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QUALITY IMPROVEMENT NEWSLETTER

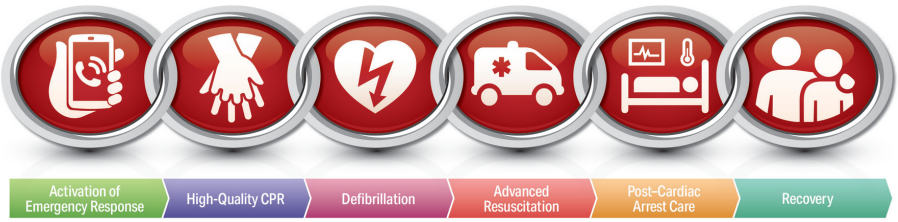
A publication from the Maine EMS Quality Improvement Committee

UNDERSTANDING OUT-OF-HOSPITAL CARDIAC ARRESTS IN MAINE

OVERVIEW

Cardiac arrest events can be some of the most stressful events for the emergency medical services (EMS) system as it requires precision and coordination from all aspects of the response system including, but not limited to, emergency medical dispatchers (EMDs), lay rescuers, first responders, EMS clinicians, emergency department staff, heart catheterization teams, and intensive care teams. This newsletter is intended to explore Maine EMS agencies' and emergency medical dispatch centers' performance in the calendar year 2019.

AHA Out-of-Hospital Cardiac Arrest Chain of Survival*



Source: American Heart Association. Out-of-hospital Chain of Survival. (2020) Accessed on October 27, 2020 from https://cpr.heart.org/en/resuscitation-science/cpr-and-ecc-guidelines
Note (*): This is the revised Out-of-Hospital Chain of Survival published in the 2020 Guidelines for CPR and ECC

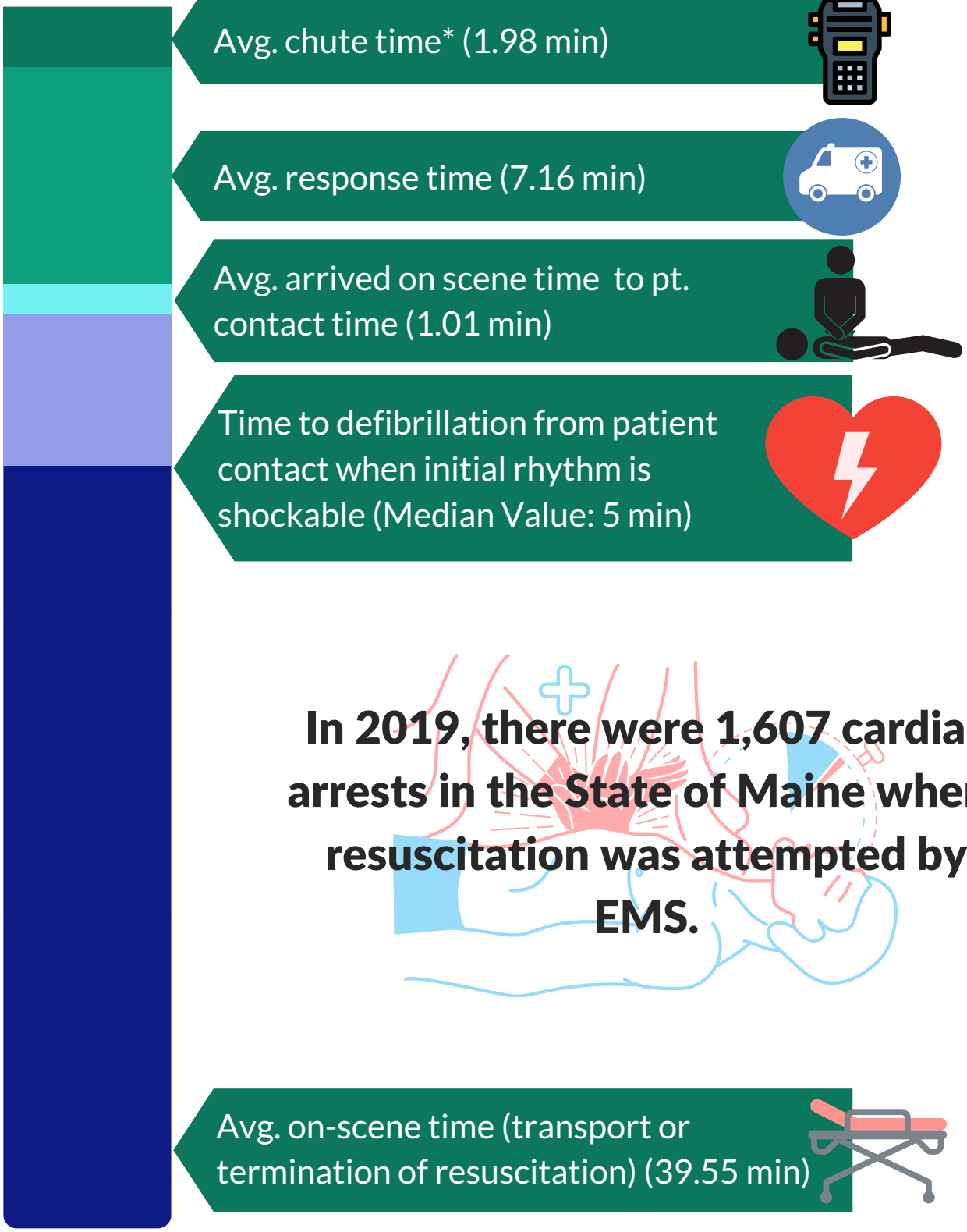
TAKE AWAYS:

