# **The Function of Nitrates (Nitroglycerin) in Angina and Heart Failure**

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## Introduction

In this Paper the use of Nitrates, a class of medication, of which Nitroglycerin is a type, will be compared between two separate disease processes, Angina and Heart Failure. Angina is a type of chest pain that is caused by a decreased blood flow to the heart while Heart failure happens when the heart muscle does not pump blood as well. The focus of this paper will include how Nitrates work for each disease process, as well as nursing practice implications such as expected therapeutic outcomes, potential adverse outcomes, safety considerations for administration and patient teaching. In addition, the paper will compare differences and similarities of Nitrates in its application for each disease process.

## Background (Angina and Heart Failure)

As mentioned above Angina is a type of chest pain caused by decreased blood flow to the heart. Another name for it is Angina Pectoris and it can be described as heaviness, squeezing, tightness, pressure, or pain in the chest. Even though it is common it is not easy to distinguish from different types of chest pains like discomfort. There are four different types of Angina. The two major types are stable angina and unstable angina. The most common type of angina is stable angina, it happens with activity, goes away with medication or rest, lasts a short time and is often predictable. Unstable Angina is the most dangerous type. It occurs at rest and is unpredictable, it also does not go away with more rest or medication and lasts longer than stable angina. Symptoms include dizziness, nausea, shortness of breath, fatigue, sweating, abdominal pain and discomfort in the neck, teeth, jaw or back (Mayo Clinic, 2022).

Heart failure, also known as congestive heart failure, can be life threatening as it means the heart is not able to supply enough blood for the body due to a weak or damaged heart. Heart failure usually affects the left side of the heart but can also affect the right side or both. According to Ho and his associates, “Heart failure is a global public health problem, affecting ≈26 million people worldwide.1 In North America, acute decompensated heart failure (ADHF) is the leading reason for hospitalization and readmissions, with a prevalence of over 6 million persons” (2016, para. 4). Some causes include allergic reactions, blood clots in the lungs located in the lungs, any illness affecting the whole body, severe infections, viruses attacking the heart muscle and the use of some medications (Mayo Clinic, 2023a). Symptoms include chest pain, a rapid or irregular heartbeat followed by shortness of breath, severe weakness or fainting and coughing up white or pink, foamy mucus (Mayo Clinic, 2023a).

## Discussion

To prevent Angina and treat symptoms of Heart Failure Nitrates can be used. They relax veins which means less blood is returning to the heart, reducing as a result the workload on the heart (Heart and Stroke Foundation of Canada, n.d.). Nitrates are vasodilators, they help widen blood vessels to make it easier for blood to flow through, and as a result the heart won’t have to work as hard reducing the risk for heart failure to occur.

Nitroglycerin is a type of nitrate that helps relieve angina quickly and can be taken not only while experiencing angina but also when it is anticipated, it has been shown to increase activity tolerance in patients with stable angina (Hambrecht et al., 2013). The route of administration recommended for immediate relief of angina are sublingual and nitroglycerin spray (Hambrecht et al., 2013). Nitrates in general, in addition to being used for Angina can also be used for the treatment of congestive heart failure. In the past diuretics and digitalis were mainly used to treat Heart Failure but today when a patient is hospitalized, they are often provided with Nitrates in the intravenous route (Vizzardi et al., 2012). Both Angina and Heart Failure are caused by not enough blood supply, for this reason nitrates being vasodilators are beneficial in the treatment of these disease processes. The main difference is that in Heart failure the heart isn’t able to pump enough blood while in Angina the heart is not experiencing a problem but just needs an increase of oxygen supply to the heart. Nitrates work the same way in each disease process although the cause of the diseases is different both end in needing more blood to reach the heart or specifically to Heart Failure the whole body.

Nitrates can be given in multiple different routes some examples that were mentioned earlier are sublingual, spray and intravenous, in addition to these routes they can also be given as tablets, capsules, ointments and patches (Hambrecht et al., 2013). This class of medication is very beneficial but also comes with its own set of adverse outcomes which include headaches, flushing, dizziness, fainting, low blood pressure (hypotension), irregular heart rhythms (arrhythmia), weakness, blurred vision, tachycardia, nausea, vomiting, skin rash or itching, tolerance (Elsevier, n.d.).

Along with side effects there are a list of things that should be considered to ensure safety when taking this class of medications. For instance, alcohol should be avoided when taking medication as it can make the medication more effective, lowering blood pressure even more (Berger, 2022). Nitrates should also not be taken by clients who have hypersensitivity to nitrates, clients who have severe anemia, clients with traumatic head injury as the medication can increase intracranial pressure (Berger, 2022). In addition, they should be used cautiously in clients taking antihypertensive medications or that have hyperthyroidism, kidney or liver dysfunction (Berger, 2022).

When teaching a patient who is taking nitrates medication like nitroglycerin the client should be advised to sit down while self-administering due to the potential side effect of hypotension, to take missed doses as soon as possible unless it almost time for the next one, not to double dose or discontinue abruptly, to be medication free 10-12hr/day and to keep tablets in their original containers as it decomposes when it is exposed to light or heat (Mayo Clinic, 2023b). In addition to these teaching, it is important to tell a patient that oral nitroglycerin tablets or sublingual should not be crushed or chewed as they become ineffective if swallowed and that patches should be rotated on different sites of the skin and placed on hairless areas, as well as to be removed at night to reduce the risk of developing tolerance (Mayo Clinic, 2023b). Lastly, Nitrates should not be used with erectile dysfunction drugs (Mayo Clinic, 2023b).

## Conclusion

In this Paper the use of Nitrates was compared between two separate disease processes, Angina and Heart Failure. This paper discussed how Nitrates work, what they do, how they are taken, what to avoid while taking this specific class of medication, side effects and what education to provide regarding this medication. This paper focused on how nitrates work for Angina and Heart failure specifically and as a result it was able to demonstrate some differences and similarities in the application of Nitrates like nitroglycerin in each disease process.

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