Adequacy of EMS systems of care protocols for OHCA, STEMI & stroke in Oregon: a structured review

Executive Report

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Disclosure:

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Introduction

Out of hospital Cardiac Arrest (OHCA), ST-segment Elevation Myocardial Infarction (STEMI) and stroke are 3 commonly encountered prehospital conditions for which systems of care have been developed to improve patient outcomes. A system of care is a cooperative effort between EMS (Emergency Medical Services) and hospitals to optimize care for time-sensitive conditions. Several published evidence-based guidelines suggest best practices for EMS treatment protocols for OHCA, STEMI and stroke.

The purpose of this study was to examine the adequacy of EMS adult protocols for OHCA, STEMI and stroke for ambulance agencies providing patient transportation in Ambulance Service Areas (ASAs) throughout the State of Oregon. The study was to determine the number of EMS adult protocols from rural ambulance agencies, which met all the evidence-based guidelines and which met selected evidence-guided or best practices for each of these 3 systems of care. A tool kit of model protocols using evidence-based best practices was developed for these three systems of care that might be beneficial for use across the state (Appendix A).

Methods

Oregon ambulance adult treatment protocols for OHCA, STEMI and stroke received were reviewed by the author in a structured format using a standardized data collection tool for abstracted data elements. Evidence-guided elements or best practices were defined as those listed in the appropriate NASEMSO Model EMS Clinical Guidelines[1] or American Heart Association (AHA) Guidelines[2,3,4,5,6,7,8]. A few additional elements were added by the author based on his EMS medical direction education, experience and clinical judgment.

Results

Ambulance service in Oregon is provided by a licensed ambulance provider in each county-managed Ambulance Service Area (ASA)[9] (Fig. 1). Air ambulance service is not governed by this ASA process. According to the State of Oregon EMS & Trauma Office there are 140 licensed ambulance agencies in Oregon, of which 9 provide only air ambulance service and another 10 have a licensed ambulance, but are not an ambulance provider in an ASA. At the request of the Oregon Health Authority's EMS &

Trauma Office EMS adult protocols for OHCA, STEMI and stroke were received from 95 of the 121 Oregon ground ambulance agencies, which provide service in one or more Oregon ASAs. Of the 95 EMS agencies from which protocols were received, 60 (63%) were located in counties considered to be Rural or Frontier by the Oregon Office of Rural Health and designated Rural for the purposes of this study; the other 35 (37%) were designated Non-rural. There were 38 distinct sets of protocols received, as several regions have developed protocols covering multiple agencies (range 1-10) in a region, a county, part of a county, or group of counties. The 60 Rural counties had 31 separate protocol sets and the 35 Non-rural counties 9 separate protocol sets

Protocols were obtained from EMS agencies in 34 of the 36 Oregon counties (Fig. 2). The number of protocols obtained per county ranged from 1-10. At least 77% of the protocols were dated within the prior 4 years (Table 1). At least 97% of the protocols from the Non-rural agencies had an effective date within the prior 4 years. Almost one tenth of the protocols received from the Rural EMS agencies did not list a date, compared with none of those from Non-rural agencies.

Data element presence ranged from 0% to 100% in protocols for OHCA (Tables 2 & 3), STEMI (Table 4) and stroke (Table 5). All OHCA protocols mentioned initial vasopressor and initial advanced airway. All STEMI protocols required a 12 lead ECG, noted that the establishment of intravenous access, and mentioned the administration of nitroglycerin (NTG) and an analgesic. All stroke protocols specified time of onset of symptoms. None of the OHCA protocols required Code 3 (lights & siren) transport. None of the STEMI or stroke protocols noted EMS fibrinolytic administration. None of the stroke protocols required the EMS provider to obtain Online Medical Control (OLMC). Protocols from 3 agencies contained all the evidence-based guideline elements for stroke (Table 6). Two of these were from Rural agencies using the same protocols and one was a Non-rural agency. None of the protocols for OHCA or STEMI contained all the evidence-based guideline elements. In general, the protocols from the Non-rural agencies were more likely to mention a data element than were those from Rural agencies. Three Rural agencies supplied protocols for OHCA and STEMI, but not for stroke. Variation was noted in individual data elements for protocols for all 3 systems of care.

Discussion

In Oregon, EMS adult protocols for OHCA, STEMI or stroke systems of care were quite varied. Of the evidence-based guideline elements, two were found in all the protocols for OHCA, four in all of the protocols for STEMI, and one in all the protocols for stroke. All the guideline recommendations for stroke were included in protocols from 3 agencies; no protocols for OHCA or STEMI included all the recommended elements.

