

## Benzodiazepines Overview

Benzodiazepines are a class of drug with a myriad of indications. They are commonly used as first-line agents for acute status epilepticus and as second-line agents in eclamptic seizures. Other uses include acute anxiety and for alcohol detoxification. These drugs are recognized by the "-pam" suffix, as common drugs are diazepam, lorazepam, triazolam, temazepam, oxazepam, midazolam, and chlordiazepoxide. These drugs exert their action by binding to the BZD site on the  $\text{GABA}_A$   $\text{Cl}^-$  channels, leading to increased frequency of the  $\text{Cl}^-$  channel opening. This leads to neuronal membrane hyperpolarization, and consequentially, decreased CNS excitability. Side effects of these drugs include decreased REM sleep, CNS depression, and dependence. Benzodiazepines have the potential for overdose, but can be treated by the antidote flumazenil.



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### Indications

#### First Line for Status Epilepticus

##### [First-place Statue-Caesar](#)

Benzodiazepines are first line drugs for the treatment of acute status epilepticus, as they are fast-acting, strong and potent anticonvulsant drugs.

#### Anesthesia Induction

##### [A-nest Induction-duck](#)

Midazolam is an intravenously administered benzodiazepine used to help induce anesthesia. While this drug has no anesthetic properties, it is helpful because it allows patients to relax and causes anterograde amnesia.

#### Anxiety

##### [Anxiety-bag](#)

Many times, benzodiazepine drugs are used as acute anxiolytics. These drugs have rapid onset and provide moderate relief, but are not used long term due to the risk of dependence.

#### Eclampsia

##### [E-clamp on pregnant-woman](#)

Benzodiazepines are used to treat women suffering from eclampsia, as a second-line medication if magnesium sulfate ( $\text{MgSO}_4$ ) is ineffective or contraindicated. Eclampsia is a life-threatening complication of pregnancy characterized by hypertension, proteinuria and tonic-clonic seizures.

#### Detoxification

##### [D-tux Detoxifying](#)

These medications are useful in treating patients who are undergoing alcohol detoxification, in order to prevent withdrawal symptoms. Patients undergoing alcohol withdrawal are at risk for delirium tremens and seizures, which can be treated by benzodiazepines such as diazepam and chlordiazepoxide.

### Mechanism of Action

## '-zepam' and '-zolam' Suffix

[Z-Pam Anderson and Z-lamb](#)

Benzodiazepines are recognizable because of the '-zepam' and '-zolam' suffix in most drug names. Common benzodiazepine drugs are diazepam, lorazepam, triazolam, temazepam, oxazepam, midazolam. Chlordiazepoxide is a benzodiazepine which does not have this trait in its name.

## Increase Frequency of Cl<sup>-</sup> Channel Opening

[Up-arrow Revolving-door Chlorine-dispenser Channel](#)

These drugs act by binding to a specific site on the GABAA Cl<sup>-</sup> receptor complex. This leads to Cl<sup>-</sup> channel opening with increased frequency, yielding a higher chloride conductance. This causes neuronal membrane hyperpolarization and decreased CNS excitation.

## Side Effects

### Decrease REM Sleep

[Down-arrow Sleeping Rum](#)

Benzodiazepines decrease REM sleep, and many patients complain of less restful sleep. Though patients sleep longer while on benzodiazepines, the amount of REM sleep decreases overall and causes increased latency to REM sleep.

### CNS Depression

[Deflated CNS-brain](#)

Patients taking these medications can have symptoms of CNS depression. Furthermore, when combined with alcohol, profound CNS depression can occur with these drugs. Alcohol binds to GABAA, as do benzodiazepines, explaining these additive effects.

### Dependence

[Dependence Ball-and-chain](#)

Patients may exhibit dependence when using benzodiazepines. This may manifest as inability to cope without the drug, tolerance to its effects, or withdrawal symptoms when not taking it.

## Antidote

### Flumazenil for Overdose

[Flute-mace-nail](#)

Flumazenil is the antidote for benzodiazepine overdose. It acts as a competitive inhibitor to benzodiazepines on the BZD site of the GABA receptor.