TIME-SENSITIVE RESPONSE TO CARDIOVASCULAR DISEASE EVENTS IN MONTANA

RESULTS OF THE 2009 EMERGENCY MEDICAL TECHNICIAN SURVEY

MONTANA
CARDIOVASCULAR HEALTH PROGRAM

MONTANA
Department of Public Health & Human Services

Montana EMS System
EMS & trauma Systems Section

INTRODUCTION

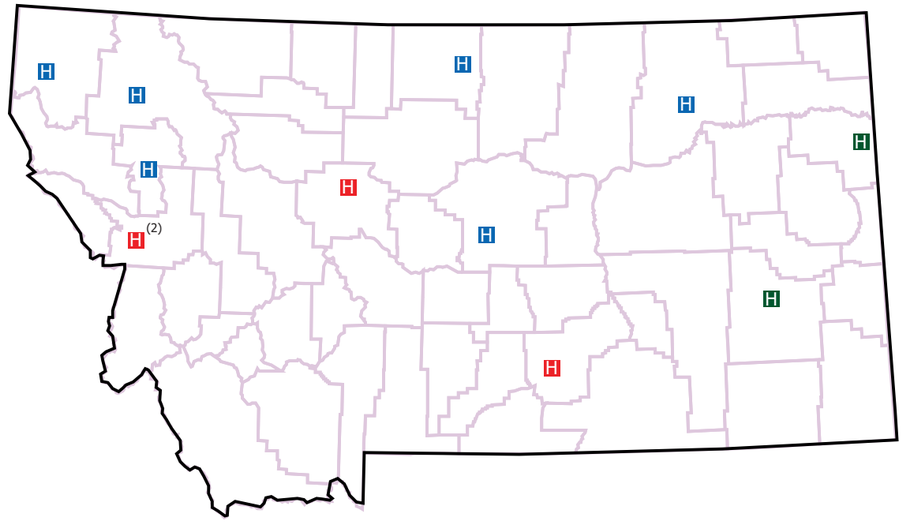
Overall, cardiovascular disease including heart disease and stroke accounted for 30% of all the deaths in Montana in 2005. (1) Emergency Medical Services (EMS) represent an important part of the chain of events that support survival for persons with cardiovascular disease in Montana. Cardiopulmonary resuscitation and early defibrillation can save heart attack victims who experience cardiac arrest outside a hospital. Time to treatment is critical for evaluation and treatment with thrombolytic agents to preserve vital tissues and achieve desired outcomes for stroke and heart attack victims. Thus, timely emergency transport and hospital pre-notification for those with heart attack or stroke are essential to save lives and prevent disability.

Since 2004, as part of the Montana Stroke Initiative, the Montana Cardiovascular Health Program worked with the Stroke Workgroup (representatives from EMS, stroke centers and many other health care settings around the state) to increase access to thrombolytic therapy for acute ischemic stroke patients within a critical 3-hour time window. Public Awareness campaigns have promoted stroke awareness and the need to call 9-1-1. EMS providers have received training in the use of screening protocols to identify possible stroke victims and to notify the hospital of transport of a possible stroke patient prior to arrival. Several large hospitals in the state have achieved professional recognition as stroke centers, and telestroke capability has expanded across rural parts of Montana as shown in Figure 1.

In 2009, a new Cardiac Workgroup comprised of healthcare providers from across the state was convened to intensify efforts to reach and treat heart attack victims in a timely fashion. The group focused on a need to identify heart attack patients with ST-segment elevation myocardial infarction (STEMI) so they could be treated with thrombolytic agents in rural areas where percutaneous coronary intervention is not immediately available. This initiative was similar to one developed nationally by the American Heart Association. The Montana Cardiac Workgroup also recognized the need to address all forms of acute coronary syndrome (i.e., non-STEMI) in Montana communities.

This report presents the results of a survey of Emergency Medical Technicians (EMT) conducted in 2009. The survey was intended to provide an overview of EMS Services and to provide information about the current status of identification and treatment for time-sensitive cardiovascular conditions including stroke and heart attack. To monitor progress in stroke identification and treatment, the report compares current information about stroke capabilities with that obtained in a similar survey in 2006. (2) In addition, the report presents baseline information about the capability of EMS services in the state to obtain and transmit 12-lead electrocardiogram (ECG) and provide inter-facility transfer of heart attack victims.

