MPC-399
Time Duration 2012-2013

Project Title:
Improving Rural Emergency Medical Services (EMS) through Transportation System Enhancements

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South Dakota State University

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Research Needs:
Rural transportation network connects local residents to employment, health care, social activities, and business opportunities. Functional and reliable rural transportation system is critical to the rural economic growth, public health, traffic safety, and social welfare. Long travel distance in South Dakota, a prominent rural state, is not uncommon because of a sparsely distributed population. Delivering people, goods, and services become more difficult as distance increases, especially for the time-sensitive ones such as emergency medical services (EMS). In rural areas, unintentional mortality rate attributed to diseases, fertility, and motor vehicle crashes is higher in rural settings than urban settings (Blumenthal, 2002). According to the National Highway Traffic Safety Administration (NTHSA), "Delay in delivering emergency medical services is one of the factors contributing to the disproportionately high fatality rate for rural crash victims." (NTHSA, 1998) In addition, the traffic safety of EMS itself is of serious concern, particularly when the crash fatality rate for these EMS vehicles per mile traveled is estimated to be more than 10 times higher than that for heavy trucks (Nadine, 2008). Ambulance vehicle crashes not only cause new casualties but also delay the golden rescue time for the patient. Same situation applies to the other time-dependent EMS which transport trauma, cardiac, and prenatal patient to nearby care centers. Driving under urgent and stressful circumstances is considerably different from driving under normal conditions, which becomes more vulnerable to the potential risks in the current rural transportation system.

Improved EMS will have direct impacts on the traffic safety and public health in rural communities. EMS can be enhanced by a better planned, designed and operated roadway network that connects hospitals with needing communities. To provide safe, timely and quality services, it is necessary to obtain a realistic estimate of the medical demand as well as the capacity of current transportation infrastructure pertaining to the services. The gaps between

service providers, patients, and transportation network connecting the two need to be identified and filled to support better EMS.

Research Objectives:
The goal of this project is to identify issues with respect to the delivery of quality EMS to rural residents and to conduct a needs assessment from the rural transportation system perspective. There are three major objectives in the research: 1) identify the existing issues with the South Dakota EMS providers or first responders related to roads and traffic controls; 2) identify the service needs from the rural communities; and 3) evaluate the rural transportation system components in support of swift and safe EMS.

Research Methods:
The research will be primarily conducted through a data survey and interviews over a 12-month period. Data survey includes the collection and analysis of medical ambulance reports and relevant transportation data such as highway routes information, traffic control strategies, speed limit, etc. Interviews will be conducted to state agencies who oversee the statewide operations of EMS and first responders who deliver the services. The perception of the efficacy of transportation system under emergency will be collected. The perception will be used to assist in providing decision support or guidance for planning, designing, and operating a rural transportation system that supports the delivery of quality EMS for rural residents. Stakeholders and potential collaborators include the South Dakota Department of Health (DOH), the South Dakota Department of Public Safety (DPS), the South Dakota Department of Transportation (DOT), representatives from Indian Health Care, and first responders. Geographic area will be included based on availability of data.

Expected Outcomes:
Based on the survey and interviews, the research will provide a fair account of existing rural EMS in SD through tables, figures, and statistics. Data obtained will assist in figuring out how human factors and road conditions hinder safe and effective transport of individuals with medical needs from rural areas to regional medical centers. The transportation system will be assessed from the EMS perspective and recommendations will be made for future research and on how to adopt an evidence-based approach to design a safer and more efficient medical transport system that services rural areas and American Indian communities. The final technical report will include data on medical transportation safety issues, analyses, and positions of stakeholders.

Relevance to Strategic Goals:
The research will directly benefit the health care, social welfare and safety for rural residents and road users. Road safety is vital for sustaining safe and livable communities and has implications for health promotion because it results in preventable death and injury and has economic and psychosocial burdens. Livable communities and safety are among the FHWA strategic outcomes (United States Department of Transportation, 2010). Ensuring that Federal, State, Tribal, and local health agencies have the necessary infrastructure to effectively provide essential public health services is one of the Healthy People 2020 National Goals (Department of Health and Human Services 2011).

Educational Benefits:
This research project will involve graduate students and undergraduate students in survey design, data collection and analysis. It will provide first-hand research experience for students to master analytical techniques and practice their communication skills.

Work Plan:

The work plan is composed by the following six tasks.

Task 1: Literature Review (2 months)

A comprehensive literature review will be conducted in the area of health care, emergency medical services, and relevant transportation needs in rural areas.

Task 2: Design Survey (2 months)

In this task, a survey questionnaire will be designed for stakeholders including EMS providers. Questions will explore human factors and perception about the roadway and environmental factors related to service effectiveness and safety. Topics explored under human factors will include individual driver's risky behavior; seat belt use; impaired driving by fatigue; and distracted and novice drivers. Factors explored under roadway environment include visibility (at night or inclement weather), road surface conditions, perceived locations and patterns with safety concerns, most frequently used routes for a given county, availability of alternate routes and contingency plans, frequency of delays in response time, etc. Stakeholders will also be asked to provide information on any other issues that they feel may potential lead to suboptimal services.

Task 3: Conduct Survey and Data Collection (5 months)

We will work with SDDPS to identify the EMS providers who will participate in the survey and share the ambulance reports with the research team. . Relevant highway and traffic information will be requested from SDDOT. Crash data will be requested from SDDPS. Health related data such as statewide medical emergencies, disease outbreaks, and other significant incidents involving the usage of EMS will be collected from SDDOH.

Task 4: Analyze Data (4 months)

Appropriate statistical method will be used to analyze the data and identify statistically significant factors contributing to pre-hospital time and ambulance crashes. Pre-hospital time includes the following elements: (1) Time between crash/incidence occurrence and EMS Notification, (2) Travel time to the crash scene by EMS, (3) On-scene EMS treatment time, and (4) Transport time to a hospital or care center. Among them, element 2 and 4 are directly associated with the travel time determined by the traffic, highway, and environmental conditions. Comparing the ambulance reports and transportation data will assist us in locating potential deficiencies quantitatively and objectively. Data analysis can also help to identify and provide efficient and effective methods for collection of necessary EMS data if they are not available in the current format. Human factors contributing to risky behaviors will be quantified through the

data analysis. Combing perceived safety concerns from the service providers and actual crash records will help to address the crash patterns and identify locations for further safety review.

Task 5: Write the Final Report (3 months)

The research team will write the final report and prepare all the deliverables for an external review.

Project schedule is as follows:

	1	2	3	4	5	6	7	8	9	10	11	12
Task 1: Literature Review												
Task 2: Design Survey												
Task 3: Conduct Survey and Data Collection												
Task 4: Analyze Data												
Task 5: Write the Final Report												

Project Cost:
Total Project Costs: $ 83,503
MPC Funds Requested: $ 55,850
Matching Funds: $ 27,918 Source of Matching Funds: SDSU

Potential Peer Reviewers:

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