

# Paramedic – Evidence Based Medicine (P-EBP) Program

## Paramedic CAT (Critically Appraised Topic) Worksheet

**Title:** Prehospital nitroglycerin administration in acute coronary syndrome.

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**Clinical Scenario:** You arrive on scene of a call for someone with chest pain. You quickly get down the ACS protocols, ASA is given, vitals checked, and a 12 lead performed. You clearly can see ST elevation in leads II, III, and aVF. You suspect an Inferior MI. The blood pressure is borderline, at 92 systolic. The heart rate is also slightly bradycardic at 56 BPM. It is in your protocols to give this medication, and you do so, which quickly leads to circulatory collapse, and an overall bad outcome. This is a classic ems story that is widely told by paramedics in the field, but how true is it really?

### **PICO (Population – Intervention – Comparison – Outcome) Question:**

*Population: acute coronary syndrome (abbreviated as ACS) patients.*

*Intervention: administration of nitroglycerin.*

*Comparison: Watchful waiting.*

*Outcomes: Overall decrease/increase in long-term mortality.*

**Search Strategy: (Nitroglycerin OR Nitrates) AND (Prehospital OR EMS OR out of hospital OR paramedic) AND (ACS OR acute coronary syndrome OR MI OR myocardial infarction)**

**Search Outcome:** 211



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## Relevant Papers:

AUTHOR, DATE	POPULATION: SAMPLE CHARACTERISTICS	DESIGN (LOE)	OUTCOMES	RESULTS	STRENGTHS/ WEAKNESSES
Nakayama 7 Oct 2022	ACS patients in 4 studies (Three retrospective studies for aspirin and 1 for nitroglycerin administered in the prehospital setting to patients) (for our purpose we focus on the single study for nitroglycerin)	retrospective  GRADE approach  LOE 2	Survival with 30 day and 1 year mortality (as well as confidence in the studies)	Prehospital aspirin administration was associated with significantly lower 30-day and 1-year mortality compared with aspirin administration after arrival at hospital, with odds ratios (OR) of 0.59 (95% confidence interval [CI] 0.35-0.99) and 0.47 (95% CI 0.36-0.62), respectively. Prehospital nitroglycerin administration was also associated with significantly lower 30-day and 1-year mortality compared with no prehospital administration (OR 0.34 [95% CI 0.24-0.50] and 0.38 [95% CI 0.29-0.50], respectively).	Strengths: Recent study. GRADE approach.  Weakness: certainty of evidence is very low. small (1) # of case reviews.



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<p>Robichaud 29 May 2015</p>	<p>All &gt; 18 year old prehospital patients with chest pain of suspected cardiac origin and computer-interpreted STEMI on their prehospital 12-lead ECG who received sublingual nitroglycerin by Urgences-sante's primary care paramedics (PCPs) as part of the provincial nitroglycerin protocol for patients with suspected ACS. Quebec's PCPs are trained at the BLS-D level and are trained in ECG acquisition but not in ECG interpretation.</p> <p>They further defined chest pain of suspected cardiac origin.</p>	<p>Retrospective single system (Urgences-sante's STEMI registry from february 2010 to july 2012)</p> <p>otherwise not well defined</p> <p>LOE 3</p>	<p>The primary outcome was hypotension, defined as a systolic blood pressure &lt; 90 mmHg, after NTG administration. The secondary outcome was a drop in systolic blood pressure <math>\geq</math> 30 mmHg after administration of Nitroglycerin.</p>	<p>A drop in systolic blood pressure <math>\geq</math> 30 mmHg occurred in 109/466 of inferior STEMIs and 81/339 of non-inferior STEMIs, 23.4% vs. 23.9%, <math>p = 0.87</math>.</p> <p>Using physician-interpreted prehospital ECGs, hypotension post NTG administration was noted in 25/282 inferior STEMIs and 26/314 non-inferior STEMIs, 8.9% vs. 8.3%, <math>p = 0.80</math></p> <p>they did not find an association between hypotension after nitroglycerin administration and the previously described standard 12-lead ECG features suggestive of right ventricular involvement in inferior STEMI.</p>	<p>Strengths: Recent study. large sample period (29 month period). good P-value between inferior STEMI and other STEMI.</p> <p>Weaknesses: Morbidity has to be inferred, and is not directly addressed. Selection bias indicated in study "potential limitation is that paramedics may have been more reluctant to give NTG to patients with inferior STEMI and elected to do so only in patients who were stable in their opinion, leading to a selection bias. "</p>
	<p>Population and Setting The LAC</p>	<p>Retrospective chart review of</p>	<p>The primary safety outcome was the</p>	<p>Ten patients (3%) treated with NTG died</p>	<p>Strengths: recent study</p>



