent than diazepam in antagonizing pentylenetetrazol-induced convulsions by all three routes tested: oral, intraperitoneal, and intravenous. Lorazepam also inhibited the stimulation caused by morphine. Both lorazepam and clonazepam had ED50s for the antagonism of convulsions of less than 1 mg/kg when they were given intravenously or orally only 1 minute before the pentylenetetrazol challenge.

Observations of monkeys provided strong evidence of the sedative action of lorazepam. Here, relatively high doses of lorazepam caused brief initial depression followed by long periods of obvious sedation. The behaviour of cats and mice, after receiving lorazepam supported these
findings. In mice, it was shown that lorazepam is a more potent sedative than diazepam or flurazepam.

Its ability to inhibit foot shock induced fighting between mice, together with reactions of rats and squirrel monkeys in a series of conflict tests considered specific predictors of anti-anxiety activity, confirmed the anxiolytic potential of lorazepam.

The general depressant effects of repeated dosings of lorazepam in rats diminished rapidly while its anticonflict action remained, findings suggesting that while the anti-anxiety effects of lorazepam endure, any behaviour disruption is transitory.

Doses of 5 to 50 mg/kg IV caused ataxia and obvious CNS depression in rhesus monkeys, lasting for over 5 hours at the highest dose. Suppression of the linguomandibular reflex was demonstrated in anesthetized cats suggesting a central muscle-relaxant effect of lorazepam in this species. Higher doses, however, were required than with diazepam to produce significant reflex inhibition.

Using suppression of linguomandibular reflexes in cats as a measure of centrally mediated muscle relaxation, it was demonstrated that intravenous doses of 0.25 to 2 mg/kg of lorazepam were active in a dose-related manner, that the patellar reflex was not suppressed indicated a preferential effect on polysynaptic pathways.

Studies on the cardiovascular system in anesthetized animals demonstrated that lorazepam, at a dose of 0.1 mg/kg, given by intraperitoneal injection had little effect on either blood pressure or heart rate. Second injections of 0.9 mg/kg one hour later caused some depression of cardiovascular parameters of anesthetized cats and dogs. Doses greater than 0.9 mg/kg resulted in an average decrease of approximately 40% in both blood pressure and heart rate. Electrocardiograms taken near the conclusion of a 33-34 day study in which beagle dogs received daily intramuscular injections of lorazepam showed only slight increases in the heart rates of both vehicle control and drug-treated animals.

In anticipation of lorazepam being used concomitantly with other therapeutic agents in a variety of clinical situations, drug interaction studies were undertaken. Lorazepam was without effect on the LD$_{50}$ of morphine in rats. Although the oral LD$_{50}$ of lorazepam in mice was not modified by phenelzine, the depressor effect of intravenous lorazepam or diazepam in the presence of phenelzine, was increased in rats. In common with other anxiolytic-sedatives, oral lorazepam in mice reduced the amount of IV thiopental required for hypnosis and respiratory arrest.

Oral doses of lorazepam administered daily for 59 days to beagle dogs did not alter the anticoagulant activity of bishydroxycoumarin. In decerebrate cats, the intensity and duration of the skeletal neuromuscular blocking action of gallamine and suxamethonium were unaffected by intravenous doses of either diazepam or lorazepam.

The drug dependency potential of lorazepam (10 mg/kg), diazepam (5 mg/kg) and chlordiazepoxide (20 mg/kg) by several routes of administration was evaluated in normal, barbital-dependent and withdrawn rhesus monkeys. Like chlordiazepoxide and diazepam,
lorazepam suppressed signs of barbital withdrawal. In long-term toxicity studies, convulsions were noted, at the high-dose levels, particularly following withdrawal of lorazepam.

The irritant potential of injectable lorazepam was compared with that of diazepam in mice and rabbits. While the degrees of irritation produced by either compound varied with the routes of administration, it appeared that the experimental vehicles were the principle cause of irritation. The degree of hemolytic potential of lorazepam in an experimental vehicle varied from mild to moderate in rabbit blood, and slight to mild in human or dog blood.

Metabolic studies in mice, rats, cats, dogs and miniature swine were conducted on the absorption, excretion, tissue distribution and biotransformation of lorazepam. Both 14C-labelled and unlabelled drug was used. The most important finding was the conjugation of lorazepam with glucuronic acid in all investigated species. Lorazepam glucuronide, essentially inactive as an anti-anxiety agent, accounted for most of the drug-related urinary excretion products in all species except the rat in which, in addition to glucuronide formation, more extensive biotransformation took place.

