ORIGINAL RESEARCH

# Prehospital Use of Aspirin Rarely Is Associated with Adverse Events

**Dan Quan, MS, IV;[1] Frank LoVecchio, DO, MPH;[2]**
**Bryan Clark, DO;[1] John V. Gallagher, III, MD[3]**

1. Midwestern University/Arizona College of Osteopathic Medicine, Glendale, Arizona USA
2. Banner Good Samaritan Regional Poison Center, Maricopa Medical Center, Department of Emergency Medicine, Arizona College of Osteopathic Medicine, Glendale, Arizona USA
3. Phoenix Fire Department, Phoenix, Arizona USA

Correspondence:
Frank LoVecchio, DO, MPH
925 E. McDowell Road
Phoenix, Arizona 85020 USA
E-mail:
Frank.LoVecchio@bannerhealth.com

Keywords: adverse reaction; aspirin; coronary syndrome; emergency medical services

Abbreviations
EMS = emergency medical services

Received: 01 June 2004
Accepted: 25 August 2004
Revised: 25 September 2004

Web publication: 10 November 2004

## Abstract

**Introduction**: Aspirin is commonly administered for acute coronary syndromes in the prehospital setting. Few studies have addressed the incidence of adverse effects associated with prehospital administration of aspirin.

**Objective**: To determine the incidence of adverse events following the administration of aspirin by prehospital personnel.

**Methods**: Multi-center, retrospective, case series that involved all patients who received aspirin in the prehospital setting from (01 August 1999–31 January 2000). Patient encounter forms of the emergency medical services (EMS) of a metropolitan fire department were reviewed. All patients who had a potential cardiac syndrome (i.e., chest pain, dyspnea) as documented on the EMS forms were included in the review. Exclusion criteria included failure to meet inclusion criteria, and chest pain secondary to apparent non-cardiac causes (i.e., trauma). Hospital charts were reviewed from a subset of patients at the participating hospitals. The major outcome was an adverse event following prehospital administration of aspirin. This outcome was evaluated during the EMS encounter, at emergency department discharge, or at six and 24-hours post-aspirin ingestion. An adverse event secondary to aspirin ingestion was defined as anaphylaxis or allergic reactions, such as rash or respiratory changes.

**Results**: A total of 25,600 EMS encounter forms were reviewed, yielding 2,399 patients with a potential cardiac syndrome. Prior to EMS arrival, 585 patients had received aspirin, and 893 were administered aspirin by EMS personnel. No patients had an adverse event during the EMS encounter. Of these patients, 229 were transported to participating hospitals and 219 medical records were available for review with no adverse reactions recorded during their hospital course.

**Conclusion**: Aspirin is rarely associated with adverse events when administered by prehospital personnel for presumed coronary syndromes.

**Quan D, LoVecchio F, Clark B, Gallagher JV: Prehospital use of aspirin rarely is associated with adverse events. *Prehosp Disast Med* 2004; 19(4):362–365.**

## Introduction

Aspirin administration is accepted widely for the treatment of patients with presumed acute or chronic coronary syndromes.[1–6] After atherosclerotic plaque rupture, the release of those elements cause platelet activation and thrombosis.[7] Aspirin administrated also has been postulated to reduce the restenosis rate following angioplasty or coronary artery bypass procedures by inhibiting rethrombosis of coronary vessels.[8] Furthermore, the risk reduction and decreased mortality has been shown by multiple studies. The ISIS-2 study provided convincing evidence that simultaneous administration of both streptokinase and aspirin reduces thrombus formation, and thus, reduces mortality.[9] This randomized trial showed a five-week mortality reduction of 23% with the use of aspirin alone, and a 42% reduction in mor-

| | Participating Facilities | Other Facilities | Total |
|---|---|---|---|
| No Aspirin | 183 | 626 | 809 |
| Refused or "Allergy" to Aspirin | 53 | 60 | 113 |
| Patient Administered Aspirin | 123 | 462 | 585 |
| Prehospital Administration of Aspirin | 228 | 664 | 892 |
| Presumed Coronary Syndrome | 587 | 1,812 | 2,399 |