FIGURE 1. Location of Primary Stroke Centers, Active Telestroke and Upcoming Telestroke Sites, Montana, 2009.



LEGEND

H MT PSC

H Active Telestroke sites

H Upcoming Telestroke sites

METHODS

In 2006 and again in 2009, the Montana Cardiovascular Health Program conducted cross sectional telephone surveys of a random sample of active First Responders (EMT-FR), EMT-Basics (EMT-B), EMT-Intermediates (EMT-I), and EMT-Paramedics (EMT-P) to assess stroke knowledge and practice of pre-hospital providers. A stratified random sample of EMS personnel was developed from the Montana Board of Medical Examiners database of licensed individuals in the state. A postcard was mailed to all licensed EMTs describing the upcoming telephone survey and requesting their participation.

To assess stroke care, the 2006 and 2009 EMT provider surveys included questions adapted from a nationwide survey published by Crocco et al. in 1999. (3) Unlike the nationwide survey where EMT-I and EMT-P were surveyed, the Montana survey also included EMT-FR and EMT-B. The 2006 survey consisted of 71 questions to evaluate areas of practice and service, knowledge of stroke signs and symptoms and risk factors, practical stroke knowledge, and interest in additional pre-hospital stroke training. The 2009 follow-up survey included supplemental stroke questions to obtain a more comprehensive picture of stroke care in Montana. An additional 18 questions were included to assess EMS capability to obtain and transmit 12-lead ECG and information about transport and transfer policies and practices for those with acute heart attack.

Although a large majority of Montana's population resides in the seven counties defined as "small urban" counties in this report, there are others who live in remote areas. For this report, a small urban county is defined as a non-metropolitan county with a city containing a population of 10,000 or more residents. The remaining 49 counties are defined as "frontier" (non-metropolitan county without a city of 10,000 or more residents). Each EMT respondent's county of practice was used to categorize the respondent as practicing in a small urban or frontier county.

A weighted analysis was conducted using SPSS v 17.0 software (SPSS Inc., Chicago, IL). Chi-square and independent t tests were used to compare differences in the EMT characteristics, stroke knowledge and attitudes, and practice of EMTs responding to the 2006 and 2009 surveys. For the additional cardiac questions included in the 2009 survey, only responses from EMT-B, EMT-I and EMT-P were included in the analysis. To assess pre-hospital cardiac care, Chi-square and independent t tests were used to compare differences in service and EMT characteristics, 12-lead ECG capacity and 12-lead ECG training.

RESULTS

Stroke Care

In 2006, 988 pre-hospital providers responded to the baseline survey, and 944 responded to the 2009 follow-up survey. (4-5) Those responding to the 2009 survey were slightly older (average 44.9 years vs. 43.3), reported more EMT providers in their service (23.8 vs. 21.9), and fewer were first responders (21% vs. 27%) compared to those responding to the 2006 survey. EMT respondents averaged 11.1 years of experience for the 2009 survey compared to 10 years for those responding to the 2006 survey. For both the 2006 and 2009 surveys, the majority of respondents were volunteers. There were no significant differences in gender, employment status, or county of practice among respondents to the 2006 or 2009 survey. (Table 1)

Table 1. Characteristics of emergency medical technician survey respondents, Montana, 2006 and 2009.

