Carroll County Department of Fire & EMS
Standard Operating Procedure

DOCUMENT DETAILS

Standard Operating Procedure: 3.39	**Effective Date: November 19, 2025**
Subject: Point of Care Ultrasound	**Section: Emergency Medical Services**
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Applicability: **[X] Volunteer** **[X] Career**

I. PURPOSE

The Carroll County Department of Fire and EMS (CCDFEMS) has chosen to add prehospital ultrasound capabilities to the EMS chase vehicles and shift commander's vehicle to further enhance the level of care that the department is able to provide. Ultrasound will be used for cardiac arrest patients to assess for carotid blood flow and/or cardiac standstill, as well as initiation of ultrasound guided IV access when appropriate. This policy serves as a jurisdictional guideline and does not supersede the Maryland Medical Protocols for Emergency Medical Services.

II. DEFINITIONS

Cardiac activity – The mechanical activity of the heart responsible for the movement of blood through the body driven by electrical activity.

Cardiac standstill – A complete cessation of mechanical cardiac activity.

Butterfly iQ App – An app downloaded to various county devices used to connect to butterfly ultrasound probes.

Ultrasound probe – A device that sends waves into the body and creates images based on echoes from those sound waves.

Ultrasound get – A gel placed between the ultrasound probe and the patient used to transmit ultrasound waves into the body producing a clear image.

Color doppler – A setting used with ultrasound imaging that highlights detected blood flow in either red or blue depending on the direction of the blood flow in relation to the ultrasound probe.

Pseudo-PEA – A phenomena in which a patient has organized cardiac activity that flows blood out from the heart but generates a blood pressure to low to produce a palpable pulse.

III. PROCEDURES

A. Cardiac standstill assessment

1. Important considerations

a. Evaluation of cardiac activity to identify the presence of cardiac activity or to identify cardiac standstill will not take precedence over any other treatments or assessments and should only be used as an additional tool for clinicians to make an informed decision on whether termination of resuscitation in the field is appropriate.

b. Clinicians shall always follow the Maryland Medical Protocols for Emergency Medical Services regarding the termination of resuscitation (protocol 3.6-A) – for patients not meeting criteria for the clinician to terminate resuscitation in the field, cardiac standstill upon ultrasound evaluation may be referenced during consult with a physician when requesting orders for termination of resuscitation in the field.

2. Patient eligibility

a. Adult patients in cardiac arrest who have received all appropriate interventions and are being considered for termination of resuscitation.

3. Procedure

a. Prepare the ultrasound device by opening the Butterfly iQ app, logging into the app, and connecting the ultrasound probe to the charging port of the device.

b. Ensure that the preset is set to “cardiac” within the app. Among the “cardiac” preset there are 3 additional modes. These are standard, deep, and coherence. Standard mode is applicable for most patients of average size. Deep mode may be used for a patient with excessive adipose tissue who is physically larger in size and where the heart is deeper within their anatomy. Coherence mode does not necessarily apply to evaluation of cardiac standstill.

c. Subxiphoid view

i. The subxiphoid view is the most beneficial view for use in patients with a LUCAS device applied.

ii. Apply the ultrasound probe inferior to the patient's xiphoid process while CPR is ongoing and during the cycle of CPR immediately prior to the pulse check. It is during the pulse check when cardiac activity will be evaluated.

iii. With CPR ongoing, place the ultrasound probe on the patient's epigastrium inferior to the xiphoid process and angle it upward toward the heart.

