

TREATMENT OF SUSPECTED CARDIAC ISCHEMIA WITH ASPIRIN BY PARAMEDICS IN AN URBAN EMERGENCY MEDICAL SERVICES SYSTEM

Kevin E. McVaney, MD, Marlow Macht, EMT-P, Christopher B. Colwell, MD,
Peter T. Pons, MD

ABSTRACT

Background. Aspirin (ASA) has unquestioned benefit to patients with cardiac ischemia. Previous studies indicate health care providers may not adequately treat patients experiencing cardiac ischemia with ASA. **Objective.** To determine the rate of ASA use for patients being treated for chest pain suggestive of cardiac ischemia in the prehospital setting. **Methods.** This was a retrospective study of paramedic encounters identified through billing records for all patients receiving the combination of an intravenous catheter, supplemental oxygen, and cardiac monitoring from November 2001 to January 2002. Prehospital medical records were reviewed in order to determine the proportion of patients with suspected cardiac ischemia who received ASA. The setting was a single prehospital emergency medical services system serving an urban population. **Results.** A total of 2,457 paramedic encounters were reviewed over a three-month period. Two hundred thirty-two patients were assessed as having cardiac ischemia, of whom 169 (73%) had no absolute or relative contraindication to ASA. Of the 169 patients, only 92 (54%) received ASA. Of the 99 patients, who received nitroglycerin for presumed cardiac ischemia and had no contraindication to receiving ASA, only 78 (79%) received ASA. Of the 453 patients complaining of nontraumatic chest pain and without a contraindication, 157 (35%) received ASA. **Conclusions.** Paramedics do not use ASA optimally and may choose therapies with less proven benefit. **Key words:** prehospital; aspirin; cardiac ischemia; paramedics; treatment.

PREHOSPITAL EMERGENCY CARE 2005;9:282-284

Aspirin (ASA) has unquestioned benefit to patients with cardiac ischemia.¹⁻⁴ Early administration of ASA is associated with improved outcomes in acute coronary syndromes (ACS) and has been the standard of care for years for patients with cardiac ischemia.^{3,5,6} Prehospital use of ASA has been associated with improved angiographic coronary flow and higher angioplasty success rates, and may improve patient outcomes.^{3,6} In many emergency medical services

(EMS) systems, prehospital administration of ASA is considered a standard component of care for patients complaining of chest pain consistent with ischemic cardiac disease.

Published studies indicate that medical care providers in many health care settings do not adequately treat patients experiencing cardiac ischemia with ASA.⁷⁻¹⁴ Studies have evaluated the administration of ASA to patients with acute myocardial infarction by cardiologists, internists, family physicians, and emergency physicians and found it to be inadequate.⁷⁻¹⁶ The early administration of ASA in patients with cardiac ischemia is considered to be a quality measure in many hospitals.¹¹⁻¹⁴ Rittenberger et al. recently studied, one suburban, one rural, and two urban EMS systems. Aspirin use in these systems ranged from 27% to 60% of patients treated for cardiac ischemia.¹⁷ One study of nine EMS systems in England found that between 15% and 74% of patients who should have received ASA did not.¹⁷ The purpose of this study was to determine the rate of ASA use for prehospital patients being treated for chest pain suggestive of cardiac ischemia.

METHODS

We conducted a retrospective study of the prehospital treatment of patients with suspected cardiac chest pain who were evaluated and transported to local hospitals by the paramedics of the Denver Health Paramedic Division. The Colorado Multiple Institutional Review Board approved this study. The Denver Health Paramedic Division employs 140 paramedics who staff 15 advanced life support ambulances that respond to 66,000 emergency medical calls annually. The paramedics treat patients with suspected cardiac chest pain under written protocols that permit the initiation of intravenous (IV) access, oxygen administration, cardiac monitoring, and administration of nitroglycerin and a 325-mg dose of aspirin based on the paramedic assessment without the need for base physician contact. Absolute contraindications to ASA administration were defined as anaphylactoid allergy or active gastrointestinal (GI) bleeding. Relative contraindications included prior ASA use that day or a history of GI bleeding or current use of other anticoagulants.