Maximum concentrations of unchanged lorazepam in whole blood and plasma of rats occurred one-half to one hour after oral drug administration, and these concentrations declined to low levels within 24 hours. In dogs and miniature swine, concentrations of orally administered lorazepam peaked and declined rapidly, but they consisted principally of lorazepam glucuronide. These findings correlated with the rapid elimination observed in dogs administered lorazepam intravenously when no free drug was detected in plasma six hours later, and the half-life was estimated to be 1.6 hours. The major route of lorazepam excretion for the dog and the miniature swine is by the kidneys. Biliary excretion has been demonstrated in the rat.

Except for the organs of absorption and excretion, tissue distribution of 14C-lorazepam in rats was nearly uniform.

Species differences in urinary excretion patterns were investigated qualitatively in the mouse, rat, cat, dog, and miniature swine. The major urinary excretion product was the glucuronide conjugate of lorazepam. In dogs, the pattern of biotransformation of lorazepam seemed independent of dose; in rats, it appeared dose-dependent and produced significant amounts of several metabolites rather than the predominance of glucuronide found in other species, including the human. No sex differences were noted in the urinary excretion patterns of the several species tested. Peak urinary excretion was noted at 2-6 hours and total recovery in urine and feces over 48 hours was as high as 100% in some species.

**TOXICOLOGY**

**Acute Toxicity: Oral** – LD₅₀s ranged from 1850-5010 mg/kg in mice to 5000 mg/kg in rats and 2000 mg/kg in dogs. The intraperitoneal LD₅₀s were 700 mg/kg in rats and mice. In newborn rats and mice, intragastric LD₅₀ values were 200 and 250 mg/kg, respectively.
Signs exhibited during acute toxicity testing included moderate to marked sedation, shortness of breath, paralysis of hind legs, loss of righting reflex and convulsions. Acute respiratory depression was noted as the mode of death.

**Acute Toxicity: Injectable** - The acute toxicity of lorazepam in adult mice and rats were determined to be:

<table>
<thead>
<tr>
<th>Species</th>
<th>Route</th>
<th>LD&lt;sub&gt;50&lt;/sub&gt; mg/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mouse</td>
<td>IM</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>IP</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>24</td>
</tr>
<tr>
<td>Rat</td>
<td>IM</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>IP</td>
<td>48</td>
</tr>
</tbody>
</table>

In beagle dogs, the approximate LD<sub>50</sub> for intravenous lorazepam was 50 mg/kg (equivalent to 10 mL/kg). The highest intramuscular dose of lorazepam that, because of its volume, could be given to dogs was 25 mg/kg (equivalent to 5 mL/kg). The toxicity of injectable lorazepam in all three species seemed due almost entirely to the vehicle employed.

**Long-Term Toxicity: Oral** – Lorazepam was administered in the diet to rats in a number of studies extending for periods of 4 to 82 weeks at doses ranging from 14.5 to 400 mg/kg/day. In the long-term studies, decreased food consumption and body weight gain were observed at the higher dose levels, while at lower dose levels weight gain tended to be increased relative to controls. Transient, dose-related sedation and ataxia also occurred, and convulsions were noted, particularly following drug withdrawal. The only gross pathological finding was esophageal dilatation, which was observed in a number of animals at different dose levels. This condition also occurred with diazepam, and the significance of this finding is at present unknown.

Increased liver, kidney, thyroid, adrenal and testicular weights, as well as centrilobular hypertrophy of the liver, cloudy swelling and loss of glycogen were observed in drug-treated animals. At the highest dose levels, changes in the nuclei of the hypertrophied liver cells also occurred. In one study, the colloid follicles of the thyroid were lined with tall cells and were reported to be increased in a dose-related manner. Effects on blood chemistry included increases in serum protein and cholesterol levels and a decrease in serum alkaline phosphatase. These changes were observed mostly at the higher dose levels and were more marked in females. Three oral studies were conducted in dogs, ranging from 6 to 52 weeks in duration at doses of up to 480 mg/kg/day. A high incidence of emesis occurred in the early stages of the studies. Most drug-treated dogs exhibited the following signs: sedation, ataxia, tremors, restlessness, excitement, apprehension, salivation, panting, vocalization, muscle weakness and depression; of these only sedation persisted. Polydipsia was also observed. There were some increases in spleen, liver and testicular weight, and, at the highest dose, serum alkaline phosphatase and hematocrit values were elevated. Increased platelet and cholesterol values were also noted in the long-term study.
Long-Term Toxicity: Injectable - In two studies in adult rats, lorazepam was administered either intravenously for ten days or intramuscularly for 33 to 37 days. Food consumption and body weight gain were little affected.