Most of the Oregon EMS adult protocols received and evaluated noted many of the evidence-based guidelines or best practices for Out of Hospital Cardiac Arrest (OHCA), STEMI and stroke. The most common elements missing from the protocols were specific event times and tidal volumes for ventilations. Some of the guidelines are fairly explicit such as a CPR chest compression rate of 100-120 per minute or a 12 lead ECG for all patients with a possible STEMI. Other guidelines are less specific, allowing for variation depending on the local situation, such as interrupted or continuous CPR chest compressions, the use of mechanical CPR, the aspirin dose for STEMI, or the time threshold of 3, 4.5, or 6 hours for acute stroke intervention. Hospital bypass specifications were not usually detailed in the protocols and may be very dependent on local conditions such as geography, ambulance agency resources, weather, or aircraft availability. The published guidelines or best practices were not always explicit and did allow for some variation; not unexpected for consensus documents developed by committees of subject matter experts in a relatively new field with ongoing research and publications.

EMS protocols were requested from Oregon ambulance agencies providing emergency patient transportation. Most protocols received were sent by an EMS agency while some were found posted on the agency's website. Protocols from some agencies were not received despite multiple requests. The State of Oregon was not able to provide a list of ASAs and the assigned ambulance agencies so it is possible that a few ambulance agencies were missed or that a few non-ASA ambulance agencies were included, particularly if the ASA assignee subcontracted with a different ambulance agency or if there is more than one ambulance provider in a single ASA. More than one protocol was received from some agencies, sometimes with different effective dates suggesting the possibility of different protocol details. Some of the protocols were in the process of being updated and may have changed between the time of review and the time this report was completed.

EMS protocols in the United States have been described as individual (as is the case in Oregon), regional, model statewide or mandatory statewide[10]. Where generally agreed upon EMS guidelines exist, such as to a large degree for OHCA, STEMI, and stroke, an argument can be made that EMS protocols should be established regionally or even statewide. The development of regional systems of care for time-sensitive conditions, as for trauma, STEMI, stroke and OHCA, suggests that EMS protocols could be at least regional, based upon the institution(s) likely to receive patients transported by EMS. The capabilities of the receiving institutions may vary significantly. Especially in the more rural parts of Oregon, options for long-distance air ambulance transport may be limited by weather conditions and aircraft availability. The Oregon trauma system[11] with its State Trauma Advisory Board (STAB) and Area Trauma Advisory Boards (ATABs) could provide a model for the further development of these other time sensitive systems of care.

EMS agency medical direction in Oregon is provided by physicians on a part-time basis in addition to other responsibilities, who provide EMS medical direction ranging from about half-time to a few hours per month or even less. The larger number of older or undated protocols from Rural agencies suggests that these EMS medical directors may have less time and energy to spend on EMS protocols. The creation and review of EMS protocols may be an easier task in many ways when a number of medical directors work together in a geographic region, as opposed to the very part-time medical director who works in a distant part of the state with limited contact with nearby peers. As the body of prehospital and EMS knowledge and research expands, the spread of evidence-based guidelines in the development of EMS protocols to improve patient care, as has been promulgated[12], is worthy of further consideration in Oregon.

Acknowledgements

Ken Kempner, PhD and Meredith Guardino for editorial review.