	Time period	
	2006 (n = 988)	2009 (n = 944)
	Mean (95% CI)	Mean (95% CI)
Age (years), average	43.3 (42.5-44.1)	44.9* (44.2-45.7)
Number years as an FR/EMT**	10.0 (6.5-10.5)	11.1* (10.6-11.6)
Number of FR/EMTs in your service	21.9 (20.2-23.6)	23.8* (22.0-25.5)
	% (n)	% (n)
Sex (male)	62 (648)	62 (595)
EMT type*		
First responder	27 (404)	21 (193)
Basic/Intermediate	65 (397)	69 (596)
Paramedic	8 (187)	9 (155)
EMS employment status		
Full time paid	21 (256)	24 (261)
Part time paid	7 (70)	8 (80)
Volunteer with stipend	28 (233)	25 (224)
Volunteer without stipend	42 (420)	42 (366)
Other	1 (9)	1 (13)
County of practice		
Small urban	37 (397)	40 (406)
Frontier	63 (591)	60 (538)

*P-value ≤0.05
** First responder/Emergency Medical Technician

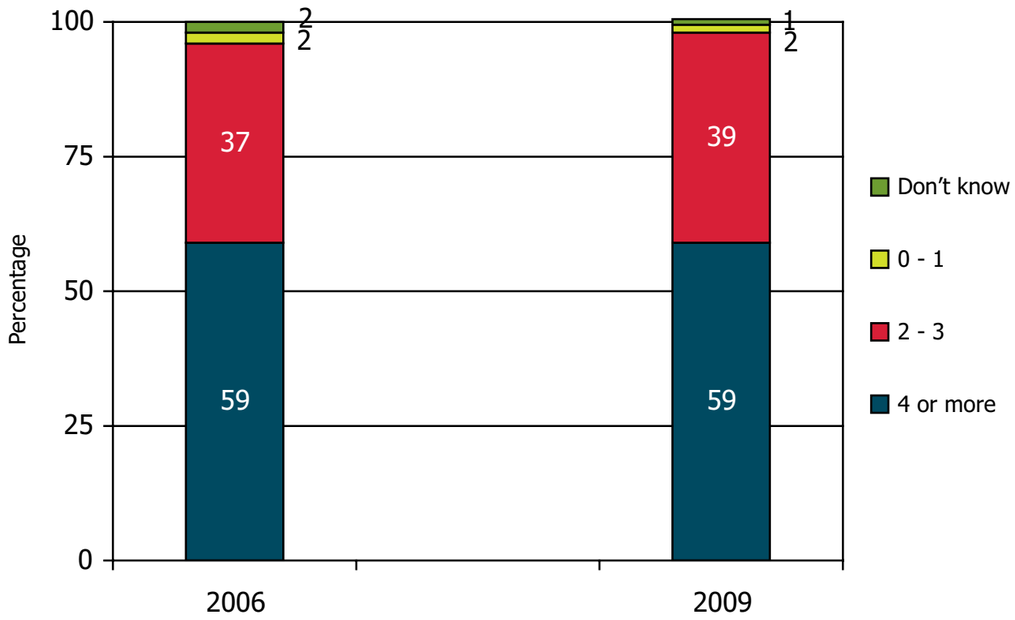
In 2009, EMT respondents were more likely to report the availability of a stroke protocol in their service, training in the use of a stroke screening tool, and the use of a stroke screening tool compared to respondents to the 2006 survey. (Table 2) Eighty-one percent reported that they felt they had an adequate level of knowledge about stroke compared to 66% of those participating in the 2006 survey. (Table 2) Reported actions taken when responding to a potential stroke patient were unchanged, with almost 90% of respondents reporting they would respond to stroke as an emergency, and they would always notify the hospital of a potential stroke patient prior to arrival. Almost all of the respondents to both surveys recognized time of onset of initial stroke symptoms as a high priority. In the 2006 and 2009 surveys, most EMT-Bs (with endorsements), EMT-Is, and EMT-Ps correctly identified appropriate acute management strategies. There were no significant changes in knowledge of stroke warning signs; over 95% of respondents to both surveys correctly identified two or more warning signs of stroke. (Figure 2) The knowledge that the recommended time-frame for thrombolytic therapy administration was three hours or less remained unchanged, 57% and 56%, for both the 2006 and 2009 surveys, respectively. (Figure 3)

Table 2. Stroke-related knowledge and practice among emergency medical technicians, Montana, 2006 and 2009.