Patients were identified from billing records of all patients treated and transported by the Denver Health Paramedic Division between November 2001

Received September 9, 2004, from the Department of Emergency Medicine (KEMcV, CBC, PTP, and the Paramedic Division (KEMcV, MM, CBC), Denver Health Medical Center, Denver, Colorado. Revision received February 22, 2005; accepted for publication February 28, 2005.

Address correspondence and reprint requests to: Kevin E. McVaney, MD, Department of Emergency Medicine, Denver Health Medical Center, 777 Bannock Street, Mail Code 0108, Denver, CO 80204. e-mail: <kevin.mcvaney@dhha.org>.

doi:10.1080/10903120590962030

and January 2002. In order to identify patients who were assessed as potential cardiac ischemia, all patients who received the combination of an IV catheter, supplemental oxygen, and a cardiac monitor were reviewed. Patients with complaints clearly resulting from trauma or acute GI bleeding were excluded. Additionally, all patients who were intubated, and thus not able to swallow ASA, were also excluded. The reviewers were all active paramedics with at least two years of experience in their current position. They were directly trained by one of the authors on chart review and use of the data-collection instrument. All reviewers were blinded to the purpose of the study. The reviewers abstracted all data from the trip reports to a prepared data-collection instrument. In an attempt to ensure accuracy, a senior paramedic or attending emergency physician reviewed 10% of the trip sheets. In order to identify patients who could have benefited from ASA therapy, the patients were grouped into three categories as follows:

- Group I: All patients with “unquestionable” documentation of paramedic concern for ischemic cardiac disease. “Unquestionable” was defined as agreement by both an attending emergency physician and a senior paramedic that the treating paramedic suspected cardiac ischemia based on the trip sheet narrative, or “cardiac ischemia” was listed as the principal concern.
- Group II: All patients who were treated with nitroglycerin for suspected cardiac chest pain. Patients given nitroglycerin for isolated congestive heart failure or pulmonary edema without chest pain were excluded.
- Group III: All nontraumatic chest pain patients over the age of 40 years.

RESULTS

A total of 2,457 paramedic encounters that included the combination of IV, oxygen, and cardiac monitoring were reviewed. After the exclusion of 412 (17%) charts because of trauma, GI bleeding, or tracheal intubation, 2,045 encounters were reviewed.

Of the 2,045 patient encounters reviewed, 232 (11%) were clearly assessed by the treating paramedic as cardiac ischemia (group I). Of the patients in group I without contraindications, 54% (CI 47–62%) received ASA. In group II, the patients treated with sublingual nitroglycerin, 79% (CI 69–86%) were treated with ASA. Of the patients over 40 years old who presented with a chief complaint of nontraumatic chest pain (group III), 35% (CI 30–39%) received ASA. In all three groups, none of the 33 patients with absolute contraindications to ASA received a dose.

Table 1 provides administration results for all groups including information on absolute and relative contraindications.

TABLE 1. Patients Treated with Aspirin with Suspected Cardiac Ischemia in the Prehospital Setting

Aspirin Contraindication	Group I (n = 232)	Group II (n = 135)	Group III (n = 596)
No contraindication	92/169 (54%)	78/99 (79%)	157/453 (35%)
Relative contraindication	10/58 (17%)	7/33 (21%)	14/119 (12%)
Absolute contraindication	0/5 (0%)	0/3 (0%)	0/24 (0%)

Group I: suspected cardiac ischemia not treated with nitroglycerin; group II: suspected cardiac ischemia treated with nitroglycerin; group III: age >40 years with nontraumatic chest pain.

