Part 6

ACLS Lesson Plans

Precourse Preparation

Instructor Tips

- The time you invest in preparation is important. Prepare well, and anticipate questions and challenges.
- Anticipate what could happen, and have a plan for possible challenges such as
  - Instructor does not arrive
  - Equipment fails or malfunctions
  - Batteries are dead (bring extras)

30 to 60 Days Before Class

- Determine course specifics:
  - Target audience
  - Number of students
  - Special needs or equipment
- Review and reserve ACLS equipment.
- Schedule the room(s) as soon as dates are determined.
- Schedule additional instructors, if needed (Table 1 in the lesson plans).

Table 1. Class Size and Student-to-Instructor Ratios for Course Activities

Activity	Recommended size or ratio
Large-group interactions	The size of the group is limited by the size of the room and the number of video monitors or projection screens.
Learning stations and High-Performance Teams: Megacode Testing	6:1 up to a maximum of 8:1 The student-to-instructor ratio should be 6 students to 1 learning station, with 1 instructor for each station. In some cases, a maximum of 8 students to 1 instructor to 1 learning station may be used. To conduct the case with ACLS interventions, the minimum number of students per instructor is 3.

Optional

Instructors or International Training Centers may consider offering an ACLS preparation course days or weeks before the ACLS Course to ensure that students understand

- ECGs (rhythm analysis)
- Pharmacology
- Airway management
- BLS skills

At Least 3 Weeks Before Class

- Confirm room reservations and setups.
- Send students a precourse letter with student materials.
- Ensure that students understand that precourse preparation is necessary for successful participation in the ACLS Course.
- Provide students information on the precourse self-assessment and video prework.
- Confirm additional instructors.
- Research local treatment protocols and prepare for discussion.

Day Before Class

- Set up the room.
- Coordinate the plan with additional instructors, if needed for class size.
- Use the Equipment List (found in Part 2 of this manual) as a checklist to ensure that all equipment is available and tested for operation (including feedback devices and their accessory devices, such as tablet computers and smartphones).
- Have extra batteries on hand for equipment.
- Check with your International Training Center Coordinator to determine any International Training Center-specific paperwork needed.
- Ensure that all course paperwork is in order, such as
  - ACLS Course roster
  - Testing checklists
  - Learning station checklists

Day of Class

- Make sure all equipment is working.
- Greet students as they arrive to help make them feel at ease.
- Have students fill out the course roster. Rosters may vary between International Training Centers; refer to Atlas (**Atlas.heart.org**). Required: Make sure all students have passed the ACLS Precourse Self-Assessment and have completed all of the ACLS video prework (depending on the agenda chosen) before entering the class.

Equipment List

Refer to Table 7 in the *ACLS Instructor Manual* for a list of the equipment and supplies needed to conduct this course. This includes a code cart for in-hospital health care professionals and a jump kit and defibrillator unit for prehospital health care professionals. The code cart or jump kit must contain the equipment and supplies listed in Table 7.

Lesson START
Welcome, Introductions, and Course Administration 15 minutes

Instructor Tips

- Knowing what you want to communicate, why it's important, and what you want to have happen as a result is critical to the success of your presentation.
- Be flexible: Be ready to adjust your lesson plan to students' needs and focus on what seems to be more productive rather than sticking to your original plan.
- Introductions: Use a visual aid (flip chart, whiteboard) to display introduction requirements (name, occupation, specialty, place of practice).

Discussion

In a large group, with all students, do the following:

- Introduce yourself and additional instructors, if needed.
- Invite students to introduce themselves and ask them to provide the following information:
  - Name
  - Occupation
  - Specialty
  - Place of practice
- As students are introducing themselves, document their occupation, specialty, etc. This information will help instructors tailor future case scenarios and lessons.
- Explain that the course is interactive and hands-on:
  - Use of the provider manual, learning station checklists
  - Skills testing checklists
  - Hands-on learning stations
- Explain the use of feedback devices (audiovisual) during the learning and testing stations with cardiac arrest or respiratory arrest. Also explain how timing is a critical component of the learning and testing stations.
- Explain that parts of the course are somewhat physically strenuous.
  - For example, Lesson 3 involves adult CPR, which will require students to perform 1 minute of compressions, which could be physically strenuous.
- Ask that anyone with a medical concern, such as knee or back problems, speak with one of the instructors.
- Explain the layout of the building, including bathrooms and fire exits.
- Advise students where an AED can be found in the building.
- Tell students to silence their cell phones.
- Tell students that if they need to answer a call, they should leave the classroom before doing so.
- Tell the students, "We are scheduled to end at _____."

Lesson 1
ACLS Course Overview, Organization, and the Science of Resuscitation

25 minutes

Instructor Tips

- Make sure to emphasize critical aspects of the course, such as the course agenda, design, and completion requirements.
- Breaks: Think about how you want to manage breaks during this course. Making yourself available allows you to answer questions people might feel too embarrassed to ask in front of others. It also gives you time to create rapport and get feedback.
- In these lesson plans, items that are in boldface have greater importance.
- Transitional language: After showing a video, be sure to provide language that helps students with the transition back to teaching, such as a recap of what the video covered and what is next.
- When reviewing the material presented in a video with students, ask leading questions to help facilitate discussion; avoid lecturing.