	Time period	
	2006 (n = 988)	2009 (n = 944)
	% (n)	% (n)
Stroke protocol available	61 (625)	69* (668)
Trained in using stroke screening tool	42 (434)	62* (605)
Stroke screening tool used	40 (412)	62* (608)
Always pre-notify hospital of potential stroke patient	84 (693)	87 (707)
Time frame for administration of thrombolytic therapy		
≤ 3 hours	57 (562)	56 (549)
> 3 hours	6 (58)	7 (75)
Don't know/Not sure	37 (368)	37 (320)
Respond to stroke as emergency	89 (882)	87 (824)
Have adequate knowledge about stroke	66 (666)	81* (771)
Determining time of onset of initial stroke symptoms is a high priority	99 (973)	100 (936)
Identified acute management strategies for potential stroke patients		
Cardiac monitor**	96 (244)	98 (396)
Insert IV†	98 (225)	98 (368)
Oxygen (all)	98 (963)	97 (914)
Check blood glucose**	94 (248)	92 (441)

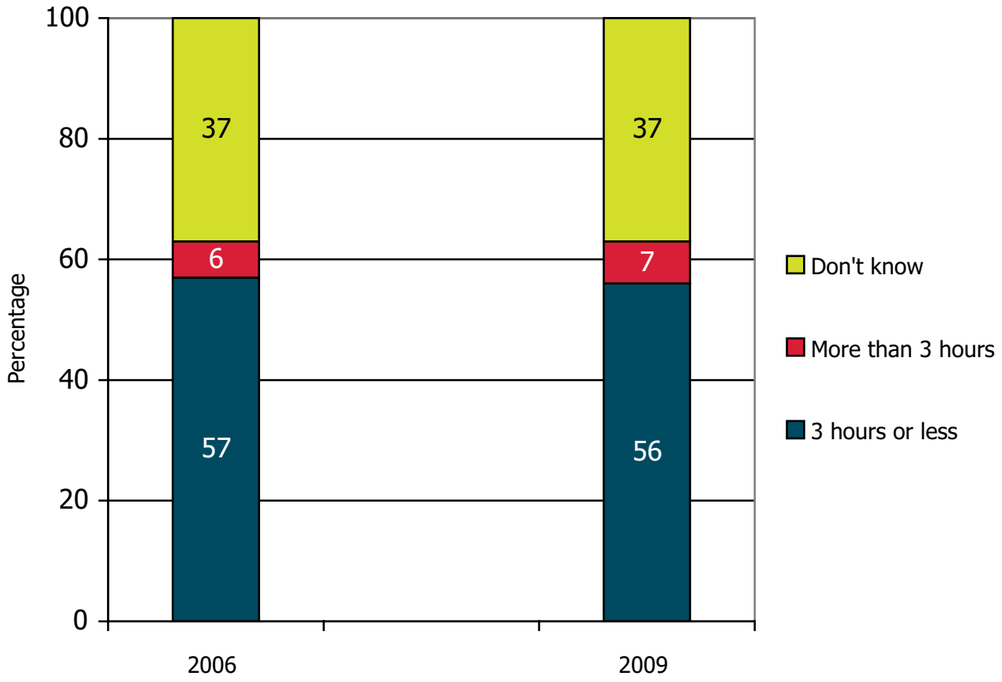
*P-value ≤0.05
**Includes respondents who are EMT-Paramedics, EMT-Intermediates, and EMT-Basics (with a monitoring endorsement)
† Includes respondents who are EMT-Paramedics, EMT-Intermediates, and EMT-Basics (with an intravenous infusion and intraosseous infusion endorsement)

Figure 2. Recognition of stroke warning signs and symptoms*, Montana, 2006 and 2009.



*Sudden numbness or weakness of the face, arm, or leg – especially on one side of the body; sudden confusion, trouble speaking or understanding; vision disturbances in one or both eyes; sudden dizziness, trouble walking or loss of balance; sudden severe headache with no known cause.

Figure 3. Awareness of recommended timeframe for t-PA therapy administration for stroke patients, Montana, 2006 and 2009.