- Accurate documentation is vital
  - Recording accurate times for procedures and utilizing tools, such as the monitors, are important to help record interventions during patient care
  - Failure to document a procedure, rhythm change, and/or assessment is often construed as not performed
- It is imperative that clinicians assess Hs and Ts to identify correctable causes of the arrest
- Use of a metronome and/or timer may increase the quality of chest compressions as well as the regular timing of cardiac medications
- Application of end-tidal CO2 can not only monitor for return of spontaneous circulation (ROSC) but it can also serve as a proxy measure for CPR quality

Quality Improvement Leaders should think about:

- What techniques of high-performance CPR can be implemented to help minimize time to first defibrillation?

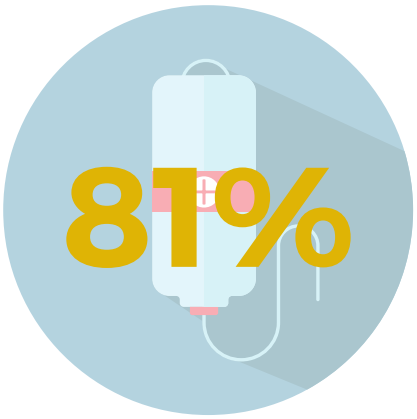
TIMELINE FOR OUT-OF-HOSPITAL CARDIAC ARRESTS INVOLVING EMS WITHIN THE STATE OF MAINE



In 2019, there were 1,607 cardiac arrests in the State of Maine where resuscitation was attempted by EMS.

Note: This diagram represents the average/median times across all of the cardiac arrests reported in the Maine EMS electronic patient reporting system (N=1,607). * Chute time represents the time the unit is dispatched until the time the unit marks themselves en route. More information about each of these measures is covered on the next page (page 3).

Obtaining Vascular Access During a Cardiac Arrest



Of the 1,607 instances of out-of-hospital cardiac arrest, 1,407 were attended by EMS clinicians (AEMT/paramedic) who have vascular access as a skill within their scope of practice.[1] While the benefits of some pharmacological interventions during cardiac arrest are debated, there is value in obtaining vascular access. Certain pharmacological agents may assist with resuscitation, facilitate treatment of the Hs and Ts, and aid in post-ROSC care. In 2019, 81% (1,139) of patients received at least one form of vascular access (peripheral intravenous, interosseous, or external jugular catherization). There were 238 documented unsuccessful attempts.

Intubation Success Rate during Cardiac Arrest

Contemporary cardiac resuscitation guidance has de-emphasized the importance of establishing an advanced airway to prioritize efforts that have been proven to be more effective such as high-quality chest compressions, early defibrillation, and effective ventilations. There were 766 documented instances where an EMS clinician attempted an advanced airway in the presence of a cardiac arrest event. These airways include intubations and blind insertion airway devices (BIADs). Of those attempts, 75% (572) were successful in obtaining a patent airway based on the documentation provided in the electronic patient care report.