Most animals were sedated to some extent, and even ataxic at the high doses. Statistically significant differences to hematologic values between treated and control animals of both studies were within normal limits. With the possible exception of decreases in serum glucose in the second study, all serum chemical differences were small and considered biologically unimportant. Ophthalmoscope examinations made in both studies revealed no ocular abnormalities.

Some organ weights of lorazepam-treated animals differed significantly from those of control animals, but there was no consistent pattern to the variations.

Histopathologic examinations at the end of both studies revealed marked tissue reactions at the injection sites of rats treated with either lorazepam or vehicle alone. The only other pathological change thought to be related to treatment was an unusual degree of extramedullary splenic hematopoiesis, a condition confined chiefly to high-dose animals of Study 2. There were no accompanying changes in bone marrow or lymphoid tissues.

Purebred beagle dogs received daily intramuscular injections of 2.5, 5.0 or 10.0 mg/kg of lorazepam for 33-34 days. Their behaviour was only mildly and occasionally affected; appetite and mean body weight changes were similar in treated and untreated dogs. The drug-treated animals drank more water. There were episodes of emesis, and occasionally some stools were loose. Injection site sores developed on drug-treated and vehicle control dogs.

Electrocardiograms taken near the study's conclusion showed slight increases in heart rate of vehicle control and lorazepam-treated animals. Alterations in several hematologic parameters in lorazepam-treated and vehicle control dogs were attributed to loss of blood and inflammatory reactions at injection sites. Statistical analysis of group mean blood chemical values showed several significant differences in mid- and high-dose lorazepam dogs and those given the vehicle only. With the possible exception of elevated cholesterol, SGPT, and SGOT values, these differences were small and believed to be of no biological importance. The elevated SGOT levels were attributed to injection site inflammation. While some changes were suggestive of liver involvement, no histological alterations to that organ were discovered. Marked inflammatory injection site reactions were found on all dogs treated with lorazepam or its vehicle. Splenic hematopoiesis occurred in varying degrees among drug-treated and vehicle control animals. Hypercellularity of the bone marrow was discovered in four lorazepam-treated dogs and two vehicle control animals. It is likely this resulted from injection site stress and blood loss.

Reproductive Studies: Oral – A number of reproductive studies, covering various stages of the reproductive cycle, were carried out in rats, rabbits, and mice. Lorazepam was administered orally in doses of up to 50 mg/kg/day. The observed effects in drug-treated groups of all three species included decreased maternal weight gain, increased resorptions, increased incidence of complete litter loss, decreased litter size, increased number of stillborn, increased neonatal mortality and decreased fetal body weight. Major and minor malformations, including cleft
palate, hind limb malrotation, extra 13th ribs, gastroschisis and major skull deficiency, were noted in rabbit and mouse experiments; some of these were qualitatively similar and/or dose-related, and possibly drug-induced.

**Developmental Neurotoxicity:** Nonclinical research has shown that administration of anesthetic and sedation drugs that block N-methyl-D-aspartate (NDMA) receptors and/or potentiate gamma-aminobutyric acid (GABA) activity can increase neuronal cell death in the brain and result in long-term deficits in cognition and behavior of juvenile animals when administered during the period of peak brain development. Based on comparisons across nonclinical species, the window of vulnerability of the brain to these effects is believed to correlate with human exposures in the third trimester of pregnancy through the first year of life, but may extend to approximately 3 years of age. While there is limited information of this effect with lorazepam, since the mechanism of action includes potentiation of GABA activity, a similar effect may occur. The relevance of these nonclinical findings to human use is unknown.

**Reproductive Studies: Injectable** - Lorazepam, intravenously administered, was studied in rats and rabbits for its possible impact on reproduction and fetal development. Injectable lorazepam was associated to some extent with the number of resorptions, litter sizes and weights in both species, but these effects were neither consistent nor dose-related.

In rats and rabbits, injectable lorazepam was not teratogenic.
REFERENCES


PART III: CONSUMER INFORMATION

C/T Lorazepam Injection USP
This leaflet is part III of a three-part "Product Monograph" published when Lorazepam Injection USP was approved for sale in Canada and is designed specifically for Consumers. This leaflet is a summary and will not tell you everything about Lorazepam Injection USP contact your doctor, nurse or pharmacist if you have any questions about the drug.

ABOUT THIS MEDICATION

What the medication is used for:
Lorazepam Injection USP is used in adults:
- for short-term relief of severe anxiety in patients with anxiety disorders.
- to relieve excessive anxiety before surgical procedures.
- to help control severe seizures (status epilepticus).

What it does:
Lorazepam Injection USP is a benzodiazepine with sedative properties which help in the treatment of anxiety.