Discussion

In a large group, with all students, do the following:

- Present the course overview.
- Discuss the course agenda, design, and course completion requirements.
- Be certain that students understand major course concepts:
  - Importance of early high-quality CPR and early defibrillation to patient survival
  - Integration of effective BLS with ACLS interventions
  - The clinical signs of patient deterioration (preventing arrest)
  - The functioning of high-performance teams relative to patient survival
    - Timing, quality, coordination, and administration
- Discuss the importance of effective team interaction and communication during a resuscitation attempt.
- Explain the learning stations and rotations through the stations.
- Answer students' questions.
- Assign students to small groups for learning stations.
  - Limit the number of students to 6 (maximum of 8 per group).
- Tell students that they will be using their provider manuals throughout the course.

- Explain the course completion requirements, including the mandatory use of an audiovisual feedback device for all CPR practice and testing and mandatory measurement of CCF for the cardiac arrest and Megacode Practice and Megacode Testing Stations. Students must
  - Pass the Adult High-Quality BLS Skills Test
  - Pass the Airway Management Skills Test
  - Demonstrate competency in learning station skills
  - Pass the Megacode Test (team)
  - Pass the open-resource exam with a minimum score of 84% (does not apply to HeartCode students)

You should issue a course completion card immediately after a student successfully completes the course but no later than 30 days after class.

Lesson Note

If you are leading a HeartCode ACLS Hands-On Skills Session, skip ahead to the next lesson in the agenda.

Play Science of Resuscitation Video

- Address what students will learn from the video.
- Play the video.

Discussion

- Discuss high-quality BLS and feedback devices.
- Answer students' questions.
- Review/summarize key points.

Lesson 2
2A: Learning/Testing Station: High-Quality BLS Practice

45 minutes

Learning Objective

- Perform prompt, high-quality BLS, including prioritizing early chest compressions, ventilation, and integrating early AED use

Instructor Tips

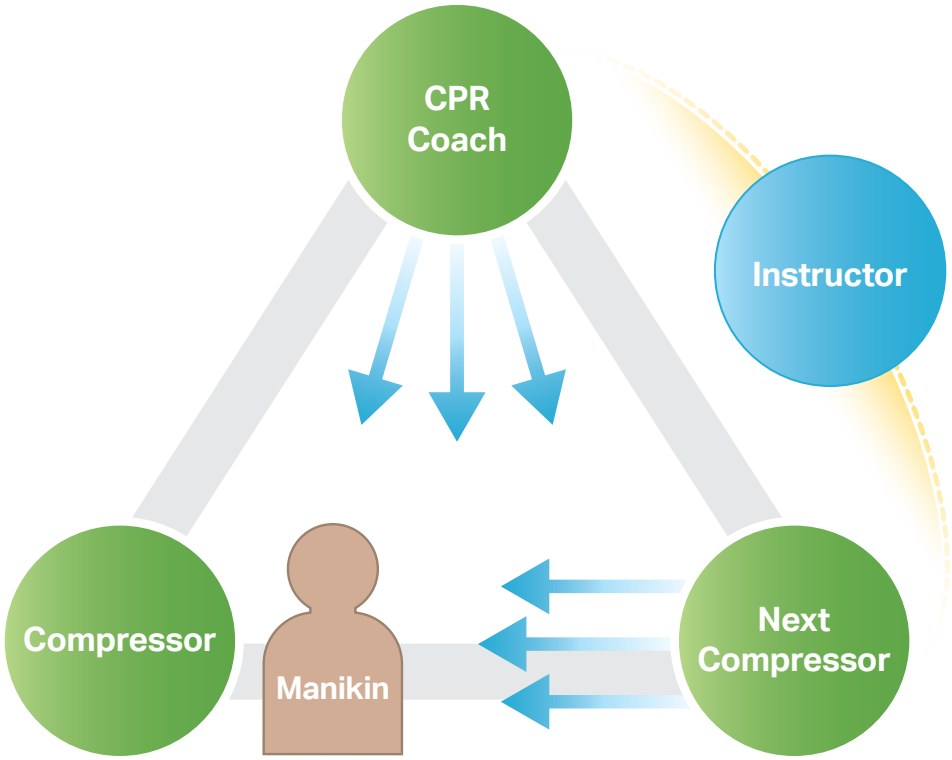
- Students should rotate through the skills station (2 different practice sessions).
- Tell students that the skills testing portion will happen immediately after this lesson.
- Monitor the rate and depth of chest compressions with a real-time audiovisual feedback device. If possible, monitor chest recoil as well.
- The students should correct their own chest compressions in response to real-time output from the feedback device.
- Use peer coaching to help with feedback and to allow students to feel comfortable correcting others.
- This lesson focuses on continuous compressions and AED use along with feedback from the CPR Coach and the feedback device. The Airway Management lesson will focus on ventilation.

Students Practice Session 1: Compressions

Arrange students in groups with manikins (Figure 1 in the lesson plans).

- 3 or fewer students per manikin
- 1 instructor per 2 manikins

Figure 1. Positions for the High-Quality BLS Learning Station with a CPR Coach.