DISCUSSION

Aspirin therapy is often overlooked by providers. In studies as recent as 2001 and 2003, ASA was not given to one in four hospitalized patients with cardiac ischemia on initial presentation. One in five patients was discharged from the hospital without ASA.^{11,12} Wollard et al. in 2001, reported a study of nine EMS systems in England and Wales.¹⁸ Compliance with ASA protocols was defined and reported differently in each system. The system with the highest compliance to its ASA protocols administered aspirin to 78% of eligible patients without contraindications. The two systems with the worst compliance treated less than 25% of eligible patients. Rittenberger et al. in 2005 demonstrated ASA treatment ranging from 27% to 60%.¹⁷ This study also examined patients who took their own ASA. Including the patients who self-treated, no system exceeded 72% ASA treatment. A 2003 study by Hauler et al. also found underuse of ASA by paramedics in both rural and suburban settings.¹⁹

In our study, 54% of patients assessed in the prehospital setting as having cardiac ischemia without any contraindications to ASA were given aspirin. If patients with relative contraindications are included, only 45% received ASA. Even more troubling was the fact that when paramedics were concerned enough to treat cardiac ischemia with nitroglycerin, only 79% of patients with no contraindications received ASA. Including patients with relative contraindications, 64% of patients received prehospital ASA administration.

We suspect that some educational issues may create a barrier to ASA administration by paramedics. Paramedics may not be aware that ASA as a single-agent may be as beneficial as single-agent thrombolytics.² Confusion about the contraindications to ASA results in less ASA administration. ASA, in the setting of cardiac ischemia, is contraindicated only in patients with true anaphylactoid allergy and acute severe hemorrhage and may still be administered to patients with relative contraindications.

Under the paramedic protocols, previous use of ASA was a relative contraindication. Among the nonallergic patients, there is very little potential downside to

giving ASA to patients who have already taken a dose prior to the onset of symptoms. ASA has been shown to be effective in doses well in excess of 80–325 mg.^{1,18–20} Cairns et al., in 1985, demonstrated a 43% reduction in mortality using an ASA dose of 1,300 mg.²¹ The risk of inducing salicylate toxicity by adding an additional dose of 325 mg is exceedingly low. A dose taken earlier in the day or even just prior to EMS arrival would not negate the benefit of EMS treatment with ASA. Although our data do not support it, we believe that paramedics should be educated to be more aggressive in the use of ASA when only relative contraindications exist.

Aspirin treatment in patients at risk for ACS is inexpensive, very low risk, and clearly beneficial. Much like physicians in multiple other studies, the paramedics in our study did not utilize aspirin optimally. They often chose therapy with less proven benefit, such as nitroglycerin instead of aspirin. Increasing paramedic education and establishing medical direction protocols to increase aspirin usage will likely reduce mortality and morbidity of patients with ACS.

LIMITATIONS

This study has several limitations. The retrospective design may have contributed to selection and/or misclassification bias. These potential biases were minimized by close oversight of data collection and appropriate inclusion and exclusion criteria. The determination of paramedic assessment, contraindications, and therapy was dependent on the paramedic documentation. Because paramedic encounters were selected for inclusion from billing records including IV, oxygen, and cardiac monitoring, patients for whom paramedics were unsuccessful in starting IV lines were not included. Also, the inclusion of patients in groups I and II is based on what the paramedic wrote as an assessment. Since this was not taken from a standardized list, the same patient might have been given an assessment of “chest pain” by one paramedic and “cardiac chest pain” by another.

CONCLUSIONS

In this prehospital system, aspirin is underutilized for patients with suspected cardiac ischemia. These data agree with previously published studies in multiple health care settings.