Figure 1. Map of Oregon Ambulance Service Areas (ASAs) and ASA holders - 2008

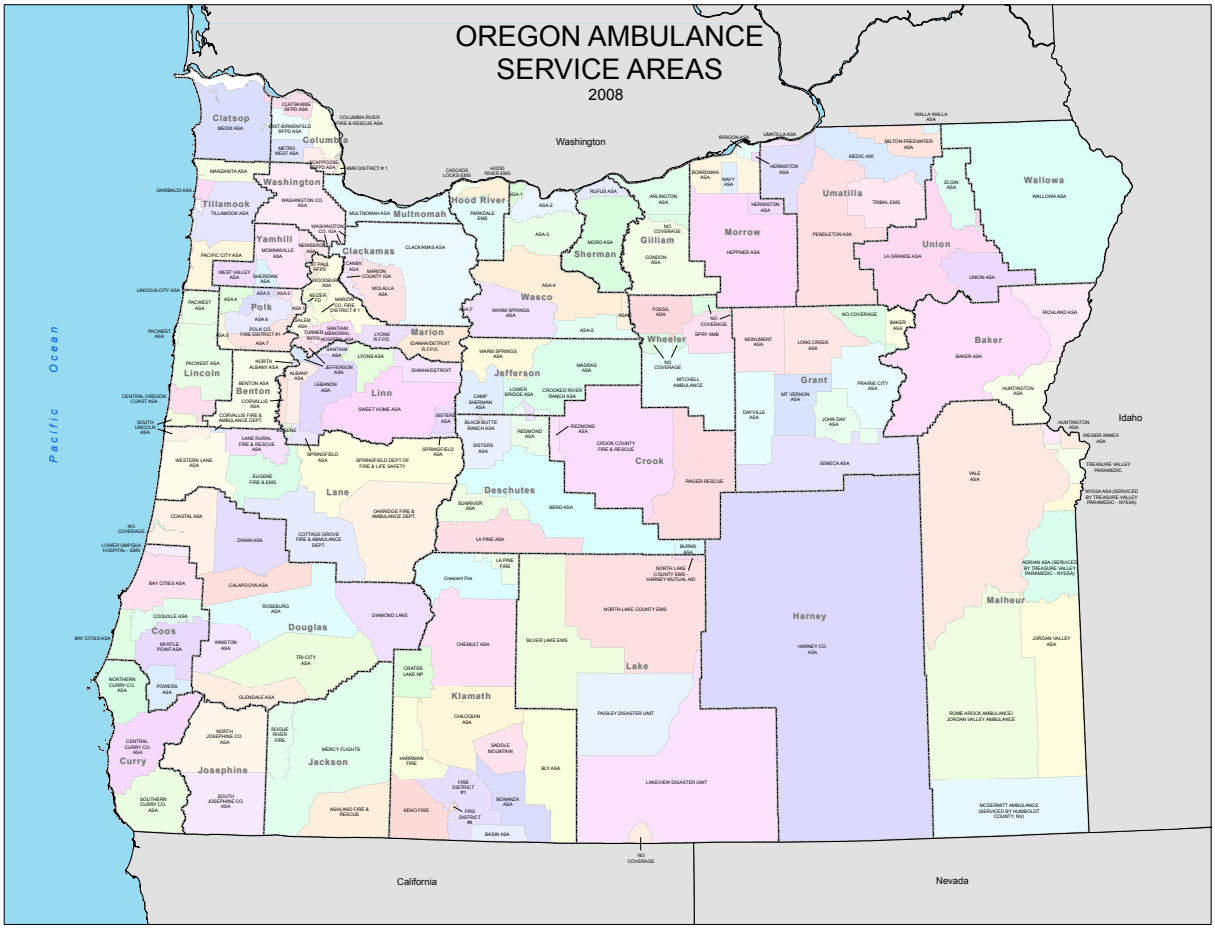
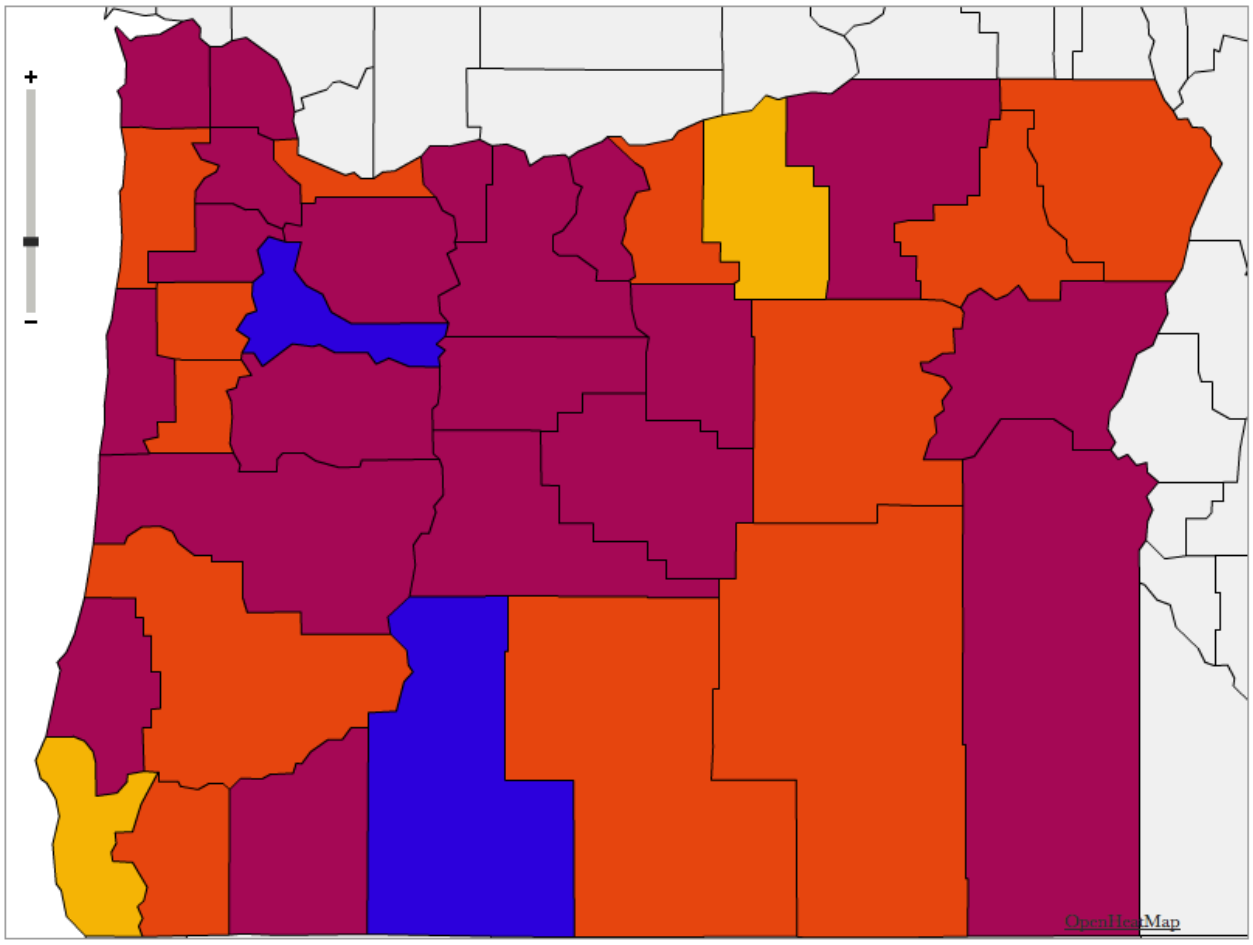