Documented Application of Capnography

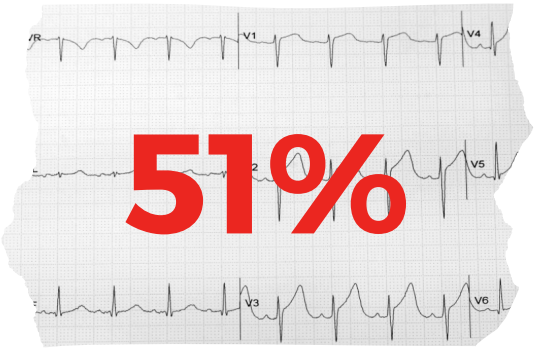
The Maine EMS Protocols strongly encourage the liberal use of in-line capnography during cardiac arrests and other respiratory-related events. For situations where an advanced airway (endotracheal intubation or BIAD) is obtained, capnography is required; however, it is also recommended during prolonged use of bag-valve masks.[2] Continuous capnography waveform and measurement monitoring can provide valuable information throughout a cardiac arrest event including insight into return of spontaneous circulation (ROSC) and re-arrest. In 2019, documentation for 572 patients indicates successful placement of an advanced airway during cardiac arrest, of those, 69% (392) patients have a documented end-tidal CO2 reading.

1. Maine EMS. Prehospital Treatment Protocols: Cardiac Arrest #1 (Red 8). (Dec. 1, 2019). Accessed on October 21, 2020 from https://www.maine.gov/ems/sites/maine.gov.ems/files/inline-files/2019%20Protocols%2009%2019.pdf
2. Maine EMS. Prehospital Treatment Protocols: Airway Algorithm (Blue 3). (Dec. 1, 2019). Accessed on August 18, 2020 from https://www.maine.gov/ems/sites/maine.gov.ems/files/inline-files/2019%20Protocols%2009%2019.pdf

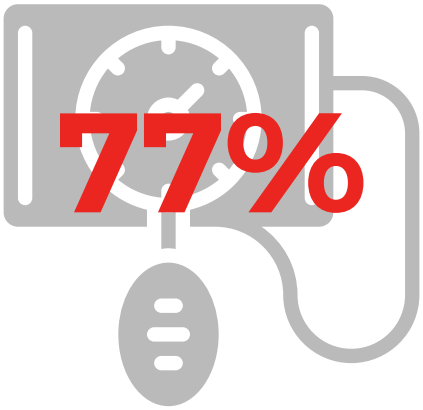
POST-RETURN OF SPONTANEOUS CIRCULATION (ROSC) CARE

12-Lead Capture Post-ROSC

A major part of the treatment pathway for victims of out-of-hospital cardiac arrest is the consideration of "Hs & Ts" or potential causes of the arrest. These include, but are not limited to, hypothermia, hypovolemia, hypoxia, hypo/hyperkalemia, hydrogen ion or acidosis, cardiac tamponade, tension pneumothorax, thromboembolic disease (i.e., pulmonary embolism or myocardial infarction), and toxins.[3] In 2019, there were 358 cases in which ROSC was achieved with an AEMT or paramedic on scene, and of those cases 51% (183) had a 12-lead ECG documented following ROSC.



Maintenance of Systolic Blood Pressures Post-ROSC



In the event of a ROSC, it is imperative that ALS EMS clinicians readily monitor the hemodynamic stability of the patient including, blood pressure. In order to maintain sufficient perfusion to vital organs throughout the body, the Medical Direction and Practices Board has recommended that systolic blood pressures be maintained at or above 100[4] mmHg. Of the 358 cases with ROSC where an AEMT or paramedic was providing clinical care, 77% (277) of patients had a final systolic blood pressure recording of greater than or equal to 100 mmHg. For the remaining 23% (81) of cases, it is important to consider fluid challenges and NOREPInephrine as interventions to assist with blood pressure management.

TERMINATION OF RESUSCITATION EFFORTS

Compliance with Minimum Resuscitation Times

The Maine EMS Prehospital Treatment Protocols indicate when resuscitation efforts may be terminated. The sentiment maintained by the Medical Direction and Practices Board regarding which treatment pathway to pursue is to "Treat the rhythm in front of you." When treating a patient in cardiac arrest, the duration of the resuscitation is based on the current cardiac rhythm that the patient is experiencing. The 2019 data suggests that Maine EMS clinicians resuscitated patients presenting in asystole, or the AED recommends no shock advised, for approximately 30 minutes on average. In cases of pulseless ventricular tachycardia and ventricular fibrillation, those patients are reportedly only resuscitated for 35 minutes on average. This may be appropriate in the case of changes in rhythm; however, it highlights the importance of documenting rhythm changes.