- Students rotate through continuous compressions practice for 1 minute on a manikin, adjusting their performance according to the real-time response of the feedback device and the CPR Coach (Table 2 in the lesson plans).
  - Owing to the total number of chest compressions that each student will have to perform throughout the entire course, we have adjusted the continuous compressions section of the High-Quality BLS Learning and Testing Stations to **1 minute per student**. This will still allow instructors enough time to evaluate rate, depth, and recoil. Please note this a training change and *not* a science change.
- Target CPR performance metrics include the following:
  - Push hard: Compression depth of at least 5 cm in adults
  - Push fast: Compression rate of 100 to 120/min
  - Allow complete chest recoil after each compression
  - Hand placement should be on the center of the chest, on the lower half of the sternum
- Monitor the rate and depth of chest compressions with an audiovisual feedback device. If possible, monitor chest recoil as well.
- Have peers coach other students on the basis of data from the feedback device.
- Give feedback during practice to both the Compressor and the CPR Coach.

Table 2. Student Rotations for CPR Coaches and Compressors During Session 1

Round 1	Round 2	Round 3
Student 1: Compressor	Student 1: CPR Coach	Student 1: Next Compressor
Student 2: Next Compressor	Student 2: Compressor	Student 2: CPR Coach
Student 3: CPR Coach	Student 3: Next Compressor	Student 3: Compressor

Students Practice Session 2: 2-Rescuer BLS

- Assign student numbers.
- Practice session (small groups around a manikin): Practice the 1- and 2-rescuer sequences according to the skills testing checklist.
- Have the skills testing checklist available (in the *ACLS Provider Manual*, handout, etc).
- Use Table 3 in the lesson plans to assign students for 2-rescuer practice.

Table 3. Student Rotations for 2-Rescuer Practice During Session 2

Person assessing and compressing	Person with AED	CPR Coach
Student 1	Student 2	Student 3
Student 2	Student 3	Student 1
Student 3	Student 1	Student 2

Lesson 2
2B: Learning/Testing Station: High-Quality BLS Testing—Testing Details

Instructor Tips

- Make sure you are familiar with how to use the skills testing checklist (refer to Part 4: Testing in the instructor manual for information on how to use skills testing checklists).
- Complete a skills testing checklist for each student during this portion of the lesson.
- Use an audiovisual feedback device to provide real-time feedback on compression quality.
- This testing station is run exactly the same as the Students Practice Session 2: 2-Rescuer BLS section in Lesson 2A.

Test Each Student Individually (2-Person Team Needed)

- Tell students who are not being tested to practice on another manikin.
- Test each student in a reasonably private environment.
  - Each student must demonstrate the entire sequence of 2-rescuer BLS without instructor prompting.
- Fill out an Adult High-Quality BLS Skills Testing Checklist for each student.
- Carefully observe the student you are testing (2 students [in a 2-person team] are necessary to run the skills test, but only 1 student is tested at a time).
  - Monitor the rate and depth of chest compressions with an audiovisual feedback device. If your feedback device provides the necessary data, monitor chest recoil as well.
- If a student is unsuccessful, refer them for immediate remediation.
  - Each student may retest 1 additional time during this station.
  - A student who remains unsuccessful may require additional remediation (refer to the Exam and Remediation sections in Part 1 of the instructor manual).

Lesson 3
3A: Learning/Testing Station: Airway Management Practice

45 minutes

Learning Objectives

- Recognize respiratory arrest
- Perform early management of respiratory arrest

Instructor Tips

- Use a phone, stopwatch, or feedback device to make sure students are ventilating at appropriate rates and volumes.
- High-quality chest compressions and defibrillation are the highest priorities. As soon as enough personnel are available, initiate ventilation and oxygenation to support the resuscitation.
- Make sure students are not ventilating too quickly or forcefully (correct rate and volume: about one-third-a-bag to one-half-a-bag squeeze over 1 second).
- Health care professionals often deliver excessive ventilation during CPR, particularly when an advanced airway is in place. Excessive ventilation is harmful because it
  - Increases intrathoracic pressure and impedes venous return and, therefore, decreases cardiac output, cerebral blood flow, and coronary perfusion
  - Causes air trapping, leading to increased end-expiratory lung volume
  - Increases the risk of regurgitation and aspiration in patients without an advanced airway
- For the respiratory arrest cases, you need to use only the lead-in and initial information to lead the student through the bag-mask ventilation and OPA/NPA skills testing. You may use the whole respiratory scenario if you want to go deeper into respiratory distress, respiratory failure, and respiratory arrest. However, to accommodate this approach, you will need to expand the airway management station.

Optional (Depending on Agenda Chosen): Play Airway Management Video

- Address what students will learn from the video.
- Play the video.
- Answer students' questions.

Students Practice: Airway Management

- Assign student numbers.
- For the practice session (small groups around a manikin): practice OPA and NPA insertion, discuss oxygen and suction, and practice 1- and 2-rescuer bag-mask ventilation.
- Students practice OPA, NPA, oxygen, suction, and 1-rescuer bag-mask ventilation as in Figure 2 and Table 4 in the lesson plans.
- Organize students for 2-rescuer bag-mask ventilation practice as in Table 5 in the lesson plans.