Figure 2. Map of Oregon counties showing number of EMS agencies from which protocols were received



No EMS agencies	1 EMS agency	2-5 EMS agencies	6-10 EMS agencies

Table 1. Protocol Effective Date

	Rural N (%)	Non-rural N (%)
OHCA Protocol Effective Date §	Total = 60	Total = 35
Within 1 year	30 (50%)	28 (80%)
Within 2 years	39 (65%)	35 (100%)
Within 4 years	46 (77%)	35 (100%)
5 or more years	6 (10%)	0 (0%)
Undated	8 (13%)	0 (0%)
STEMI Protocol Effective Date	Total = 60	Total = 35
Within 1 year	34 (57%)	28 (80%)
Within 2 years	44 (73%)	34 (97%)
Within 4 years	49 (82%)	34 (97%)
5 or more years	5 (8%)	1 (3%)
Undated	6 (10%)	0 (0%)
Stroke Protocol Effective Date	Total = 57	Total = 35
Within 1 year	32 (56%)	28 (80%)
Within 2 years	40 (70%)	34 (97%)
Within 4 years	48 (84%)	34 (97%)
5 or more years	4 (7%)	1 (3%)
Undated	5 (9%)	0 (0%)

§ Chi-square p-value < 0.05 for Rural vs Non-rural

Table 2. OHCA data elements present in protocols from EMS agencies

	Rural N (%)	Non-rural N (%)
(listed by decreasing sum of N Rural + N Non-rural)		
*Initial vasopressor	60 (100%)	35 (100%)
*Initial vasopressor	60 (100%)	35 (100%)
*Initial advanced airway	60 (100%)	35 (100%)
*Initial anti-arrhythmic	58 (97%)	35 (100%)
*Early AED/defibrillator use (detailed in Table 3)	56 (93%)	35 (100%)
*Defibrillation energy	56 (93%)	35 (100%)
*Magnesium if Torsades §	52 (87%)	**35 (100%)**
*Chest compression rate § (detailed in Table 3)	51 (85%)	**34 (97%)**
*IV or IO	55 (92%)	28 (80%)
*Chest compression type (detailed in Table 3)	49 (82%)	28 (80%)
*High flow oxygen §	**51 (85%)**	22 (63%)
*Termination of Resuscitation (TOR) protocol §	39 (65%)	**32 (91%)**
*$ETCO_2$ monitoring §	37 (62%)	**34 (97%)**
*Ventilation rate - airway	40 (67%)	28 (80%)
*Chest compression depth §	34 (57%)	**28 (80%)**
*Ventilation rate - BVM (detailed in Table 3) §	33 (55%)	**28 (80%)**
*Subsequent anti-arrhythmic	37 (62%)	18 (51%)
*12 lead ECG if ROSC §	25 (42%)	**24 (69%)**
*EMS Cooling	26 (43%)	20 (57%)
*Back-up advanced airway	27 (45%)	10 (29%)
*Rotate compressors	20 (33%)	16 (46%)
*Initial cardiac rhythm	18 (30%)	17 (49%)
Time of cardiac arrest	20 (33%)	14 (40%)
*Subsequent vasopressor	19 (32%)	15 (43%)
*Hospital bypass specified	19 (32%)	15 (43%)
*Rapid determination of cardiac arrest	10 (17%)	10 (29%)
*Tidal volume	7 (12%)	5 (14%)
*Mechanical CPR	6 (10%)	5 (14%)
Specific OHCA notification	4 (7%)	3 (9%)
*Time CPR started	3 (5%)	4 (11%)
Time of ROSC	3 (5%)	3 (9%)
Defibrillator download	4 (7%)	0 (0%)
Online Medical Control (OLMC) required	1 (2%)	0 (0%)
Code 3 Transport required	0 (0%)	0 (0%)

*Guideline recommendation[1,2,3,4]