3. Maine EMS. Prehospital Treatment Protocols: Cardiac Arrest Overview (Red 7). (Dec. 1, 2019). Accessed on August 18, 2020 from https://www.maine.gov/ems/sites/maine.gov.ems/files/inline-files/2019%20Protocols%2009%2019.pdf
4. Maine EMS. Prehospital Treatment Protocols: Adult Post-Resuscitation Care (Red 15). (Dec. 1, 2019). Accessed on October 20, 2020 from https://www.maine.gov/ems/sites/maine.gov.ems/files/inline-files/2019%20Protocols%2009%2019.pdf

THOUGHTS ON IMPROVING OUTCOMES

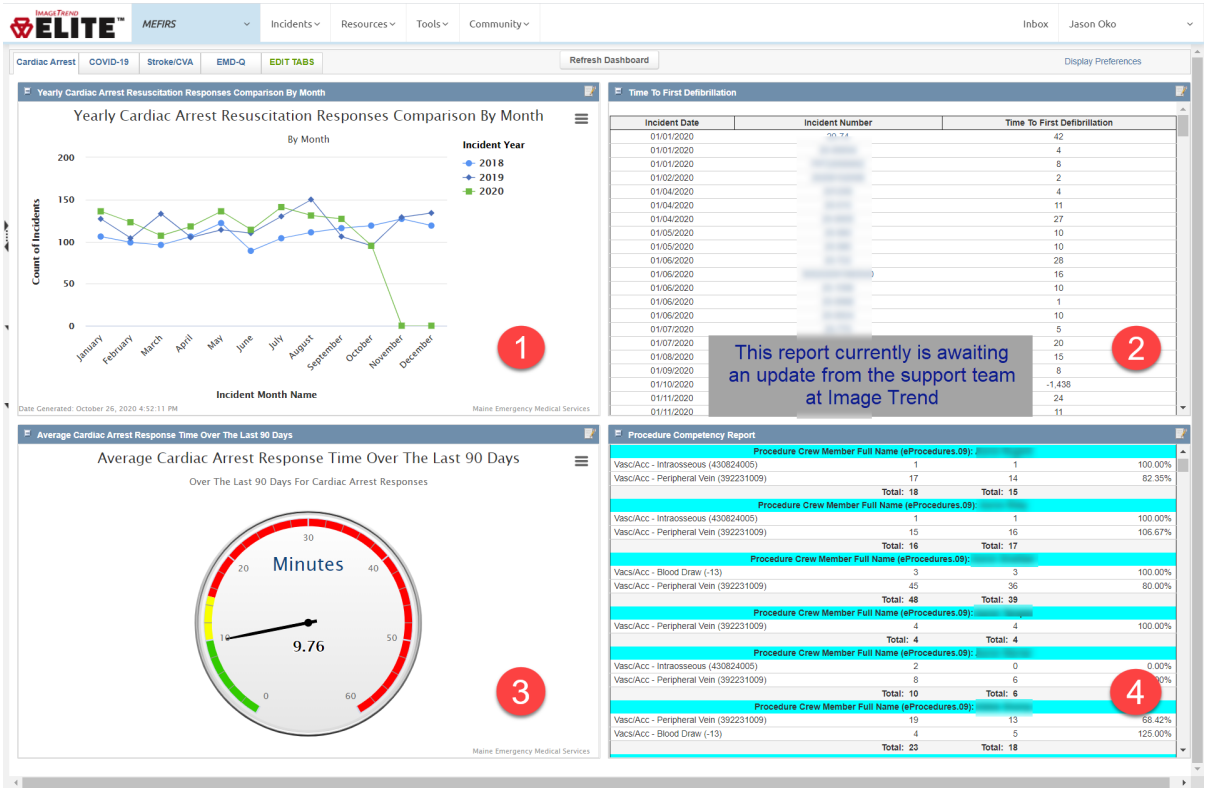
- EMDs: Consider using the ECHO fast-track to expedite delivery of CPR instructions.
- During the COVID-19 pandemic, it is important for EMS clinicians and others involved with the resuscitation efforts, to wear all of the appropriate personal protective equipment (PPE) as recommended by the protocols. The safety and well-being of the responders is a critical part of the response and has been added to the 2020 AHA update to the Chain of Survival.
- Early notification of the receiving facility if transporting the patient to an emergency department.
- Debriefing cardiac arrest events with all persons involved to identify lessons learned and opportunities for improvement.
- Support CQI efforts to improve consistency and effectiveness of cardiac arrest documentation.
- Consider training opportunities regarding team-based high-performance CPR, medication pumps, mechanical CPR devices, and other equipment utilized during an arrest.