Figure 2. Positions for the Airway Management Learning Station with a CPR Coach.

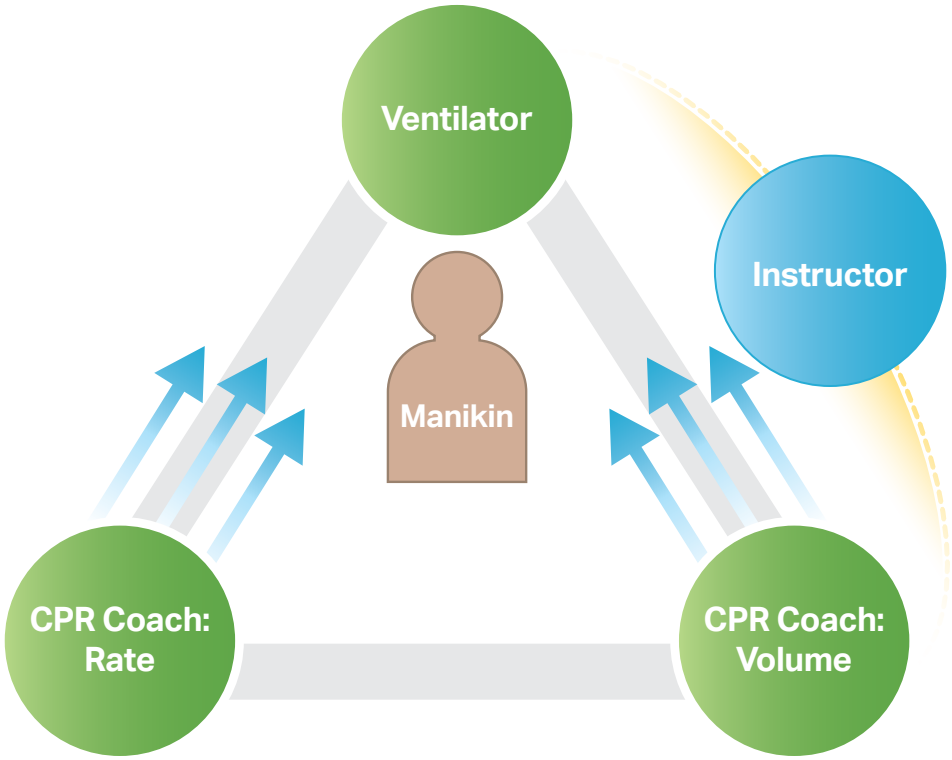


Table 4. Student Rotations for Ventilator and CPR Coaches During First Part of Practice

Round 1	Round 2	Round 3
Student 1: Ventilator	Student 1: CPR Coach (Volume)	Student 1: CPR Coach (Rate)
Student 2: CPR Coach (Rate)	Student 2: Ventilator	Student 2: CPR Coach (Volume)
Student 3: CPR Coach (Volume)	Student 3: CPR Coach (Rate)	Student 3: Ventilator

Table 5. Student Assignments for 2-Rescuer Bag-Mask Ventilation Practice

Person squeezing the bag	Person holding the mask	CPR Coach
Student 1	Student 2	Student 3
Student 2	Student 3	Student 1
Student 3	Student 1	Student 2

Optional

Lesson 3
3B: Learning/Testing Station: Airway Management Testing—Testing Details

Test Students One at a Time

- Advise students that they will be tested on bag-mask ventilation with OPA/NPA insertion skills.
- Present the respiratory case scenario (case scenarios can be found in the Appendix of the instructor manual or in the Instructor Resources on Atlas).
- Each student manages a complete airway case (testing session):
  - Perform a full assessment.
  - Begin ventilation without delay.
  - Insert an OPA or an NPA.
  - Connect the bag-mask device to oxygen and adjust the flow rate to the appropriate level.
  - Give bag-mask ventilation with the OPA/NPA for 1 minute (skills test).
    - Rate (once every 6 seconds)
    - Speed (squeeze the bag for 1 second)
    - Volume (about one-third-a-bag to a one-half-a-bag squeeze that produces chest rise)
  - Check off student's skills on the skills testing checklist as each student demonstrates adequate management of the respiratory case.
    - **Note the fail criteria for rate (ventilating once every 4 seconds or less or 8 seconds or more).**
  - Monitor ventilation with a phone, stopwatch, or feedback device to make sure students are ventilating at appropriate rates and at appropriate volumes, if that information is available.

Lesson 3
3C: Learning/Testing Station: Airway Management—Student Practice Details (Optional)

Instructor Tips

- This portion of the lesson is optional.
  - Whether or not you teach this lesson will depend on the makeup of your class. That is why it is important to ask students at the beginning of the class to introduce themselves and provide information about their occupations.

Optional: Play Advanced Airways Video

- Address what students will learn from the video.
- Play the video.
- Answer students' questions.