§ Chi-square p-value < 0.05 for Rural vs Non-rural – **larger value**

Table 3. Selected OHCA data elements present in protocols from EMS agencies

	Rural N (%)	Non-rural N (%)
*Early AED/defibrillator use		
Yes	18 (30%)	20 (57%)
After 2 min CPR	6 (10%)	0 (0%)
If downtime > 5 min, after 2 min CPR	9 (15%)	14 (40%)
If unwitnessed, then 1-2 min CPR	22 (37%)	0 (0%)
AHA Guidelines	1 (2%)	1 (3%)
Not listed	4 (7%)	0 (0%)
*Chest compression rate		
80-100	1 (2%)	0 (0%)
about 100	9 (15%)	0 (0%)
100	22 (37%)	19 (54%)
100-120	12 (20%)	6 (17%)
110	6 (10%)	5 (14%)
110-120	0 (0%)	3 (9%)
AHA Guidelines	1 (2%)	1 (3%)
Not listed	9 (15%)	1 (3%)
Chest compressions		
Interrupted	29 (48%)	13 (37%)
Continuous	14 (23%)	14 (40%)
Both	3 (5%)	0 (0%)
AHA Guidelines	3 (5%)	1 (3%)
Not listed	11 (18%)	7 (20%)
*Ventilation rate with BVM		
Every 6 seconds	3 (5%)	0 (0%)
Every 6-8 seconds	3 (5%)	0 (0%)
10:1	6 (10%)	8 (23%)
30:2	13 (22%)	6 (17%)
6-8/minute	1 (2%)	6 (17%)
10-12/minute	6 (10%)	8 (23%)
AHA Guidelines	1 (2%)	0 (0%)
Not listed	27 (45%)	7 (20%)
*Ventilation rate with advanced airway		
Every 6-8 seconds	32 (53%)	13 (37%)
30:2	6 (10%)	10 (29%)
> every 5 sec	1 (2%)	0 (0%)
10-12/minute	0 (0%)	5 (14%)
AHA Guidelines	1 (2%)	0 (0%)
Not listed	20 (33%)	7 (20%)

Table 4. STEMI data elements present in protocols from EMS agencies

	Rural N (%)	Non-rural N (%)
(listed by decreasing sum of N Rural + N Non-rural)		
*12 lead ECG required	60 (100%)	35 (100%)
*IV established	60 (100%)	35 (100%)
*Nitroglycerin (NTG) administration	60 (100%)	35 (100%)
*Analgesic administration	60 (100%)	35 (100%)
*Aspirin administration (detailed below)	59 (98%)	35 (100%)
*Nitroglycerin BP limit	56 (93%)	35 (100%)
*12 lead ECG interpretation	54 (90%)	35 (100%)
*Nitroglycerin Erectile Dysfunction contraindication	54 (90%)	35 (100%)
*Hospital bypass specified §	46 (77%)	**34 (97%)**
*STEMI notification required	47 (78%)	31 (89%)
*Determination of cardiac chest pain equivalent §	**51 (85%)**	23 (66%)
*EKG transmitted	39 (65%)	18 (51%)
*Oxygen to keep the $SpO_2 \geq 94\%$	32 (53%)	20 (57%)
*12 lead ECG delivered to hospital	28 (47%)	23 (66%)
Upper age limit	25 (42%)	8 (23%)
*Time of onset of symptoms	25 (42%)	8 (23%)
*No NTG if RV MI	16 (27%)	8 (23%)
12 lead ECG acquisition before NTG §	**19 (32%)**	4 (11%)
*Right-sided ECG leads if inferior MI §	**8 (13%)**	0 (0%)
Code 3 Transport required §	1 (2%)	**6 (17%)**
Online Medical Control (OLMC) required	4 (7%)	0 (0%)
*Time of initial 12 lead	1 (2%)	3 (9%)
*Time of EMS on scene §	0 (0%)	**3 (9%)**
Direct transfer to cath lab §	0 (0%)	**3 (9%)**
*Time of STEMI notification	0 (0%)	1 (3%)
*EMS fibrinolytics administration	0 (0%)	0 (0%)