HOW TO SEE YOUR OWN DATA ON OUR NEW CARDIAC ARREST DASHBOARD

The Cardiac Arrest Dashboard provides a look at your agency's data in four different reports.

- Report 1 looks at the number of responses to cardiac arrest incidents where a resuscitation was attempted, and the arrest was not traumatic in its etiology.
- Report 2 reports your time from initial CPR to the time the first defibrillation was given, when a defibrillation was given. *This report only reports up to July 12, 2020, Image Trend is reviewing the error.*
- Report 3 returns your average response time to cardiac arrest incidents over the last 90 days.
- Report 4 is a procedure competency report for the last 90 days for your agency's clinicians.

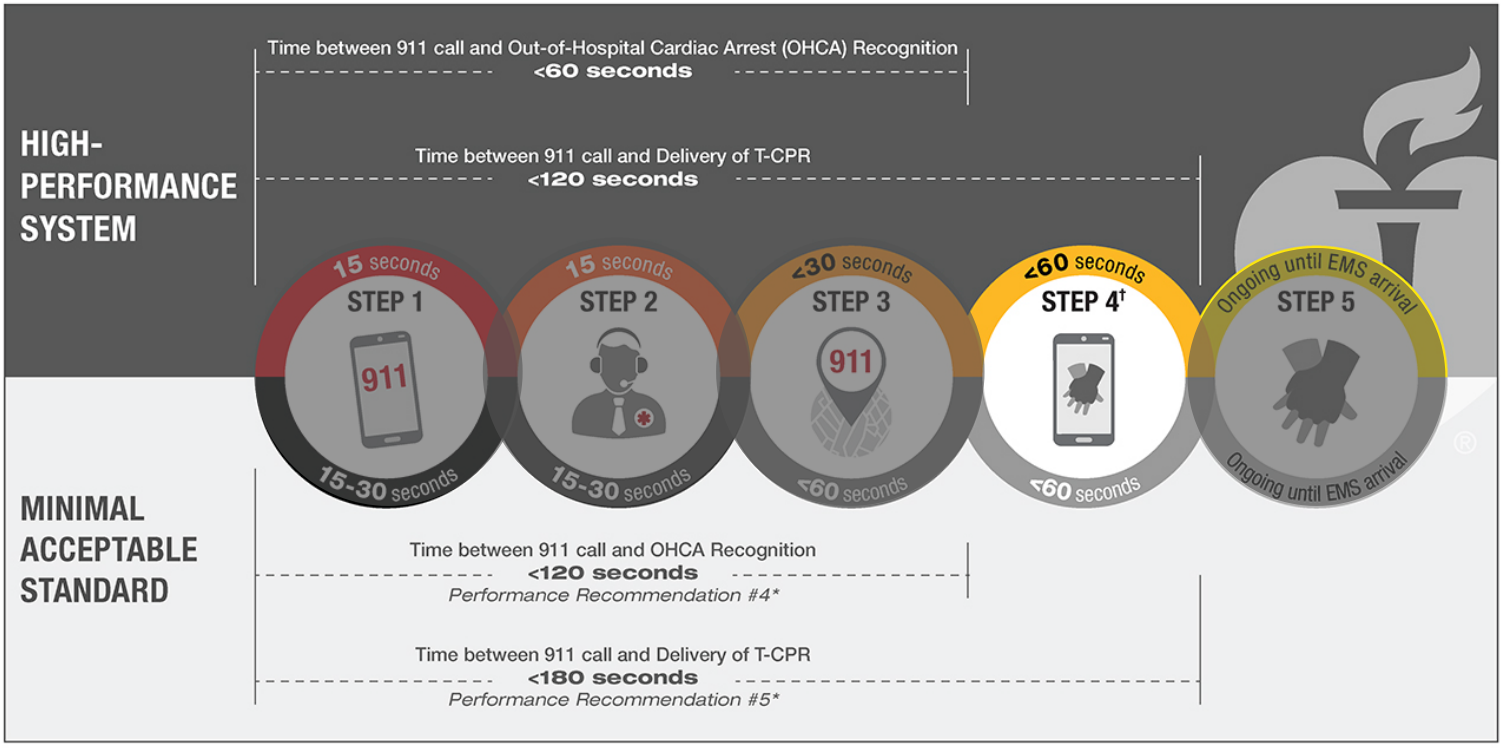
This report is available in Report Writer, by going to *Tools*, *Report Writer*, and selecting, *Load Dashboard*