Students Practice: Advanced Airway Insertion (Optional, Based on Students' Scope of Practice)

- Rotate through all students inserting advanced airway devices and administering ventilations.
- Optional advanced airway device modules:
  - Supraglottic airway devices
    - Laryngeal mask airway (multiple variations)
    - Laryngeal tube
    - Endotracheal tube

Lesson 4
Technology Review

15 minutes

Instructor Tips

- If there are 2 instructors, this activity can be done in 2 smaller groups. For a single instructor, keep the class in one large group.
- It is important that students get hands-on experience with the equipment they will be responsible for using during the learning stations and testing stations.
- Ideally, equipment would be the same as what is used in a real emergency.
- Advise students that the equipment may be different in their workplace.

Discussion and Students Practice: Technology

- Demonstrate and review monitor/defibrillator functions, buttons, and connections (features of your equipment may vary) and then have some students demonstrate the functions, for clarity.
  - Power button
  - Transcutaneous pacing
  - Synchronized cardioversion
  - Blood pressure
  - P_{ETCO_2}
  - Pulse oximetry
  - Pad connections
  - ECG connections and lead placement (3-lead, 4-lead, 5-lead)
  - Optional 12-lead placement and right-sided 12-lead placement
- Review crash cart/jump kit supply locations.
- Explain the use of audiovisual feedback devices during the learning and testing stations involving CPR and ventilation. Also explain how timing and objective measures are critical components of the learning stations and testing stations.

Lesson 5
5A: Learning Station: Preventing Arrest: Bradycardia 60 minutes

Learning Objectives

- Recognize bradycardias that may result in cardiac arrest or complicate resuscitation outcome
- Perform early management of bradycardias that may result in cardiac arrest or complicate resuscitation outcome

Instructor Tips

- About a 60-minute lesson (30 minutes for showing the optional algorithm video, answering questions, discussing bradycardias [including setting up transcutaneous pacing]; up to 30 minutes for going through the 3 bradycardia cases [about 10 minutes each])
- Students often have difficulty differentiating between the heart block rhythms. Focus more on the treatments for stable vs unstable bradycardia than on detailed analysis of specific rhythms.
- For in-hospital case scenarios only, students should request rapid response team/MET response.
- For bradycardia case scenarios, refer to the instructor manual Appendix.
- When debriefing students:
  - Ask open-ended questions to engage group discussion and allow for greater detail.
  - When answering a question, acknowledge the individual with eye contact, and then answer to the entire room, coming back to the questioner periodically.

Optional (Depending on Agenda Chosen): Play Bradycardia Algorithm Video

- Address what students will learn from the video.
- Play the video.
- Answer students' questions.

Discussion

- Monitor/defibrillator technology review, if needed
  - Apply limb leads to patient so that pacing can be achieved through pacer pads.
- Signs of clinical deterioration
- Stable vs unstable patients
- Definition of unstable signs and symptoms
- First-degree atrioventricular block
- Second-degree type I atrioventricular block
- Second-degree type II atrioventricular block
- Third-degree (complete block)
- Junctional rhythms (slow)
- Idioventricular rhythm
- H's and T's
- Local protocol

Lesson 5
5B: Learning Station: Preventing Arrest: Bradycardia—Rotations

Instructor Tips

- This learning station is designed to allow 3 of the 6 students (adjust according to the number of students in your group) to be a Team Leader during this lesson and the other 3 to be a Team Leader in Lesson 6: Tachycardia.
- When students have to rotate roles during practice, provide enough space for rotation to allow for effective observation and monitoring of student performance.
- To ensure incorporation of knowledge into practice, make sure each student actually performs the skills of defibrillation, synchronized cardioversion, and transcutaneous pacing.


Students Practice: Student Rotations in Learning Station Cases According to Team Roles

- The Team Leader will direct the actions of the other team members. For example, the Team Leader will coach the Airway team member if the performance of bag-mask ventilation is not making the chest rise.
- Team members will perform interventions as directed by the Team Leader. This is an opportunity for students to practice skills and receive feedback from the Team Leader. Students will demonstrate effective team behaviors (eg, closed-loop communication, clear messages).
- For bradycardia, the Timer/Recorder will check off critical action boxes on the Bradycardia Learning Station Checklist.

Students Practice

- Select 3 cases for 3 students to manage individually in this station (Table 6 in the lesson plans).
- Students will run scenarios (individually) and perform debriefing for all 3 cases (case scenarios can be found in the Appendix of the instructor manual or in the Instructor Resources on Atlas).

Discussion

- Provide feedback on students' debriefing (Table 7 in the lesson plans).
  - Use the gather-analyze-summarize debriefing process described here.
  - What was challenging?
  - What worked well in this case?