§ Chi-square p-value < 0.05 for Rural vs Non-rural – **larger value**

*Aspirin administration		
162 mg	11 (18%)	3 (9%)
162-324 mg	10 (17%)	4 (11%)
243-324 mg	0 (0%)	1 (3%)
324 mg	35 (58%)	27 (77%)
Amount not specified	3 (5%)	0 (0%)
Not listed	1 (2%)	0 (0%)

*Guideline recommendation[1,5,6]

Table 5. Stroke data elements present in protocols from EMS agencies

	Rural N (%)	Non-rural N (%)
(listed by decreasing sum of N Rural + N Non-rural)		
*Time of onset of symptoms (detailed below)	57 (100%)	35 (100%)
*Hypoglycemia treatment	57 (100%)	34 (97%)
*IV established	55 (97%)	35 (100%)
*Stroke evaluation method (detailed below) §	52 (91%)	**35 (100%)**
*Blood glucose determination (CBG) §	**55 (97%)**	27 (77%)
*Head of bed elevated §	26 (46%)	**32 (91%)**
*Stroke notification required	28 (49%)	20 (57%)
*12 lead ECG	24 (42%)	19 (54%)
*Hospital bypass specified	24 (42%)	18 (51%)
*Oxygen to keep the $SpO_2 \geq 94\%$	21 (37%)	20 (57%)
Code 3 Transport	6 (11%)	**11 (31%)**
*EMS Fibrinolytics	0 (0%)	0 (0%)
Online Medical Control (OLMC) required	0 (0%)	0 (0%)
§ Chi-square p-value < 0.05 for Rural vs Non-rural – **larger value**		
*Time of onset of symptoms (hours since last seen normal)		
2	4 (7%)	0 (0%)
2-3	1 (2%)	0 (0%)
3	17 (30%)	6 (17%)
3.5	2 (4%)	1 (3%)
3.5/6	6 (11%)	4 (11%)
3 if thrombolytic /6 if intravascular intervention	1 (2%)	0 (0%)
4	1 (2%)	6 (17%)
4.5	9 (16%)	9 (26%)
5	0 (0%)	5 (14%)
6	12 (21%)	3 (9%)
Yes	4 (7%)	1 (3%)
Not listed	3 (5%)	0 (0%)
*Stroke evaluation method §		
Cincinnati Prehospital Stroke Scale	16 (28%)	21 (60%)
Cincinnati Prehospital Stroke Scale &/or Los Angeles Prehospital Stroke Screen	1 (2%)	0 (0%)
F.A.S.T. and Cincinnati Prehospital Stroke Scale	1 (2%)	0 (0%)
FAST	15 (26%)	5 (14%)
Facial droop. Arm drift. Abnormal speech with "You can't teach an old dog new tricks".	3 (5%)	0 (0%)
H&P	8 (14%)	0 (0%)
Modified Los Angeles Prehospital Stroke Screen	6 (11%)	9 (26%)
Not listed	8 (14%)	0 (0%)

*Guideline recommendation[1,7,8]

Table 6. Summary of evidence-based guidelines protocol element presence in EMS protocols

	Compliance (%)			
	Rural		Non-rural	
	Mean	Range	Mean	Range
All 3 Systems of Care§	61%	34-76%	**67%**	57-79%
OHCA§	57%	21-79%	**65%**	46-79%
STEMI	63%	40-75%	65%	55-75%
Stroke§	67%	0-100%	**79%**	60-100%

§ t-test $p < 0.05$ for Rural vs Non-rural – **larger value**

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Appendix A – Model Protocols

High Performance CPR - Adult

Ventricular Fibrillation/Pulseless Ventricular Tachycardia (VF/VT)

Cardiac Chest Pain & STEMI

Stroke

CPR - HIGH PERFORMANCE - ADULT

EMR, EMT, AEMT, EMT-I, Paramedic

INDICATIONS:

Any adult patient with cardiac arrest (unresponsive with absent or abnormal respirations) without a POLST Do Not Resuscitate (DNR) order.