THE CRITICAL ROLE OF EMERGENCY MEDICAL DISPATCHERS (EMD)

Equally important to the care on scene provided by EMS clinicians, it is imperative that we also understand the vital role of the emergency medical dispatchers (EMD) who are dispatching first responders to the emergency and providing life-saving, step-by-step instructions on how to conduct chest compressions. The American Heart Association (AHA) and Maine EMS believe that EMD professionals are integral to providing high-quality medical responses throughout the state and function as a key component of a high-performance EMS system. The AHA has established the following standards regarding telephone CPR (T-CPR) (see figure below). Due to limitations of our current system with data reporting, we are not able to easily compile the measures involving Steps 1-3 (shaded); however, we are able to report out on measures related to Step 4 in the process which can be found on the next page (Page 7).

Telephone CPR (T-CPR) Time Interval Standards



STEP 1
911 call connects to Primary Public Safety Answering Point (PSAP)

STEP 2
Primary PSAP connects to Emergency Medical Dispatch (EMD) PSAP

STEP 3
Address acquisition

STEP 4†
Recognition of OHCA
1. Call taker verbally recognizes OHCA
2. Instructions started for T-CPR

STEP 5
Delivery of first T-CPR compression and continued T-CPR support

*These recommended performance intervals should be as short as possible as described in the "High-Performance System" #'s provided are minimal acceptable performance

†As soon as a medical emergency is recognized, dispatch of the 1st due EMS response should occur in parallel with other EMD processes and within 30 seconds of address acquisition.

Source: American Heart Association. Telephone CPR (T-CPR) Program Recommendations and Performance Measures. (n.d.) Accessed on August 18, 2020 from https://cpr.heart.org/AHAECC/CPRAndECC/ResuscitationScience/UCM_477526_Telephone-CPR-T-CPR-Program-Recommendations-and-Performance-Measures.jsp

EMD: RECOGNIZING AN ARREST AND GIVING INSTRUCTIONS

One of the most important responsibilities of call takers and emergency medical dispatchers to perform during a call is to assess the patient or caller's problem and to determine the primary "card" or chief complaint algorithm that they are going to use. This is determined by asking a series of defined questions that direct the dispatcher as to the next steps to take with the caller. Once it is identified that the individual in question is likely suffering from cardiac arrest, they direct the caller to position the patient in a manner that enables high-quality chest compressions, and they provide instructions on placing the caller or another bystander's hands on the patient's chest to deliver compressions. The time period that is elapsed from the moment the dispatcher initiates questions regarding the patient's condition to the time that there are hands on the patient's chest are captured in Step 4 (see diagram on previous page). In the State of Maine, the current average median time for all 29 dispatch centers is 106 seconds compared to the AHA standard of 60 seconds.

Notes on the Data:

The data included in this report is retrospective and originates from the 277 EMS agencies and the approximately 5,600 EMS providers in the state of Maine who provide data to the EMS Run Reporting system.

Maine EMS QA/QI Committee

For more information on continuous quality improvement (CQI) and the tools within MEFIRS, feel free to attend a Maine EMS QA/QI Committee Meeting which are held on the third Wednesday of every month at 1:30 P.M. Meetings are held at the Maine EMS Office located at 45 Commerce Drive; Augusta, Maine 04333 as well as virtually.

The Maine EMS Quality Improvement Committee is a standing committee of the Maine EMS Board and is comprised of 15 members representing the medical director's community, regions, EMS agencies, and at-large representatives. The Committee is focused on continuous quality improvement of the EMS system. As part of their charge, they review statewide, de-identified information to better understand a variety of topics affecting EMS including, but not limited to: naloxone administration, strokes, out-of-hospital cardiac arrest, airway management, and chest pain.

Disclaimer: The purpose of this newsletter is informational only and is not intended to be a comprehensive review of the entire EMS system, nor is it intended to be a scientific review. Rather, this is intended to offer a snapshot of the performance surrounding specific EMS run types.