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the "similar to me" rating error, resulting in a halo effect in the overall evaluation.

It is critical to patient well-being and safety that graduates of paramedic programs are able to provide competent medical care in the field setting. In order to evaluate the field competency of students, evaluators must provide objective feedback on student performance that is consistent from evaluator to evaluator.

This limited study revealed: 1) the need for guidelines that clarify standards of performance by defining specific examples of behaviors that do (or do not) exemplify the standard and 2) the need to develop a training program for preceptors to prepare them in evaluation skills. As a result of this study, guidelines and a training program were developed and a study is currently in progress to evaluate the effects of that training program on interrater reliability.

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NITROGLYCERIN IN THE OUT-OF-HOSPITAL TREATMENT OF CHEST PAIN

To the Editor:—Nitroglycerin (NTG) is an organic nitrate commonly used as a vasodilator in treating angina and has been recognized as a useful cardiovascular drug for more than 100 years. Reported adverse effects range from headache to cardiovascular collapse. This rapidly acting nitrate is

widely used in a variety of out-of-hospital (OOH) settings for the treatment of chest pain (CP).

A recent, thoughtful thread on the EMS-L Internet discussion list revisited several controversies related to this use.¹ Four separate questions were implicit in the discussion: 1) Does the widespread self-administration of NTG by cardiac patients endorse its safety? 2) Can EMT-basics safely assist patient administration of the drug, as allowed in the 1994 curriculum revision? 3) Should placement of an intravenous line (IV) precede NTG administration whenever possible? 4) What complications should be anticipated? The variety of opinions expressed by EMS-L participants prompted a brief review of the literature that follows.

The benefits of NTG in the management of unstable angina and acute myocardial infarction (AMI) were described as early as 1879.² Recently, the "ACC/AHA guidelines for the management of patients with acute myocardial infarction" reviewed the benefits of sublingual NTG.³ According to these guidelines, randomized controlled trials of nitrate use demonstrate a small but statistically significant reduction in mortality. The brief half-life of NTG makes any potential adverse effects theoretically minimal. The authors recommend the use of NTG in the routine management of the patient with ischemic-type CP.

Advocates for OOH use of NTG without prior IV access note that patients regularly, and presumably safely, self-administer NTG in unmonitored settings. Two reports suggest that the home use of NTG is not always benign. Bassan found that of 112 patients surveyed, two experienced dizziness and one fainted, and suggested that patients take the medication only in the supine position.⁴ Interestingly, he also found that 57% of patients would take NTG for rapid heart beat, dizziness, or weakness. Not

all patients seeking assistance in taking NTG should get it. Kelly reported one episode of fainting in a prospective series of 44 patients who were receiving instructions in NTG self-medication.⁵ These authors accept the uncommon but serious nature of such events and stress caution when administering the medication in every circumstance.

Although occasional dramatic reports of complete heart block and asystole appear in the literature, retrospective in-hospital reviews describe an incidence of serious adverse reactions in fewer than 5% of cases.⁶⁻⁹ The most common serious adverse effect of NTG is the hypotension/bradycardia syndrome. The mechanism is uncertain. Patients who become bradycardic during hypotension may be experiencing unrecognized right ventricular ischemia (RVI), which can cause an abnormal response of the conduction system. The Bezold-Jarisch reflex is a phenomenon described in animals whereby stimulation of unmyelinated vagal fibers in the myocardium in the setting of hypovolemia can cause such a paradoxical bradycardic response. The response has also been attributed to a simple vasovagal event.¹⁰

Nitroglycerin in the presence of RVI presents significant hemodynamic risks. Right ventricular ischemia occurs in up to 50% of patients with inferior wall MIs, but only 10-15% of them have profound hypotension after the administration of preload reducing medications. Because of their dependence on preload, patients suspected of having RVI should be given nitrates with great caution, if at all. If hypotension does occur, replenishing preload with large amounts of intravenous crystalloid usually improves cardiac output.^{5,11,12} Accurate OOH identification of RVI is usually not possible.

The relevant OOH literature is limited (no surprise here) to one well-written report of a prospective

observational study of NTG administration, three abstract-only reports, and a report of two cases. Wuerz and colleagues prospectively studied patients receiving NTG.¹³ Modest systolic blood pressure (SBP) reduction appeared in the 225 chest pain patients who received NTG. One patient became asystolic and apneic for 2 minutes, two patients had symptomatic bradycardia with hypotension, and a fourth patient became hypotensive while tachycardic. Each of these patients recovered, collectively requiring atropine, fluids, and CPR. Wuerz et al. determined significant adverse rate of 1.33%.

At the 1998 NAEMSP Mid-Year Meeting, two relevant abstract reports were presented. Brice and colleagues retrospectively reviewed OOH NTG administration to CP and congestive heart failure (CHF) patients.¹⁴ Of 815 CP patients who received NTG, no significant adverse effects appeared, although 3.6% of both CP and CHF patients experienced SBP <100 mm Hg. Cole retrospectively examined OOH CP and CHF patients who received NTG.¹⁵ A high-dose (HD) NTG regimen was compared with a traditional-dose (TD) NTG regimen. Curiously, of all patients receiving HD NTG, 0.4% suffered SBP <100 mm Hg, compared with 3.2% of TD NTG patients. Cole reported no specific adverse episodes. When these authors publish complete accounts of their work, we will be better equipped to know whether their designs would detect the expected small incidence of significant adverse effects.

Herman and colleagues presented an ACEP Research Forum abstract describing a retrospective review of 113 chest pain patients who received OOH NTG.¹⁶ The mean SBP decreased by 11 mm Hg. No mention was made of BP outliers or adverse events. Though not directly relevant here, Wasserberger described two cases of complications in the OOH use of

NTG.¹⁷ One patient, presumed to have CHF, experienced an SBP drop to 60 mm Hg after receiving NTG and furosemide. Chest films later confirmed pneumonia. The second patient, presumed to have CP and CHF, experienced an SBP drop to 88 mm Hg after receiving NTG and lidocaine. He was admitted with pneumonia and dehydration. Wasserberger's letter is relevant, however, to the issue of OOH misdiagnosis, a matter Wuerz discusses at some length. If the risks of OOH NTG are small, they are nonetheless unnecessary when NTG is inappropriately administered.

A newly approved medication for male erectile dysfunction, sildenafil citrate (Viagra), deserves special mention. This highly publicized medication may induce large and sudden drops in systemic blood pressure when administered to patients concurrently using nitrates.¹⁸ Out-of-hospital personnel should be aware that patients who are using sildenafil should not be given nitrates in any form.

The OOH use of NTG requires a risk-benefit assessment. We leave the assessment of benefits to other writers. The data examining the severity of hypotension following administration point to a largely predictable change in blood pressure. The occurrence of severe adverse effects such as the bradycardia/hypotension syndrome probably ranges from 1% to 5%. We found no reports of death related to NTG administration; even the few persons experiencing asystole were apparently successfully resuscitated. The uncommon but very significant adverse effects of NTG in the OOH setting cannot be predicted by prior successful use, by presence or absence of an actual cardiac event, or by pretreatment vital signs. However, risk factors such as RVI (perhaps loosely recognized as ischemic-type chest pain with bradycardia) and concurrent use of Viagra should alert OOH providers.

Based on our convenience sample of EMS-L participants, some complacency exists about this drug. Seemingly stable patients may take a sudden turn for the worse after NTG. EMT-Bs should be especially vigilant when monitoring these patients since the basic skills set limits interventions. EMT-paramedics whose protocols allow NTG prior to IV placement should be similarly observant and prepared for ACLS intervention as needed.

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