Cardiac Care

Seven hundred fifty-one EMS providers including EMT-Bs, EMT-Is and EMT-Ps responded to the 2009 survey with 53% practicing in frontier counties and the remaining 47% practicing in small urban counties. (Table 3) EMT providers in small urban counties differed from those in frontier counties with regard to age (average 40.8 years vs. 46.2) and gender (75% male vs. 47%), but reported similar number of years of EMT experience (10.7 vs. 11.7). (Data not shown) Respondents from frontier counties were much more likely to be volunteers than respondents in small urban counties.

Table 3. Characteristics of emergency medical technicians responding to the cardiac survey, Montana 2009.

	Total (N = 751)
	Mean (95% CI)
Age (years), average	43.9 (43.0-44.8)
Number of yrs as EMT	11.2 (10.7-11.8)
Number of EMT	26.2 (24.1-28.2)
	% (n)
Male	59 (460)
Type of County	
Small Urban	47 (355)
Frontier	53 (396)
Service description	
Full-time members	17 (139)
Combination Full-time & Part-time	14 (127)
Volunteers	50 (343)
Combination paid and volunteer	18 (137)
Other	1 (5)

Overall, almost 30% of EMTs reported that their service had 12-lead ECG devices in the EMS vehicles dispatched for heart attack. Services in urban counties were twice as likely (41% vs. 20%) to have 12-lead devices in the vehicles dispatched for chest pain compared to those in frontier counties. (Data not shown) Among the EMT respondents that reported having 12-lead ECG devices available, overall, respondents reported an average of 87% of their EMS vehicles had 12-lead ECG capabilities, and 60% reported the ability to transmit a 12-lead ECG tracing to a local hospital or interventional hospital in Montana. EMT reported they were able to transmit 12-lead ECG tracings in a variety of ways. Almost half (47%) of those with the ability to transmit reported that they read the ECG and called in the interpretation, 18% used a computer algorithm, and 31% reported transmitting the tracing directly to the hospital. (Data not shown) Forty percent reported technology limitations with technological resources and geographic “dead spots” being the most common barriers. (Data not shown) Overall, 75% of Montana services had provided some 12-lead ECG STEMI identification training, and 94% of EMT-Ps who attended training felt able to read and interpret a 12-lead tracing. (Table 5) Overall, 39% reported transporting heart attack patients, at least sometimes, between facilities. Those in the frontier communities reported providing inter-facility transfers more frequently than those from urban settings. (Figure 4) If an acute heart attack was suspected, EMT providers from frontier counties were more likely to wait at the local hospital for possible transfer and would wait twice as long compared to those in urban counties. (Table 6) Most EMT providers notified the receiving facility with an update of the cardiac patient’s status at about 12 minutes prior to arrival.

Table 4. 12-lead electrocardiogram (ECG) transmission capabilities and 12-lead ECG training among EMT providers reporting 12-lead ECG devices, Montana, 2009.

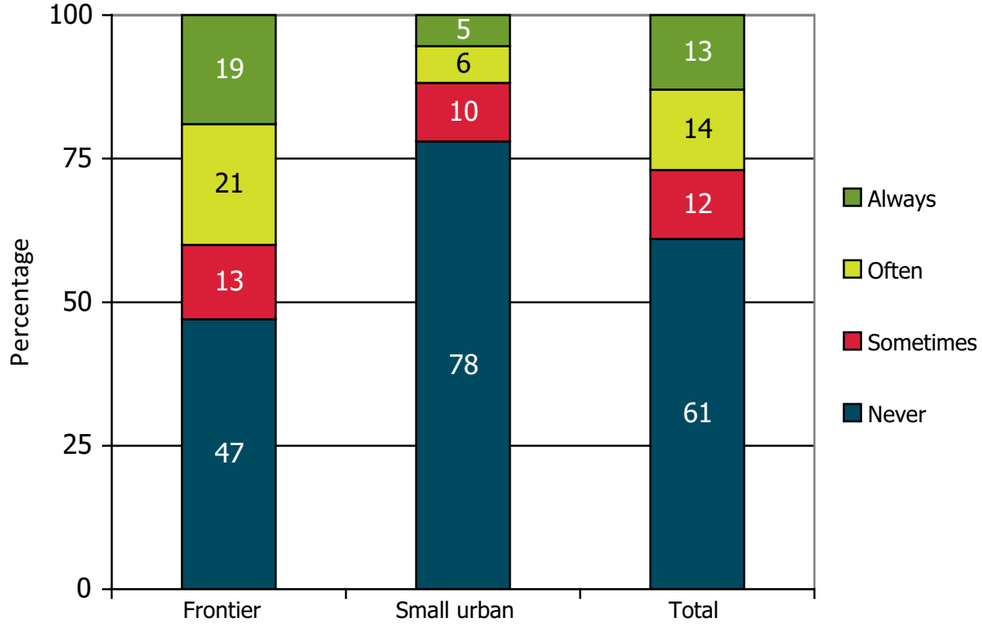
	Total
	% (n)
Able to transmit 12-lead ECG	60 (133)
EMS read ECG and interpretation called	47 (62)
Read by computer algorithm and called	18 (24)
ECG transmitted directly to hospital	31 (42)
Don’t know	5 (5)
Provides 12-lead ECG training	75 (192)
EMT-I and EMT-P attended	94 (104/111)
EMT-P feel knowledgeable to read and interpret 12-lead ECG	94 (96/102)