When it should not be used:
You should not be treated with Lorazepam Injection USP if you:
- are allergic to the group of medicines known as benzodiazepines (such as diazepam, clonazepam, chlordiazepoxide, bromazepam, or flurazepam).
- are allergic to lorazepam or any non-medicinal ingredient in the formulation
- have myasthenia gravis
- have acute narrow angle glaucoma

What the medicinal ingredient is:
Lorazepam

What the nonmedicinal ingredients are:
Benzyl alcohol (preservative), polyethylene glycol and propylene glycol.

What dosage forms it comes in:
Injection: 2 mg/mL

WARNINGS AND PRECAUTIONS

Serious Warnings and Precautions
Taking Lorazepam Injection USP with opioid medicines can cause severe drowsiness, breathing problems, coma, and death.

Severe anaphylactic/anaphylactoid reactions have been reported with the use of benzodiazepines such as Lorazepam Injection USP. Cases of angioedema involving the tongue, throat or airway have been reported in patients after taking the first or subsequent doses of benzodiazepines. Some patients taking benzodiazepines have had additional symptoms such as trouble breathing, throat closing, or nausea and vomiting. Some patients have required medical therapy in the emergency department. If angioedema involves the tongue, throat or airway, airway obstruction may occur and be fatal. Patients who develop angioedema after treatment with a benzodiazepine should not be rechallenged with the drug.

BEFORE you start treatment with Lorazepam Injection USP talk to your doctor, nurse or pharmacist if you:
- have lung disease or breathing problems (e.g. chronic obstructive pulmonary disease (COPD), sleep apnea syndrome).
- have a history of depression, suicide attempts or psychosis.
- regularly drink alcohol or use recreational drugs or have a history of dependence/addiction to alcohol or drugs. You must not consume alcohol or other drugs that affect the central nervous system while undergoing treatment with Lorazepam Injection USP.
- have liver disease.
- have kidney disease.
- are pregnant or plan on becoming pregnant (see “Use in pregnancy”).
- are breastfeeding. Lorazepam Injection USP passes into breast milk. Therefore, if you are breast feeding, this medicine should be avoided.
- are less than 18 years of age
- are older than 50 years of age.
An increased risk of falls and fractures, excessive sedation and other side effects have been reported in people over 50 who take benzodiazepines such as Lorazepam Injection USP.

Driving and using machines: Lorazepam Injection USP may affect your ability to be alert. Driving, operating machinery and other hazardous activities should therefore be avoided altogether or at least during the first few days of treatment. This effect of Lorazepam Injection USP may be made worse if you drink alcohol. If your doctor has increased your dose or if you have changed the timings of when you take your medication this may also affect your reactions.

Dependence and withdrawal: Benzodiazepines such as Lorazepam Injection USP have produced dependence (addiction) and withdrawal symptoms can occur when treatment is stopped suddenly. The risk of dependence (addiction) increases with higher doses and longer duration of treatment.

Changes in mood and behavior: A variety of abnormal thinking and behavior changes may occur when you use a benzodiazepine, including aggressiveness, extroversion,
confusion, strange behavior, restlessness, illusions, hallucinations, feeling like you are not yourself, worsening of insomnia or worsening of depression including suicidal thinking. If you develop any unusual or disturbing thoughts or behavior while undergoing treatment with Lorazepam Injection USP, discuss the matter immediately with your doctor.

**Use in Pregnancy:** Certain benzodiazepines, such as Lorazepam for Injection USP, have been linked to birth defects when taken during the early months of pregnancy. In addition, benzodiazepines taken during the last weeks of pregnancy have been known to sedate the baby and may also cause withdrawal symptoms after birth. This medicine should not be administered if you are pregnant, or might become pregnant, unless advised by your doctor. Contact your doctor immediately if you think you may be pregnant, or intend to become pregnant.

**INTERACTIONS WITH THIS MEDICATION**

As with most medicines, interactions with other drugs are possible. Tell your doctor, nurse, or pharmacist about all the medicines you take, including drugs prescribed by other doctors, vitamins, minerals, natural supplements, or alternative medicines.

Drugs that may interact with Lorazepam Injection USP include:
- barbiturates
- antipsychotics
- sedative/hypnotics (sleeping pills)
- anxiolytics
- antidepressants
- narcotic analgesics (pain relievers) (opioids) (see Serious Warnings and Precautions box)
- sedative antihistamines (allergy medications)
- anticonvulsants (including valproate)
- anesthetics
- probenecid (to reduce uric acid levels)
- theophylline or aminophylline (respiratory treatments)
- scopolamine (used to treat motion sickness and to relieve nausea and vomiting after surgery)
- alcohol

Do not undergo treatment with Lorazepam Injection USP if you drink alcohol.