**Table 1**—Patients with presumed coronary syndromes

| | H 1 | H 2 | H 3 | H 4 | Total |
|---|---|---|---|---|---|
| Unavailable charts | 6 | 3 | 0 | 1 | 10 |
| ED discharge or 6 hours post-EMS encounter | 0/42 | 0/25 | 0/11 | 0/28 | 0/106 |
| 24 hours post-EMS encounter | 0/42 | 0/29 | 0/25 | 0/17 | 0/113 |
| Adverse events reported | 0/84 | 0/54 | 0/36 | 0/45 | 0/219 |



**Table 2**—Results from the participating hospitals (ED = emergency department; EMS = emergency medical services; H = hospital)

tality when both aspirin and streptokinase were administered, compared to a placebo. Long-term mortality was reduced further with aspirin usage.

Despite the benefits of aspirin administration for acute coronary syndromes, the prevalence of aspirin intolerance or adverse events is not clear. Researchers have studied aspirin intolerance and have yet to determine conclusively, the number of individuals who have this "allergy". The best estimation of aspirin intolerance is 2–3% of the general population in the United States.[10]

Adverse events of aspirin administration by prehospital personnel for patients with an acute coronary syndrome have been reported only rarely. The administration of aspirin in the prehospital or emergency medical services (EMS) setting is common in presumed coronary syndromes. The goals of this study were to describe the incidence of adverse events following aspirin administration in the setting of presumed acute coronary syndromes.

## Methods

### *Study design*

A retrospective, case series was performed on patients with presumed acute coronary syndromes using data obtained from emergency medical services encounter forms and hospital charts. Project approval was obtained from the Fire Department involved and from the participating hospitals' institutional review boards.

### *Study setting and population*

In 1999, the City had a population of 1.3 million. Its Fire Department EMS Division covers 476 square miles, and, in 1999, transported 50,748 patients. Four metropolitan area hospitals were chosen for the study. The facilities included one county teaching hospital, one urban, teaching hospital, one urban, non-teaching community hospital, and one cardiac specialty care hospital.

### *Study protocol*

Fire Department EMS encounter forms over a six-month period from August 1999–January 2000 were reviewed to identify aspirin administration by prehospital personnel to patients with presumed coronary syndromes (i.e., chest pain, dyspnea) consistent with a cardiac origin. Patients were excluded from the study if: (1) chest pain occurred secondary to traumatic events; (2) they already were taking prophylactic aspirin; and (3) they had taken aspirin prior to the arrival of EMS. For patients with chest pain consistent with coronary syndromes, aspirin administration is integrated into the prehospital protocol as a standing order. Patients that met the criteria of chest pain resulting from cardiac origin were followed through their treatment at the four hospitals. Each patient's prehospital, emergency department, and, if applicable, hospital chart, were examined for any adverse events. An adverse event was defined to be a hypersensitivity reaction, such as urticaria, bronchoconstriction, or angioedema. Once the patient was at the hospital, examination of the data was conducted at time intervals of hospital discharge (if <24 hours), six hours, and 24 hours.

Charts were reviewed by qualified abstractors who were trained and had 5–10 practice runs. The practice runs were abstracted on standardized abstract forms and reviewed by another author. In the setting of conflicts or ambiguous data, all reviewers were asked to discuss the salient points and come to a conclusion. Monthly meetings during the abstracting period were conducted for monitoring. The reviewers were blinded as to the purpose of the study. An inter-rater reliability coefficient was calculated.

### *Data Analysis*

Data were analyzed using Excel™, STATA™, and Microsoft Access™ as appropriate.