PRECAUTIONS:

Do not delay the initiation of chest compressions.

Pulse check should not take more than 5-10 seconds. If definite pulse is not detected, then begin chest compressions.

PROCEDURE

- Manual chest compressions *(intermittent at 30:2 or continuous),* rapid AED/defibrillation analysis, and, if indicated, shock at energy level per manufacturer recommendation
- Chest compressions at 100-120 /minute
- Compression depth of at least 2-2.4" (5-6 cm)
- Rotate chest compressors at least every 2 minutes
- High flow 100% O_2
- Ventilations:
  - Bag-Valve-Mask (BVM) ventilations:
    Intermittent at 30:2 or every 10th continuous chest compression
  - Artificial airway – asynchronous ventilations every 6 seconds
  - Tidal volume just to get visible chest rise
- IV or IO with crystalloid
- $ETCO_2$ monitoring
- Advanced airway insertion with no interruption of chest compressions
- If ROSC (return of spontaneous circulation) occurs12 lead ECG without delay in transport

  Report:Time of cardiac arrest
  - Time of EMS on scene
  - Whether or not bystander CPR was performed
  - Time of EMS to patient
  - Time EMS started CPR
  - Initial cardiac rhythm
  - Time of 1st shock (defibrillation)
  - Time of ROSC

  Notify destination hospital of patient with cardiac arrest and ROSC

  Transport to hospital with appropriate capabilities
- If no ROSC consider TOR (termination of resuscitation) protocol
- Review of CPR quality using defibrillator download

VENTRICULAR FIBRILLATION/ PULSELESS VENTRICULAR TACHYCARDIA (VF/VT)

SUBJECTIVE:

Loss of consciousness.

OBJECTIVE:

Unresponsive and pulseless with absent or abnormal respirations.
AED shows “shockable rhythm”.
Cardiac monitor shows ventricular fibrillation or ventricular tachycardia.

ASSESSMENT:

Ventricular fibrillation or pulseless ventricular tachycardia (VF/VT).

TREATMENT:

EMR:	• High Performance CPR • AED or defibrillator use as soon as available
EMT:	• Supraglottic airway after chest compressions, AED/defibrillator use and IV/IO access with no interruption of CPR
AEMT:	• IV or IO with crystalloid
EMT-I:	• Initial defibrillation with single shock at manfacturer’s recommended energy setting • Epinephrine 1:10,000 1mg IV or IO - repeat every 3-5 minutes • Subsequent defibrillation with single shock at manfacturer’s recommended energy setting • Amiodarone: 1st dose 300 mg or 5 mg/kg; 2nd dose 150 mg/kg • Lidocaine secondary to amiodarone: 1.5 mg/kg
Paramedic:	• Endotracheal intubation if supraglottic airway not placed with no interruption of CPR • Magnesium sulfate - if torsades de pointes

CARDIAC CHEST PAIN

SUBJECTIVE:

Chest or epigastric discomfort lasting minutes to hours – not usually seconds or days

Discomfort may originate, be limited to, or may radiate to neck, jaw, shoulder, inner arm or elbow

May be associated with diaphoresis, nausea, vomiting, SOB , weakness, lightheadedness or palpitations.

May be brought on by exertion, stress or occur spontaneously.

Relieved by rest or nitroglycerine.

May have PMH of bypass surgery, angioplasty, angina, heart attack or myocardial infarction.

Atypical presentations are common and may include no discomfort.

OBJECTIVE:

Examination may be normal. Patient may appear ashen or sweaty. Patient may be hypotensive, bradycardic or have evidence of pulmonary edema (rales). Cardiac rhythm is monitored to detect the occurrence of ventricular or atrial dysrhythmias.

ASSESSMENT:

Diagnosis of cardiac chest pain or heart equivalent discomfort is made on the basis of the patient's history. Other causes of chest discomfort include chest wall trauma, esophageal reflux, gastritis, peptic ulcer disease, pneumonia, pericarditis, pleurisy, pancreatitis, costochondritis, gall bladder disease, aortic dissection, aortic aneurysm, pulmonary embolism and anxiety.

