

# A Hunt for Innovative Therapies to Treat Diabetic Neuropathy via Drug Repurposing

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## Abstract

Chronic complications of diabetes mellitus include diabetic neuropathy. Diagnosis and treatment of diabetic neuropathy remain elusive due to concerns about the safety and efficacy of current treatments. Repurposing old drugs for new therapeutic approaches sounds promising, given the difficulties associated with discovering new drugs. This review focuses on the current pharmacological and non-pharmacological treatments for diabetic neuropathy as well as the molecular pathways involved in its progression. In addition, a holistic and mechanism-centric drug repurposing strategy is used to identify existing medications as potential new therapies for diabetic neuropathy. Additionally, the current state of diabetic neuropathy clinical research is brought to light. In conclusion, the barriers to drug repurposing are identified to pique the researchers' interest in overcoming them and rapidly bringing the drugs to diabetic neuropathy patients.

**Keywords:** Innovative therapies • Diabetic neuropathy • Drug repurposing

## Description

Chronic complications of diabetes mellitus include diabetic neuropathy. Diagnosis and treatment of diabetic neuropathy remain elusive due to concerns about the safety and efficacy of current treatments. Repurposing old drugs for new therapeutic approaches sounds promising, given the difficulties associated with discovering new drugs. This review focuses on the current pharmacological and non-pharmacological treatments for diabetic neuropathy as well as the molecular pathways involved in its progression. In addition, a holistic and mechanism-centric drug repurposing strategy is used to identify existing medications as potential new therapies for diabetic neuropathy. Additionally, the current state of diabetic neuropathy clinical research is brought to light. In conclusion, the barriers to drug repurposing are identified to pique the researchers' interest in overcoming them and rapidly bringing the drugs to diabetic neuropathy patients [1].

Diabetes is now the fourth most common metabolic disorder worldwide. It comes with a lot of problems that can hurt your quality of life. Diabetics have elevated blood glucose levels as a result of either the pancreas not producing enough insulin or the target cells not being able to absorb glucose from the blood. According to the International Association for the Study of Pain, "pain caused by a lesion or disease of the somatosensory nervous system" is the definition of neuropathic pain. One third of diabetic patients experience diabetic neuropathy, a condition that increases their risk of developing cardiovascular, peripheral and cerebral disorders. Diabetic neuropathy is a side effect of diabetes. There is currently no medication that directly inhibits the pathogenic mechanisms that cause diabetic neuropathy, making it extremely painful. An ideal diabetic neuropathy treatment could be one that minimizes side effects and prevents nerve function loss while also improving symptoms [2].

Anticonvulsant and antidepressant medications have been found to be effective in managing diabetic neuropathy - related pain. There have been a number of medication combinations that have been shown to partially control the symptoms of diabetic neuropathy. Not only are drugs being tested that have been taken off the market because they pose significant health risks when used for a

long time. There are currently very few treatments for painful diabetic neuropathy that have been approved by the Food and Drug Administration. Using a spinal cord stimulation device that has been approved by diabetic neuropathy Food and Drug Administration can alleviate diabetic neuropathy pain. Numerous other medications and drug combinations have been suggested by other regulatory agencies. These medications have a number of negative effects and their effectiveness is limited because the pathophysiology of diabetic neuropathy is still poorly understood, it is hard to find drugs and treat it [3].

The treatment of diabetic neuropathy is frequently challenging for both patients and medical professionals. Drug repurposing can be a very convincing alternative to discovering and developing new drug molecules in order to produce a treatment for diabetic neuropathy that is more effective and has fewer side effects. Drug repurposing is a different way to deal with any safety issues. The goal of drug repurposing research is to discover new effects of approved drugs used in clinical practice studies that were previously unknown. By making use of drugs that have already been approved and have already been tested on humans for pharmacokinetics and safety profiling, it is possible to cut down on the amount of time and money spent developing new drugs. As a result, patients with diabetic neuropathy should have drug repositioning considered and implemented immediately. We present a summary of recent developments in the drug repurposing -based discovery of new drugs for diabetic neuropathy in this review [4].

The mechanism of diabetic neuropathy, which involves a wide variety of molecular pathways and is unusually complex, is a multifactorial disorder with multiple causes. One of the most important factors in the development of diabetic neuropathy is hyperglycemia, which can trigger the polyol pathway, the protein kinase C pathway, the hexosamine pathway, the formation of advanced glycation end products, oxidative stress and the pro-inflammatory and apoptotic pathways, which cause nerve damage and decrease peripheral blood flow. The subject's neuronal and immune systems are put at risk when metabolic disorder and microvascular damage are combined.

It would appear that the field of diabetic neuropathy lacks novel therapies. The management of diabetic neuropathy prescribes a list of pathogenic treatment options, but none of them provide complete relief. Also, neuromodulation methods like low-intensity laser therapy, monochromatic infrared light therapy, transcutaneous electrical nerve stimulation, spinal cord stimulation and percutaneous electrical nerve stimulation are only used when evidence-based treatments for diabetic neuropathy don't work. Additionally, nonpharmacological treatments like diet and exercise modification and dietary supplements are suggested. Yoga and acupuncture are also used as holistic treatments. Yoga and acupuncture have been documented to be helpful in the treatment of diabetic neuropathy. However, the treatment's long-term efficacy is unknown. As a result, a novel treatment for diabetic neuropathy treatment must be found immediately.

Drug approvals for diabetic neuropathy were unsuccessful due to potential

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drawbacks like a lack of specific biomarkers, experimental models, systematic phenotyping profiling in humans and limitations in diagnosis strategies. Another obstacle exists even in the face of safety concerns regarding the successful application of preclinical findings in clinical settings. Because diabetic neuropathy is a multifactorial disorder with a complicated mechanism, it is harder to target than other medical areas. As a result, drug repurposing has the potential to be a promising field of study for the development of novel treatment strategies for these obstacles. Repositioning existing drug candidates for diabetic neuropathy treatment through screening will lessen the obstacles that come with it [5].

Repurposing or repositioning drugs involves finding new uses for drugs that have already been approved for use in clinical settings. A promising alternative to de novo drug discovery is this method of identifying new pharmacological activity of approved drugs. The availability of the approved drug's pharmacokinetic and toxicological profile, a reduction in time and expense in preclinical and clinical studies and a narrowing of the productivity gap are among the benefits of this strategy. In light of drug repurposing strategies, a number of studies have been conducted in which computational and in silico methods have facilitated the creation of novel drug molecules for a particular novel character that has not yet been generated or reported.

Gabapentin, pregabalin, duloxetine, amitriptyline and metformin, all of which were originally developed for the treatment of various diseases, were found to be helpful in the management of diabetic neuropathy in this setting. Repurposing or repositioning drugs involves finding new uses for drugs that have already been approved for use in clinical settings. A promising alternative to de novo drug discovery is this method of identifying new pharmacological activity of approved drugs. The availability of the approved drug's pharmacokinetic and toxicological profile, a reduction in time and expense in preclinical and clinical studies and a narrowing of the productivity gap are among the benefits of this strategy. In light of drug repurposing strategies, a number of studies have been conducted in which computational and in silico methods have facilitated the creation of novel drug molecules for a particular novel character that has not yet been generated or reported [6].

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None.

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## Conflict of Interest

None.

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