The blue directional indicator on the probes should face the patient's left side.

iv. During CPR it may be difficult to locate anatomical structures, however the clinician should observe for the anechoic (appearing black) chambers of the heart. While anatomical structures may not be clearly observed during CPR, it is important to have the ultrasound probe ready in the correct position prior to pausing CPR. This assures CPR is resumed quickly upon the discovery of cardiac activity.

v. Upon pausing CPR and obtaining a view of the heart, press the record button to capture a short video (at least 6 seconds) of the view obtained.

d. Parasternal long axis view

i. The parasternal long axis view is beneficial in patients who do not have a LUCAS device applied, or in cases where the subxiphoid view is unsuccessful.

ii. Apply ultrasound gel to the left of the patient's sternum at the height of the nipple line following the pause in CPR compressions.

iii. Place the ultrasound probe at an approximate 30-degree angle to the sternum and observe for the anechoic chambers of the heart – the probe may need to be adjusted to the rib space above or below where the probe was initially placed.

iv. Upon pausing CPR and obtaining a view of the heart, press the record button to capture a short video (at least 6 seconds) of the view obtained.

e. Incorporate all assessment findings obtained from ultrasound imaging into your clinical decision making. Patients that do not meet criteria for termination of resuscitation as set forth by the Maryland Medical Protocols for Emergency Medical Services will communicate to the on-line physician the results of ultrasound evaluation when requesting orders for termination of resuscitation in the field.

4. Documentation

a. When a recording is captured within the app, the blue box in the corner of the screen will populate displaying the number of recordings. Click on this box to bring up the option to save a new study.

b. Complete the patient details tab and include as much information as possible. The patient's ID will be documented as the incident number.
c. Press "save study" at the bottom of the screen when finished.

B. Carotid blood flow assessment

1. Important considerations

a. Evaluation of carotid blood flow shall not take precedence over other indicated assessments or treatments and should be used as an additional tool to assist clinicians in making an informed decision regarding the treatment plan for patients in Pulseless Electrical Activity (PEA) cardiac arrest.
b. Clinicians shall refer to and follow the Maryland Medical Protocol for Emergency Medical Services regarding assessment and treatment of cardiac arrest (protocol 3.4-A). All assessments and treatments within the protocol will take precedence over the ultrasound assessment of carotid blood flow.

2. Patient eligibility

a. Adult cardiac arrest patients who remain in PEA following the administration of 3 doses of epinephrine (preferably, perform carotid ultrasound after the round of CPR between the 3rd and 4th dose of epinephrine).

3. Procedure

a. Prepare ultrasound device by opening the Butterfly iQ app, logging into the app, and connecting the ultrasound probe to the charging port of the device.
b. Ensure that the preset is set to "vascular: carotid" mode under the action's menu at the bottom of the screen, select color doppler.
c. A box will appear on the screen. **Note**: ***Blood flow within the box will be identifiable as blue if the blood flow is away from the probe and red if the blood flow is toward the probe. The presence of any color is important, regardless of whether it is blue or red.***
d. Apply ultrasound gel to the ultrasound probe prior to the scheduled pulse check.
e. Just prior to pausing CPR, place the ultrasound probe on the patient's neck in the same anatomical location where a carotid pulse assessment would be obtained. **Note**: ***It is important that the internal jugular vein is not misidentified as the carotid artery. The internal jugular vein is typically larger and more superficial to the carotid artery. The internal jugular vein may not be appreciable depending on the patient's fluid status and blood pressure. Excessive pressure applied with the ultrasound probe may collapse the internal jugular vein causing it to disappear from view.*** Once the carotid artery has been located and identified, ensure that the structure is visible within the box on the screen to conduct the blood flow assessment.

f. During the pulse check, record a short video (at least 6 seconds) of the view obtained. If the ultrasound probe is directly perpendicular to the vasculature, blood flow may be unidentifiable even if it is present. Angle the ultrasound probe approximately 15 degrees and fan left and right to ensure no blood flow is present. During the assessment a second clinician should assess for the presence of a femoral pulse simultaneously.
g. If blood flow is observed to be present, the patient is experiencing "pseudo-PEA." In "pseudo-PEA the patient has organized cardiac activity, however in this state the patients' blood pressure is too low to produce a palpable pulse. During "pseudo-PEA" follow the steps below.
    i. Continue chest compressions until the patient regains a palpable pulse.
    ii. Consider early transport to a cardiac interventional center
    iii. Consider aggressive treatment of profound hypotension including additional IV fluid boluses, and the use of appropriate pressors such as epinephrine.
        1) For witnessed PEA in the trauma arrest patient with less than 5 minutes of down time, consider whole blood administration

4. Documentation

a. When a recording is captured within the app, the blue box in the corner of the screen will populate displaying the number of recordings. Click on this box to bring up the option to save a new study.
b. Complete the patients' details tab and include as much information as possible. The patient ID will be documented as the incident number.
c. Press "save study" at the bottom of the screen when finished.