Table 6. Student Rotations for Bradycardia Learning Station

Team Role	Case 1 (Up to 10 minutes)	Case 2 (Up to 10 minutes)	Case 3 (Up to 10 minutes)
Team Leader	Student 6	Student 1	Student 2
Airway	Student 1	Student 2	Student 3
IV/IO/Medications	Student 2	Student 3	Student 4
Monitor/Defibrillator	Student 3	Student 4	Student 5
Compressor (if needed)	Student 4	Student 5	Student 6
Timer/Recorder	Student 5	Student 6	Student 1

Table 7. Structured and Supported Debriefing Process for Bradycardia Learning Station

Phase	Goal	Actions
Gather	Ask what happened during the case to develop a shared mental model of the events. Listen to students to understand what they think and how they feel about the simulation.	• Request a narrative from the Team Leader. • Request clarifying or supplementary information from the high-performance team.
Analyze	Facilitate students' reflection on and analysis of their actions.	• Review an accurate record of events. • Report observations (both correct and incorrect steps). • Assist students in thoroughly reflecting on and examining their performance during the simulation as well as in reflecting on their perceptions during the debriefing. • Direct and/or redirect students during the debriefing to ensure continuous focus on session objectives.
Summarize	Facilitate identification and review of the lessons learned that can be taken into actual practice.	• Summarize comments or statements from students. • Have students identify positive aspects of their high-performance team or individual behaviors. • Have students identify areas of their high-performance team or individual behaviors that require change or correction.

Lesson 5
5C: Learning Station: Preventing Arrest: Bradycardia— Details for Case Rotations

Students Practice

Use Table 8 in the lesson plans to determine case rotations for this learning station.

Table 8. Timing and Tasks for Bradycardia Learning Station

Case rotations (3 rotations, up to 10 minutes each)	Directions for case rotations (Instructors must conduct the scenario in real time)
Start case scenario(s) (6 minutes)	• Review assigned team roles from the rotation chart for this case. • Ensure that students understand the expectations for their assigned roles (eg, "Your role is to use the bag-mask device to give ventilations that cause the chest to rise"). • Introduce the case by reading the case scenario. • Set the timer to 6 minutes. • Ask the Team Leader to begin managing the case. • Advise the Team Leader to observe and coach while being mindful of the case timing. • Students may use the Handbook of ECC, reference cards, or crash cart cards. • Observe and coach – Effective team performance – Appropriate case management – High-quality skills performance, including high-quality CPR, when needed, throughout the scenario • Guide the Team Leader through management of the case. • Stop the case after 6 minutes.
Case debriefing (up to 4 minutes)	• Debrief for up to 4 minutes as needed (set timer if needed). • Conduct a debriefing at the end of the case (refer to Debriefing Tools in the instructor manual). • Ask the Team Leader to gather, analyze, and summarize the case, roles of team members, and areas for improvement. • Ask the Timer/Recorder to critique the case. • Give a summary of key concepts of the case: – Differentiating between signs and symptoms that are caused by the slow rate vs those that are unrelated – Correctly recognizing the presence and type of atrioventricular block – Using atropine as the drug intervention of first choice – Deciding when to start transcutaneous pacing – Deciding when to start epinephrine or dopamine to maintain heart rate and blood pressure – Knowing when to call for expert consultation about complicated rhythm interpretation, drugs, or management decisions

Repeat for each of the remaining cases.

Lesson 6
6A: Learning Station: Preventing Arrest: Tachycardia (Stable and Unstable)

60 minutes

Learning Objectives

- Recognize tachycardias that may result in cardiac arrest or complicate resuscitation outcome
- Perform early management of tachycardias that may result in cardiac arrest or complicate resuscitation outcome

Instructor Tips

- About a 60-minute lesson (30 minutes for viewing the optional algorithm video, answering questions, discussing tachycardias [including setting up synchronized shock]; up to 30 minutes for going through the 3 tachycardia cases [about 10 minutes each])
- Begin with the end in mind: knowing what you want to communicate, why it's important, and what you want to have happen as a result is critical to the success of your lesson.
- Emphasize the need for rapid treatment (ie, electrical therapy) in patients with unstable tachycardia.
- For in-hospital case scenarios only, students should request rapid response team/MET response.
- For tachycardia case scenarios, refer to the Appendix of the instructor manual.
- To ensure incorporation of knowledge into practice, make sure each student actually performs the skills for defibrillation, synchronized cardioversion, and transcutaneous pacing.

Optional (Depending on Agenda Chosen): Play Tachycardia Algorithm Video

- Address what students will learn from the video.
- Play the video.
- Answer students' questions.

Discussion

- Monitor/defibrillator technology review if needed
- Review tachycardias:
  - Stable vs unstable patient
  - Sinus tachycardia
  - Narrow-complex tachycardia
  - Atrial fibrillation
  - Atrial flutter
  - Junctional rhythms (fast)
  - Monomorphic ventricular tachycardia (with pulse)
  - Polymorphic ventricular tachycardia (with pulse)
  - Torsades de pointes
  - Wide-complex tachycardia of uncertain type
  - Discuss local protocol

Lesson 6
6B: Learning Station: Preventing Arrest: Tachycardia (Stable and Unstable)—Rotations

Instructor Tips

- This learning station is designed to allow 3 of the 6 students to be a Team Leader during this lesson and the other 3 to be a Team Leader in Lesson 5: Bradycardia.
- Other assigned student roles may vary depending on the number of students at the station.
- Cases may be run in a different order, but assigned student roles should not be changed.
- If students rotate roles during practice, provide enough space for rotation to allow for effective observation and monitoring of student performance.