Table 5. Inter-facility transfers of patients with AMI (including STEMI), by county of service, Montana, 2009.

	Frontier	Small urban	Total
Wait at the local hospital for potential transfer of suspect AMI/STEMI patient [% (n)]	68 (132)*	20 (20)	56 (152)
Number of minutes wait at local hospital [mean (95% CI)]	42.8* (37.8-47.9)	20.9 (11.6-30.1)	41.4 (36.5-46.3)
Call receiving facility when transporting AMI/ STEMI patient [% (n)]	97 (197)	94 (86)	97 (283)
Number of minutes call is made prior to arrival [mean (SD)]	12.4 (11.5-13.3)	12.3 (10.0-14.5)	12.3 (11.5-13.2)

*P-value ≤0.05

Figure 4. Inter-facility transfers (meaning transport from local hospital to referral cardiac interventional facility) for further treatment of patients with acute myocardial infarction (including STEMI), by county of service, Montana, 2009.



CONCLUSION

EMS services in Montana face daunting challenges coordinating evaluation, care and transport of cardiac and stroke patients across distances from outlying facilities to referral centers. Individuals in frontier counties are less likely to work as full-time EMTs compared to those in urban settings, and many are volunteers. Nonetheless, efforts to address time-sensitive cardiovascular diseases have intensified statewide. Stroke is widely recognized as an emergency and hospitals are notified routinely of pending arrival of a possible stroke victim by most services. The use of stroke protocols and screening tools has increased. For acute cardiac care, less than one third of vehicles dispatched for chest pain in Montana are equipped with devices for obtaining 12-lead ECG tracings in the field. Emergency vehicles in urban areas are more likely to have the capability of obtaining and transmitting ECG tracings directly to the hospital compared to the vehicles in frontier communities. Inter-facility transfers of heart attack patients are common in the frontier areas of Montana, and many EMS services anticipate the transfer of heart attack patients by having EMT staff wait at the local hospital. Most services notify the receiving hospital prior to arrival with heart attack patients.

Both the Montana Stroke Workgroup and the Cardiac Workgroup, in partnership with the Cardiovascular Health Program, will continue working with EMS services across the state to address time-sensitive cardiovascular conditions. Through the Stroke Workgroup's initiative, Montana's EMTs have been offered numerous stroke continuing education opportunities including free access to the American Heart Association's pre-hospital stroke training. In conjunction with telestroke installations in rural communities, a paramedic provides National Stroke Association training to local EMS. In 2011, the Cardiac Workgroup and Cardiovascular Health Program are arranging two regional12-lead ECG trainings for EMS providers. In conclusion, this report recognizes the extraordinary contributions of EMS providers across the state in addressing the needs of Montanans with time-sensitive acute cardiovascular conditions.

ACKNOWLEDGEMENTS

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INFORMATION OR QUESTIONS

If you have questions about this report, or would like additional information about the Montana Stroke Workgroup or the Cardiac Workgroup, please contact: Mike McNamara, M.S., FAACVPR

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