

# Assessment of Global Positioning System Utilization in Emergency Medical Services

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## Abstract

One of the reasons mortality is higher for rural vehicular trauma victims than for urban victims is the longer time required to get a rural trauma victim into a definitive care facility. Use of Global Positioning System (GPS) navigation has been shown to reduce this time, but use of this technology by Emergency Medical Service (EMS) agencies is not universally employed.

While the greatest emphasis of utilizing GPS technology in the EMS environment should be placed on improving patient outcomes by reducing total pre hospital time, additional benefits for EMS agencies may be seen in the form of reduced expenditures from improved routing of ambulances .

## Proposal

The purpose of the proposed study is to assess the economic impact on EMS agencies through implementing GPS technology. EMS agencies may see a return on their capital investments in GPS systems from reductions of mileage, maintenance, and fuel expenditures.

This study will attempt to determine the average cost per mile to operate EMS vehicles and calculate a break even point for the purchase of GPS navigators based on the premise of a reduction of overall miles traveled while utilizing GPS technology. The assertion of a reduction of overall miles traveled is centered upon the results of a recent study conducted by the Center for the Study of Rural Vehicular Trauma at the University of South Alabama.

Cost per mile to operate EMS vehicles will be determined by collecting retrospective data from EMS services. This data will include annual fuel and maintenance cost, annual miles traveled, annual run volume, number of vehicles in fleet, type of vehicles used, cost of vehicles, and average service life of vehicles. Additional factors to be considered may include depreciation and method of depreciation of vehicles, fluctuations in fuel prices, range of cost and service life of GPS navigators.

## Background

The University of South Alabama initiated the Center for the Study of Rural Vehicular Trauma (hereafter referred to as the Center) in 2001. A central focus of the Center is to better understand why rural vehicular trauma victims do not fare as well as urban vehicular trauma victims. Utilizing the Crash Outcome Data Evaluation System (CODES) software, the Center was able to link EMS Patient Care Reports to police crash records. CODES software was developed by the National Highway Traffic Safety Administration (NHTSA) for the purpose of joining data from different sources to improve the understanding of crash scenarios. Instead of using patient identifiers (which are not universal to individual data sources), CODES employs probabilistic linkage techniques using data points common to each data source (date, location, gender, age, position in vehicle, etc.) and compensates for missing data to prevent any biases in the results.

This linkage provided location and mortality data from the police crash records that were not found in the EMS records, thus providing the Center with the ability to segregate data into rural/urban, and mortality/non mortality categories. The main findings of the Center suggest that the most important reasons for the disparity in mortality between rural and urban vehicular trauma victims relate to the longer time required getting a rural trauma victim into a definitive care facility compared their urban counterparts.

The findings showed time differentials accumulate during all time components that comprise the period from rural EMS activation until arrival at the receiving hospital. These components are: (1) response time, (2) scene time, and (3) transport time to a treatment center. The analysis also showed that each of these time components is significantly associated with mortality in rural areas, whereas significant association with mortality in urban EMS areas was not elicited.<sup>1,2</sup>

From these findings, the Center developed four interventions aimed at reducing time to definitive care and its subcomponents. Three of these interventions were directed specifically at reducing response time: Reduction of Response Time and Response Distances through Static Relocation of Ambulance Stations<sup>3</sup>; Reduction of Response Time and Response Distances Utilizing Global Positioning Satellite (GPS) Navigation<sup>4</sup>; and Reduction of Dispatch Time, Response Time, and Response Distances Utilizing Automatic Vehicle Location (AVL). While all three of these projects were successful in showing that response time and response distances could be reduced, the GPS project produced an added and unsuspected reduction in overall EMS miles traveled<sup>4</sup>.

#### Methods

12 EMS agencies participated in the original Reduction of Response Time and Response Distances Utilizing Global Positioning Satellite (GPS) Navigation project. These agencies were provided with free GPS navigators (Garmin 7200 Street Pilot) in consideration for prospective performance data. These same agencies will be contacted and asked to provide the necessary data for the proposed project. Additionally, Regional EMS Coordinators throughout the state of Alabama will be informed of the project with an open invitation to any EMS agency within Alabama to participate.

The investigators will develop the initial survey to include the following variables: annual fuel and maintenance cost, annual miles traveled, annual run volume, number of vehicles in fleet, type of vehicles used, cost of vehicles, and average service life of vehicles. Data will be collected for the 2008 calendar year.

A pilot test of the survey will be conducted among select EMS agencies for clarity and suggestions of additional variables. Upon final revisions, the survey will be emailed to participants. A time frame will be established for completion and return of the surveys, with follow up emails and phone calls to late respondents.

Surveys will be reviewed for completeness, with phone calls or emails to respective agencies for missing values or clarification. Cost per mile will be based upon total expenses for the year divided by the total miles driven for the year. A cost break even point will be based upon the determined cost per mile and variations in cost of GPS navigators.

## Timeline

Month 1	Develop Cost Criteria & Begin Draft of Survey
Month 2	Contact Regional EMS Directors for Support & Identify Pilot Participants
Month 3	Send Out Survey to Pilot Participants Via Email
Month 4	Revise Questionnaire Based on Responses From Pilot Participants
Month 5	Send Out Final Survey to Participants Via Email
Month 6	Follow Up With Participants
Month 7	Follow Up With Participants
Month 8	Deadline for Return of Surveys
Month 9	Compile Data & Assess, & Begin Rough Draft
Month 10	Complete First Draft & Submit to Reviewers
Month 11	Make Revisions Based on Reviewers' Comments & Resubmit to Reviewers
Month 12	Make revisions based on reviewers' comments & Complete Final draft

The product of this project will be a manuscript suitable for submission to a peer reviewed journal. Dr. Richard Gonzalez, Principal Investigator for the Center, and Glenn Cummings, Program Director for the Center will conduct the work. The estimated cost of the project is \$10,000.

## References

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