Students Practice: Student Rotations in Learning Station Cases According to Resuscitation Team Roles

- The Team Leader will direct the actions of the other team members. For example, the Team Leader will coach the Airway team member if performance of bag-mask ventilation is not making the chest rise.
- Team members will perform interventions as directed by the Team Leader. This is an opportunity for students to practice skills and receive feedback from the Team Leader. Students will demonstrate effective team behaviors (eg, closed-loop communication, clear messages).
- The Timer/Recorder will check off critical action boxes on the Tachyarrhythmia Learning Station Checklist.

Students Practice

- Select 3 cases for 3 students to manage individually in this station (Table 9 in the lesson plans).
- Run the scenario and perform the debriefing for all 3 cases (case scenarios can be found in the Appendix of the instructor manual or in the Instructor Resources on Atlas).

Discussion

- Provide feedback on the students' debriefing.
  - What was challenging?
  - What worked well in this case?

Table 9. Student Rotations for Tachycardia Learning Station

Team role	Case 1 (Up to 10 minutes)	Case 2 (Up to 10 minutes)	Case 3 (Up to 10 minutes)
Team Leader	Student 3	Student 4	Student 5
Airway	Student 4	Student 5	Student 6
IV/IO/Medications	Student 5	Student 6	Student 1
Monitor/Defibrillator	Student 6	Student 1	Student 2
Compressor (if needed)	Student 1	Student 2	Student 3
Timer/Recorder	Student 2	Student 3	Student 4

Lesson 6
6C: Learning Station: Preventing Arrest: Tachycardia (Stable and Unstable)—Details for Case Rotations

Students Practice

Use Table 10 in the lesson plans to determine case rotations for this learning station.

Table 10. Timing and Tasks for Tachycardia Learning Station

Case rotations (3 rotations, up to 10 minutes each)	Directions for case rotations (Instructors must conduct the scenario in real time)
Start case scenario (6 minutes)	• Review assigned team roles from the rotation chart for this case. – Ensure that students understand the expectations for their assigned roles (eg, "Your role is to use the bag-mask device to give ventilations that cause the chest to rise"). • Introduce the case by reading the case scenario. • Set the timer to 6 minutes. • Ask the Team Leader to begin managing the case. • Students may use the Handbook of ECC, reference cards, or crash cart cards. • Observe and coach: – Effective team performance – Appropriate case management – High-quality skills performance – Guide the Team Leader through management of the case • Stop the case after 6 minutes.
Case debriefing (Up to 4 minutes)	• Up to 4 minutes as needed (set timer if needed) • Conduct a debriefing at the end of the case. – Refer to Debriefing Tools in the instructor manual. • Ask the Team Leader to summarize the case, the roles of team members, and areas for improvement. • Ask the Timer/Recorder to critique the case. • Give a summary of key concepts of the case. – Begin with the end in mind: knowing what you want to communicate, why it's important, and what you want to have happen as a result is critical to the success of your lesson. – Discuss differentiating between signs and symptoms that are caused by a rapid rate vs those that are unrelated. – Emphasize the need for rapid treatment (ie, electrical therapy) in patients with unstable tachycardia. – For in-hospital case scenarios only, students should request rapid response team/MET response. – Discuss defibrillation, synchronized cardioversion, and transcutaneous pacing.

Repeat for each of the remaining cases (Stable and Unstable Tachycardia).

Lesson 7
High-Performance Teams

30 minutes

Learning Objectives

- Model effective communication as a member or leader of a high-performance team
- Recognize the impact of team dynamics on overall team performance

Instructor Tips

- Clearly communicate the objectives of this lesson to help the students gain a better understanding of the lesson.
- This team dynamics section is a great way to further engage the students.
- Change the inflection in your voice and also change your pace to help change the energy level in the room.

Play High-Performance Teams Video (In-Hospital, Out-of-Hospital, or Both)

- Ask students to open the provider manual to Part 3: High-Performance Teams.
- Address what students will learn from the video.
- Play the video.

Discussion

- Ask students what questions they have about high-performance teams:
  - What behaviors did they observe?
  - Discuss timing and measurement in relationship to impact on survival.
  - Discuss the H's and T's that can help the health care professionals to arrive at a diagnosis in this case.

Review/Summarize Key Points

- The better you work as a team (timing, quality, coordination, and administration), the better the potential outcome for your patient.
- Emphasize the importance of understanding the choreography of a resuscitation attempt as a team and the impact on timing.
- Remind students that they will be functioning as Team Leaders and as different members in the learning and testing stations and will need to apply these concepts.

Lesson 8
8A: Learning Station: High-Performance Teams: Cardiac Arrest and Post–Cardiac Arrest Care

160 minutes

Learning Objectives

- Model effective communication as a member or leader of a high-performance team
- Recognize the impact of team dynamics on overall team performance
- Recognize cardiac arrest
- Perform optimized management of cardiac arrest until termination of resuscitation or transfer of care, including post–cardiac arrest care
- Evaluate resuscitative efforts during a cardiac arrest through continuous assessment of CPR quality, monitoring the patient's response, and delivering real-time feedback to the team