## Results

Results are listed in Tables 1 and 2. A total of 25,600 EMS encounter forms were completed for the six-month period. They yielded 2,399 patients with a potential for cardiac syndrome. Five hundred, eighty-five (24.4%) patients received aspirin prior to the arrival of the EMS personnel. Prehospital personnel administered aspirin to 892 (33.1%) individuals. Another 113 (4.8%) patients either refused aspirin administration or stated that they had an "allergy" to aspirin.

Two hundred, twenty-nine patients who received prehospital aspirin administration were studied (39.1%) (Table 2). Of the 229 individuals, 219 hospital records (95.6%) were available for review at the participating facilities. No patients were reported to have had an adverse reaction to aspirin administration at emergency department discharge, six hours post-aspirin adminstration, or 24-hours post-aspirin administration.

## Discussion

The results of the study indicate that the prehospital administration of aspirin to patients with the coronary syndromes is safe. The outcomes are consistent with the rare event of fatal hypersensitivity reactions, as well as aspirin intolerance as manifested by urticaria, angioedema, and bronchoconstriction. With proper instruction, paramedics who participated in the study inquire about drug reactions and allergies associated with aspirin administration. A study regarding the training of paramedics in the use of aspirin provided evidence that with the proper training, paramedics are able to retain information and recognize contraindications to aspirin administration.[11]

An adverse reaction to aspirin often is thought of as the triad of aspirin, nasal polyps, and asthma. Over the years, this triad has become less valued. The most common reaction is urticaria/angioedema in 64.9% of cases, and aspirin-induced asthma occuring in 35.6% of the cases.[12,13] Anaphylatic shock is quite uncommon with only 1% having this manifestation. Furthermore, since the discovery of aspirin in the 1800s, many studies have attempted to determine the rate of adverse reactions from the ingestion of the drug. The studies had widely varying criteria, and thus, the results were quite different. Several attempts at deciphering and determining the results from the studies have been written.[10,14] Despite these attempts, there is no consensus of the true rate of adverse reactions to aspirin. The availability of aspirin over-the-counter for more than 100 years has demonstrated that hypersensitivity reactions are uncommon. Exposure of the general population to aspirin is quite common, given the sheer number of available aspirin-containing, over-the-counter, cold remedies and analgesics.

Approximately 33.7% of 809 eligible study patients did not receive aspirin. This relatively high number of eligible patients who did not receive aspirin is troubling, but it is expected that this has improved over the years, as it has become more widely accepted as the standard of care. Some studies have shown prehospital aspirin administration is sub-optimal for 63–87% of eligible patients.[15–17] Delays often occur during the prehospital and hospital phases of treatment. Patient denial of symptoms, bystander recognition of the signs and symptoms of acute coronary syndromes, on-scene evaluation by prehospital personnel, transportation times, and hospital evaluation time contribute to reperfusion (thrombolytics and angioplasty) delays.[18–22] Increasing education of the lay public and prehospital recognition of acute coronary syndromes along with prompt prehospital aspirin administration may help in reducing the mortality rates for these patients.[23]

The major limitations of this study include its retrospective design, reporting bias (or failure to report) by the medical providers, and the study sample size. These data are based on clinical observations by prehospital personnel en route to the hospital, and by nursing and ancillary staff in the hospital. Since prehospital and hospital staff were not aware of the study criteria, subtle reactions may not have been recognized, and thus, not documented. Adverse reactions in some individuals may manifest subtlety, especially in those with asthma, for whom wheezing may have been caused secondarily by aspirin administration. The patient's medical history was not taken into account by the study.

## Conclusion

This study indicates that aspirin administration by prehospital personnel for presumed acute coronary syndromes only is rarely (if at all) associated with adverse reactions. Prehospital personnel accurately identify those with aspirin intolerance during the prehospital encounter.