TREATMENT:

EMR:	• 12 lead ECG • Aspirin - *160-325* mg chewed – give even if taking other anticoagulant or "blood thinner" medications • Oxygen only to maintain SpO_2 = 94% or above
EMT:	• May assist with self-administration of patient's own nitroglycerin
AEMT:	• Nitroglycerin - if systolic BP > (*90-100)* mm Hg and no recent erectile dysfunction medication • IV (20 or 18 gauge preferred) with saline lock unless crystalloid or medications indicated
EMT-I:	• Cardiac monitor • Morphine or Fentanyl
Paramedic:	• STEMI protocol - next page

ST ELEVATION MI (STEMI)

SUBJECTIVE:

Heart equivalent chest discomfort AND

OBJECTIVE:

Defibrillator 12 lead ECG meeting one of these 3 criteria:

New LBBB (left bundle branch block,

ST elevation, beginning at the J point:

≥ 1 mm ST elevation in
2 contiguous lateral leads (I, aVL, V_4, V_5 & V_6) OR
2 contiguous inferior leads (II, III, & aVF)

≥ 2 mm ST elevation in two contiguous chest leads (V_1, V_2, & V_3)

OR Automatic ECG interpretation of "STEMI" with paramedic confirmation

If patient had ventricular fibrillation or ventricular tachycardia converted to perfusing rhythm with stable vital signs, then ECG must be at obtained after at least 5 minutes of the converted rhythm.

ASSESSMENT:

Acute myocardial infarction with ST elevation is usually best managed with rapid transport to a hospital offering emergent cardiac catheterization services for diagnosis and treatment.

TREATMENT:

EMR:
EMT:
AEMT: *12 lead ECG transmission to hospital if paramedic not available*
EMT-I

Paramedic:

- Minimize on-scene time and transport the patient with a STEMI to a hospital with cath lab capability.
- Notify the receiving hospital of STEMI patient as soon as possible
- *Right-sided ECG leads if inferior MI*
- *No nitroglycerin (NTG) if right ventricular infarction*
- Leave a copy of the 12 lead ECG at the hospital
- Report:
  Time of onset of symptoms
  Time of EMS on scene
  Time of initial 12 lead ECG
  Time of STEMI identification
  Time of aspirin administration
  Time of cath lab hospital (PCI center) notification

CEREBRAL VASCULAR ACCIDENT (CVA OR STROKE)

SUBJECTIVE:

Sudden onset of focal neurological deficit - commonly unilateral paralysis (extremity or facial weakness typically on one side of the body) or aphasia (absent, abnormal, garbled or slurred speech). Patients with these symptoms of less than *(3, 4.5, 6)* hours duration may be candidates for thrombolytic or other interventional therapy.

Other symptoms of stroke may include disturbances in consciousness, ataxia, visual loss, diplopia (double vision), dysphagia (difficulty swallowing), seizure, coma or death.

These symptoms may be accompanied by nausea, vomiting, or headache.

Risk factors for stroke include prior stroke or TIA, atrial fibrillation, hypertension, angina or heart attack, diabetes, hypercholesterolemia, obesity, smoking history, and illicit drug use (i.e. meth, cocaine, synthetic marijuana).

OBJECTIVE:

Patient assessment should include the evaluation of pupils, speech, language, motor responses and sensations. Limbs should be evaluated for equal strength and motion. Neurological exam findings may change with time. Monitor blood pressure, pulse, respirations, cardiac rhythm and blood sugar.

ASSESSMENT:

Diagnosis of stroke (CVA) is made on the basis of patient history and physical exam. "Stroke mimics" include trauma, hypoglycemia, seizure disorder, psychiatric disorder and drug ingestion.

TREATMENT:

EMR:	• If the patient was last seen normal within the previous *(3, 4.5, 6)* hours, he/she may be a candidate for thrombolytic or other interventional therapy. Reduce scene time, transport to the nearest stroke center and report: *Prehospital stroke assessment tool, such as Cincinnati Prehospital Stroke Scale or Los Angeles Prehospital Stroke Screen.* Specific time (hh:mm) the patient was last seen normal, and the names and phone numbers of any witnesses. • Notification of hospital of stroke patient. • 12 lead ECG - if this does not delay patient care or transport • Oxygen only to maintain SpO_2 above 94% . Elevate head of bed 20-30° if tolerated
EMT:	• Check blood sugar • Oral glucose for hypoglycemia if airway is protected
AEMT:	• IV with saline lock • Glucose IV or pediatric IO for hypoglycemia
EMT-I: **Paramedic:**	• Cardiac monitor • Adult IO