C. <u>IV access</u>

1. Important considerations

a. Ultrasound guided IV access will not take precedence over other treatments or assessments and should be used as an additional tool to aid clinicians in obtaining vascular access.

2. Patient eligibility

a. Adult patients that meet the following criteria:
    i. Clinical benefit exists from peripheral IV access in the field
    ii. All traditional methods of peripheral IV access have failed.
    iii. Clinical judgement that the patient is not a current IO access candidate.
    iv. The patient does not immediately require emergent medication administration (If the patient requires immediate medication, fluid or blood administration IO access is much faster and therefore a more appropriate option).

3. Procedure

a. Prepare ultrasound device by opening the Butterfly iQ app, logging into the app, and connecting the ultrasound probe to the charging port of the device.

b. Ensure that the preset is set to “vascular: access” mode.
c. Select and prepare the patient’s upper extremity in the same manner used for traditional peripheral IV access.
d. Prepare the ultrasound probe by placing a small amount of gel on the working end of the probe. Affix a Tegaderm tightly over the end of the probe containing the gel. a Tegaderm to one side of the working end of the ultrasound probe, place gel on the ultrasound probe, and then place the Tegaderm tightly over the end of the ultrasound. Try to work any bubbles out before sealing the Tegaderm to the ultrasound probe completely. The purpose of the Tegaderm is to prevent infections as a complication of venous cannulation.
e. Place additional ultrasound gel on the patients selected arm in the area that the cannulation to be performed.
f. Using the ultrasound probe search for a suitable vein using the short axis view. Acceptable veins for cannulation should not exceed a depth of 2 cm and should be large enough to accept the IV catheter. The vein should be straight **Note:** ***This can be identified by sliding the ultrasound probe proximally and distally. If during this movement the vein remains in view in the center of the screen, it is straight.*** After appropriate identification and selection of an acceptable vein. begin recording the procedure using the record button on the app.
g. Using the short axis view, align the desired vein in the center of the screen and insert the needle into the skin. While the needle is still shallow, identify it on the ultrasound view as a bright circular mark. The visual point that this mark first comes into view is the anatomical location of the needle tip.
h. Advance the needle forward and toward the vein keeping the tip of the needle in view of the ultrasound. Carefully advance the needle into the vein and advance approximately 1 cm more seating the catheter. Stop the recording once the IV catheter is placed.
i. Secure the IV catheter in the same manner as used for all peripheral IV’s.

4. Documentation

a. When a recording is captured within the app, the blue box in the corner of the screen will populate displaying the number of recordings. Click on this box to bring up the option to save a new study.
b. Complete the patient details tab and include as much information as possible. The patient ID will be documented as the incident number.
c. Press “save study” at the bottom of the screen when finished.

D. <u>Quality Assurance</u>

1. Notification and review

a. The field use of the ultrasound device requires notification to the Assistant Chief of EMS and the Medical Director. Notification of use should be made via secure departmental email and include the date, time unit, incident number, type of use and initials of the patient.
b. Every use of the ultrasound will be reviewed and appropriate feedback provided.
c. Ultrasound Images and videos will be stored and viewed via the Butterfly iQ software. All images and videos will be used for QA/QI purposes.

IV. RECISION

This Standard Operating Procedure rescinds all directives regarding Point of Care Ultrasound content or similar content previously issued for personnel of the Carroll County Department of Fire & EMS.

V. RELATED STANDARD OPERATING PROCEDURES / DOCUMENTS

N/A

VI. ATTACHMENTS

N/A