**PROPER USE OF THIS MEDICATION**

**Usual adult dose:**
Your doctor will prescribe a suitable dose for you. The dose your doctor prescribes will depend on your illness and how you respond to the medicine.

Lorazepam Injection USP will be given to you either intramuscularly (IM) by injection into a large muscle, such as your arm or buttock, or intravenously (IV) directly into a vein.

**Overdose:**
In case of drug overdose, contact your doctor, nurse, pharmacist, hospital emergency department or regional Poison Control Centre immediately, even if there are no symptoms.

**SIDE EFFECTS AND WHAT TO DO ABOUT THEM**

Side effects may include:
- excessive sleepiness and drowsiness
- dizziness, weakness, unsteadiness
- slurred speech, confusion
- rash
- nausea, vomiting, constipation, changes in appetite and weight
- pain, redness, burning at the injection site

If any of these affects you severely, tell your doctor, nurse or pharmacist.

Hostility, aggressiveness and other paradoxical effects such as irritability and excitability, are known to occur with the use of benzodiazepines, such as Lorazepam Injection USP. Please tell your doctor right away if you feel these effects when taking Lorazepam Injection USP. Paradoxical reactions may be more likely to occur in the elderly.

Withdrawal-related side effects:
- Sudden discontinuation of treatment with Lorazepam Injection USP may cause symptoms of withdrawal including: headache, muscle pain, convulsions, extreme anxiety, tension, restlessness, confusion and irritability. In severe cases of withdrawal, symptoms may include numbness and tingling of the extremities, hallucinations, increased sensitivity to light, noise and physical contact and seizures.

Lorazepam Injection USP can cause abnormal blood test results. Your doctor will decide when to perform blood tests and will interpret the results.
### Serious Side Effects, How Often They Happen and What To Do About Them

<table>
<thead>
<tr>
<th>Symptom / effect</th>
<th>Talk with your doctor, nurse or pharmacist</th>
<th>Stop taking drug and seek immediate emergency help</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Uncommon</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavioural problems:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>aggression, rage, sudden anxiety or excitation, restlessness, agitation, irritability, hallucinations (see or hear things that are not there) or delusions; severe sleep disturbances, nightmares, inappropriate behavior</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td><strong>Angioedema and Severe Allergic Reactions:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>swelling of the face, eyes, or tongue, difficulty swallowing, wheezing, hives and generalized itching, rash, fever, abdominal cramps, chest discomfort or tightness, difficulty breathing, unconsciousness.</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td><strong>Liver disorder:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>abdominal pain, nausea, vomiting, loss of appetite, yellowing of skin and eyes, dark urine</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td><strong>Rare</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>difficulty sleeping, changes in weight, feelings of worthlessness, guilt, regret, helplessness or hopelessness, withdrawal from social situations, family gatherings and activities with friends, reduced sex drive, and thoughts of death or suicide.</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td><strong>Unknown</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Blood Pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>dizziness, fainting, lightheadedness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory depression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>shortness of breath, trouble breathing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory Loss</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This is not a complete list of side effects. For any unexpected effects while being administered Lorazepam Injection USP, contact your doctor, nurse or pharmacist.

### How To Store It

Refrigerate between 2 and 8°C. Protect from light. Do not use if solution is discoloured or contains a precipitate. Discard within 28 days of initial use.
Keep out of the reach and sight of children.

**Reporting Side Effects**

You can report any suspected side effects associated with the use of health products to Health Canada by:

- Visiting the Web page on Adverse Reaction Reporting [https://www.canada.ca/en/health-canada/services/drugs-health-products/medeffect-canada/adverse-reaction-reporting.html](https://www.canada.ca/en/health-canada/services/drugs-health-products/medeffect-canada/adverse-reaction-reporting.html) for information on how to report online, by mail or by fax; or
- Calling toll-free at 1-866-234-2345

*NOTE: Contact your health professional if you need information about how to manage your side effects. The Canada Vigilance Program does not provide medical advice.*

**MORE INFORMATION**

If you want more information about Lorazepam Injection USP:

- Talk to your healthcare professional
- Find the full product monograph that is prepared for healthcare professionals and includes this Patient Medication Information by visiting the Health Canada website, by contacting the sponsor, Sandoz Canada Inc., at:
  1-800-361-3062

  or by written request at:
  110 Rue de Lauzon
  Boucherville QC
  J4B 1E6

  Or by e-mail at: medinfo@sandoz.com

This leaflet was prepared by Sandoz Canada Inc.

Last revised: June 24, 2019