## References


1. Lewis HD, Jr: Unstable angina: Status of aspirin and other forms of therapy. *Circulation* 1985;72(Suppl V):155–160V.
2. Lewis HD, Davis JW, Archibald DG, *et al*: Protective effects of aspirin against acute myocardial infarction and death in men with unstable angina: Results of Veterans Administration Cooperative Study. *N Engl J Med* 1985;313:1369–1375.
3. Cairns JA, Gent M, Singer J, *et al*: Aspirin, sulfinpyrazone, or both, in unstable angina: Results of a Canadian multicentre clinical trial. *N Engl J Med* 1985;313:1369–1375.
4. Theroux P, Ouimet H, McCans J, *et al*: Aspirin, heparin, or both to treat acute unstable angina. *N Engl J Med* 1988;319:1105–1111.
5. Theroux P, Waters D, Qui S, *et al:* Aspirin versus heparin to prevent myocardial infarction during the acute phase of unstable angina. *Circulation* 1993;88:2045–2048.
6. The RISC Group: Risk of myocardial infarction and death during treatment with low-dose aspirin and intravenous heparin in men with unstable coronary artery disease. *Lancet* 1990;336:827–830.
7. DeWood MA, Spores J, Rotske R, *et al*: Prevalence of total coronary occlusion during the early hours of transmural myocardial infarction. *N Engl J Med* 1980;303:897–902.
8. Hackett D, Davies G, Chierchia S, Maseri A: Intermittent coronary occlusion in acute myocardial infarction. *N Engl J Med* 1987;317:1055–1059.
9. ISIS-2 (Second International Study of Infarct Survival) Collaborative Group: Randomized trial of intravenous streptokinase, oral aspirin, or neither among 17,187 cases of suspected acute myocardial infarction. *Lancet* 1988;2:349–360.
10. Abrishami MA, Thomas J: Aspirin intolerance—A review. *Annals of Allergy* 1977;39:28–37.
11. Funk D, Groat C, Verdile V: Education of paramedics regarding aspirin use. *Prehosp Emerg Care* 2000;4:62–64.
12. Speer F, Denison T, Baptist J: Aspirin allergy. *Annals of Allergy* 1981;46:123–126.
13. Speer F: Aspirin allergy: A clinical study. *South Med J* 1975;68:314–318.

14. Kwoh CK, Feinstein AR: Rates of sensitivity reactions to aspirin: Problems in interpreting the data. *Clin Pharmacol Ther* 1986;40:494–505.
15. Rogers WJ, Bowlby LJ, Chandra NC, *et al*: Treatment of myocardial infarction in the United States (1990 to 1993): Observations from the National Registry of Myocardial Infarction. *Circulation* 1994;90:2103–2114.
16. Cannon CP, Henry TD, Schweiger MJ, *et al*: Current management of ST elevation myocardial infarction and outcome of thrombolytic ineligible patients: Results of the multicenter TIMI 9 Registry. *J Am Coll Cardiol* 1995;(special issue):231A–232A. Abstract.
17. 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;273:1509–1514.
18. Sharkey SW, Brunette DD, Ruiz E, *et al*: An analysis of time delays preceding thrombolysis for AMI. *JAMA* 1989;262:3171–3174.
19. Kennedy JW, Weaver WD: Potential use of thrombolytic therapy before hospitalization. *Am J Cardiology* 1989;64:8a–11a.
20. Pressley JC, Wilson BH, Severance HW, Jr., *et al*: Basic emergency medical care of patients with AMI: Initial pre-hospital characteristics and in-hospital complications. *J Am Coll Cardiol* 1984;4:487–492.
21. Schmidt SB, Borsch MA: The prehospital phase of AMI in the era of thrombolysis. *Am J Cardiol* 1990;65:1411–1415.
22. Gonzales E, Jones L, Ornado J, *et al*: Hospital delays and problems with thrombolytic administration in patients receiving thrombolytic therapy: A multicenter prospective assessment. *Ann Emerg Med* 1992;21:1215–1221.
23. Gruppo Italiano per lo Studio della Streptochinasi nell'Infarto Miocardico (GISSI): Effectiveness of intravenous thrombolytic treatment in acute myocardial infarction. *Lancet* 1986;1:397–401.