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<p>Bosson 28 Jan 2019</p>	<p>regional cardiac system includes seventy-three 911-receiving centers, of which 36 are STEMI Receiving Centers (SRC). Emergency Medical Services are provided by 30 fire-based provider agencies with approximately 4000 paramedics. The system serves a population of greater than 10 million distributed over more than 4000 square miles.</p>	<p>prospectively identified patients with suspected STEMI transported by EMS to one of three participating PCI-capable hospitals</p> <p>LOE 2</p> <p>consideration of the risk of Bias</p>	<p>change in blood pressure in patients who received field NTG compared to those who did not. Secondary safety outcomes were the frequencies of ED hypotension (defined as a triage systolic blood pressure (SBP) &lt; 100 mmHg), drop in SBP 30 mmHg, bradycardia (defined as heart rate &lt; 60 beats per minute), and out-of-hospital cardiac arrest (OHCA).</p>	<p>in the hospital compared with 39 patients (9%) who did not receive NTG. In the propensity-score adjusted model, patients who received NTG had decreased odds of in-hospital mortality, OR 0.3 (95% CI 0.1, 0.8)</p> <p>They stated P-values for hypotension (Hypotension p value for difference = 0.1.) and Bradycardia (Bradycardia p value for difference = 0.3.)</p>	<p>large sample size "Using the kappa statistic, inter-rater reliability was assessed on a random 10% sample of records." Large sample size</p> <p>Weaknesses: Doesn't fit our PICO perfectly, similar outcomes and inferences can be made however.</p>
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**Comments:** Study 2 (Robichaud 29 May 2015) doesn't directly infer into morbidity, but it does not have any adverse events in short term mortality, and suggests no change in their current practice (nitroglycerin administration without checks for inferior MIs)

**Consider:** we see no reason to change current practice in our areas with the administration of nitroglycerin, and overall the study of this practice makes us more comfortable with its use.



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**Clinical Bottom Line:** Nitroglycerin seems to have only clinical positives in regard to mortality. More study is required in these areas.

## References:

**PMID: 36304434** [Prehospital Administration of Aspirin and Nitroglycerin for Patients With Suspected Acute Coronary Syndrome - A Systematic Review](#)

Nakayama N, Yamamoto T, Kikuchi M, Hanada H, Mano T, Nakashima T, Hashiba K, Tanaka A, Matsuo K, Nomura O, Kojima S, Yamaguchi J, Matoba T, Tahara Y, Nonogi H; Japan Resuscitation Council (JRC) Acute Coronary Syndrome (ACS) Task Force and the Guideline Editorial Committee on behalf of the Japanese Circulation Society (JCS) Emergency and Critical Care Committee. Prehospital Administration of Aspirin and Nitroglycerin for Patients With Suspected Acute Coronary Syndrome - A Systematic Review. *Circ Rep.* 2022 Jul 28;4(10):449-457. doi: 10.1253/circrep.CR-22-0060. PMID: 36304434; PMCID: PMC9535127.

**PMID: 26024432** [Prehospital Nitroglycerin Safety in Inferior ST Elevation Myocardial Infarction](#)

Robichaud L, Ross D, Proulx MH, Légaré S, Vacon C, Xue X, Segal E. Prehospital Nitroglycerin Safety in Inferior ST Elevation Myocardial Infarction. *Prehosp Emerg Care.* 2016;20(1):76-81. doi: 10.3109/10903127.2015.1037480. Epub 2015 May 29. PMID: 26024432.

**PMID: 30556765** [Safety and Effectiveness of Field Nitroglycerin in Patients with Suspected ST Elevation Myocardial Infarction](#)

Bosson N, Isakson B, Morgan JA, Kaji AH, Uner A, Hurley K, Henry TD, Niemann JT. Safety and Effectiveness of Field Nitroglycerin in Patients with Suspected ST Elevation Myocardial Infarction. *Prehosp Emerg Care.* 2019 Sep-Oct;23(5):603-611. doi: 10.1080/10903127.2018.1558318. Epub 2019 Jan 28. PMID: 30556765.