References

1. Theroux P, Ouimet H, McCans J, et al. Aspirin, heparin, or both to treat acute unstable angina. *N Engl J Med.* 1988;17:1105–11.
2. ISIS-2 (Second International Study of Infarct Survival) Collaborative Group. Randomized trial of intravenous streptokinase, oral aspirin, both, or neither among 17,187 cases of suspected acute myocardial infarction. *Lancet.* 1988;2:349–60.
3. Eisenberg MJ, Topal EJ. Prehospital administration of aspirin in patients with unstable angina and acute myocardial infarction. *Arch Intern Med.* 1996;156:1506–10.
4. Hennekens CH, Jonas MA, Buring JE. The benefits of aspirin in acute myocardial infarction: still a well-kept secret in the United States. *Arch Intern Med.* 1994;154:37–9.
5. Freimark D, Matetzky S, Leor J, et al. Timing of aspirin administration as a determinant of survival of patients with acute myocardial infarction treated with thrombolysis. *Am J Cardiol.* 2002;89:381–5.
6. Zijlstra F, Ernst N, de Boer MJ, et al. Influence of prehospital administration of aspirin and heparin on initial patency of the infarct-related artery in patients with acute ST elevation myocardial infarction. *J Am Coll Cardiol.* 2002;11:1733–7.
7. Ellerbeck EF, Jencks SF, Radford MJ, et al. Quality of care for Medicare patients with acute myocardial infarction: a four-state pilot study from the Cooperative Cardiovascular Project. *JAMA.* 1995;273:1509–14.
8. Schreiber TL, Elkhatib A, Grines CL, O'Neill WW. Cardiologist versus internist management of patients with unstable angina: treatment patterns and outcomes. *J Am Coll Cardiol.* 1995;26:577–82.
9. Ayanian JZ. Knowledge and practices of generalist and specialist physicians regarding drug therapy for acute myocardial infarction. *N Engl J Med.* 1994;331:1136–42.
10. Saketkhou BB, Conte FJ, Noris M, et al. Emergency department use of aspirin in patients with possible acute myocardial infarction. *Ann Intern Med.* 1997;127:126–9.
11. Burwen DR, Galusha DH, Lewis JM, et al. National and state trends in quality of care for acute myocardial infarction between 1994–1995 and 1998–1999: the Medicare Health Care Quality Improvement Program. *Arch Intern Med.* 2003;163:1430–9.
12. Shahi CN, Rathore SS, Wang Y, et al. Quality of care among elderly patients hospitalized with unstable angina. *Am Heart J.* 2001;142:263–70.
13. Krumholz HM, Philbin DM Jr, Wang Y, et al. Trends in the quality of care for Medicare beneficiaries admitted to the hospital with unstable angina. *J Am Coll Cardiol.* 1998;31:957–63.
14. Berger AK, Edris DW, Breall JA, Oetgen WJ, Marciniak TA, Molinari GF. Resource use and quality of care for Medicare patients with acute myocardial infarction in Maryland and the District of Columbia: analysis of data from the Cooperative Cardiovascular Project. *Am Heart J.* 1998;135(2):349–56.
15. McLaughlin TJ, Soumerai SB, Willison DJ, et al. Adherence to national guidelines for drug treatment of suspected acute myocardial infarction: evidence for undertreatment in women and the elderly. *Arch Intern Med.* 1996;156:799–805.
16. Krumholz HM, Radford MJ, Ellerbeck EF, et al. Aspirin in the treatment of acute myocardial infarction in elderly Medicare beneficiaries: patterns of use and outcomes. *Circulation.* 1995;92:2841–7.
17. Rittenberger JC, Beck PW, Paris PM. Errors of omission in the treatment of prehospital chest pain patients. *Prehosp Emerg Care.* 2005;9:2–7.
18. Woollard M, Smith A, Elwood P. Pre-hospital aspirin for suspected myocardial infarction and acute coronary syndromes: a headache for paramedics? *Emerg Med J.* 2001;18:478–81.
19. Hauler J, Hostler D, Kaiser G, McIntosh C, Hikida R. Prehospital compliance with a standing orders chest pain protocol—an error of omission? [abstract]. *Prehosp Emerg Care.* 2003;7:180
20. Cairns JA, Gent M, Singer J, et al. Aspirin, sulfapyrazone, or both in unstable angina. *N Engl J Med.* 1985;313:1369–75.
21. Hirsh J. The optimal antithrombotic dose of aspirin. *Arch Intern Med.* 1985;145:1582.