Instructor Tips

- If you have fewer than 6 students, you can assign multiple roles to individual students.
- Encourage students to use their provider manual, reference cards, or Handbook of ECC early on during the cases but to become less reliant on those resources as the cases progress.
- For cardiac arrest and post–cardiac arrest care case scenarios, refer to the Appendix of the instructor manual.
- The instructor should have working knowledge of all vasopressors associated with the students' workplace.
- **Conduct prebriefing before starting the case.**
- The team should discuss the plan for managing each case including objective timing goals.
- Conduct learning station **cases in real time**.
- Be sure to use all equipment necessary to facilitate scenarios as realistically as possible and to allow students to be familiar with using the equipment. In addition, use a realistic setting for your students if possible.
- Monitor rate and depth of chest compressions along with CCF **by using an audiovisual feedback device with real-time feedback.** In addition, monitor chest recoil if possible and ventilations.
- Monitor ventilation in real time by using a timing device or an audiovisual feedback device.
- **CCF should be measured and discussed in debriefing.**
- When debriefing students:
  - Ask open-ended questions to engage group discussion and allow for greater details.
  - Discuss prebriefing goals (eg, CCF 82%,) vs actual results, with reflection on how students can perform better for the next case.
  - When answering a question, acknowledge the individual with eye contact, and then answer to the entire room, coming back to the questioner periodically.

Optional (Depending on Agenda Chosen): Play Cardiac Arrest Algorithm Video and Post–Cardiac Arrest Algorithm Video

- Address what students will learn from the video.
- Play the video.
- Answer students' questions.

Discussion

- Monitor/defibrillator technology review if needed
- Review team roles, responsibilities, and assignments for each case (refer to Lesson Plans 8B and 8C).
  - Case scenarios can be found in the Appendix of the instructor manual or in the Instructor Resources on Atlas.
- Students may use the Handbook of ECC, reference cards, or crash cart cards.
- To show the continuum of care, all VF case scenarios must achieve ROSC.
- Four cases will be VF/pVT resulting in ROSC (post–cardiac arrest care).
- Two cases will be split between PEA and asystole.
- Ask students to recall the post–cardiac arrest care priorities:
  - Maximize oxygenation and ventilation.
  - Maximize hemodynamics.
  - Obtain a 12-lead ECG; move to the cath lab if ST-segment elevation myocardial infarction (STEMI) is present.
  - Initiate temperature control.
- For post–cardiac arrest care, ensure that students address
  - Oxygenation and ventilation
  - Hemodynamic optimization (blood pressure, 12-lead, glycemic control)
  - Temperature control
  - Criteria for percutaneous coronary intervention
- Advise that students will perform debriefing.
  - Refer to Debriefing Tools in the instructor manual.
- Select cases for each student to demonstrate appropriate management.
- Identify and discuss local protocols as needed.
- Highlight effective patient management through the Adult Post–Cardiac Arrest Care Algorithm.

Lesson 8
8B: Learning Station: High-Performance Teams: Cardiac Arrest and Post–Cardiac Arrest Care—Rotations

Instructor Tips

It is important that all students have a role in each case.

- Student role assignments may vary depending on the number of students at the station. However, every student must function as the Team Leader for 1 case.
- Cases may be run in a different order, but ensure that no single student always goes first in subsequent learning stations.
- Any additional students may be given roles as additional recorders.

Students Practice: Student Rotations in Learning Station Cases According to Resuscitation Team Roles

- The Team Leader will direct the actions of the other team members. For example, the Team Leader will coach the Airway team member if performance of bag-mask ventilation is not making the chest rise.
- Team members will perform interventions as directed by the Team Leader. This is an opportunity for students to practice skills and receive feedback from the Team Leader. Students will demonstrate effective team behaviors (eg, closed-loop communication, clear messages).
- The Timer/Recorder will use a phone or a stopwatch to time 2-minute intervals for case management, announce each 2-minute interval for switching roles, and record critical action times on the ACLS Code Timer/Recorder Sheet (in the Appendix of the instructor manual or in the Instructor Resources on Atlas) or on a whiteboard.

Students Practice

- Select the cases for the students to manage individually in this station (Table 11 in the lesson plans).
- Run the scenario and perform the debriefing for all cases (case scenarios can be found in the Appendix of the instructor manual or in the Instructor Resources on Atlas).

Discussion

- Provide feedback on the students' debriefing (Table 12 in the lesson plans):
  - What was challenging?
  - What worked well in this case?

Table 11. Student Rotations for Cardiac Arrest and Post–Cardiac Arrest Care Learning Station

Team role	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Team Leader	Student 1	Student 2	Student 3	Student 4	Student 5	Student 6
Airway	Student 2	Student 3	Student 4	Student 5	Student 6	Student 1
IV/IO/Medications	Student 3	Student 4	Student 5	Student 6	Student 1	Student 2
Monitor/ Defibrillator/ CPR Coach	Student 4	Student 5	Student 6	Student 1	Student 2	Student 3
Compressor	Student 5	Student 6	Student 1	Student 2	Student 3	Student 4
Timer/Recorder	Student 6	Student 1	Student 2	Student 3	Student 4	Student 5

Table 12. Structured and Supported Debriefing Process for Cardiac Arrest and Post–Cardiac Arrest Care Learning Station

Phase	Goal	Actions
Gather	Ask what happened during the case, to develop a shared mental model of the events. Listen to students to understand what they think and how they feel about the simulation.	• Request a narrative from the Team Leader. • Request clarifying or supplementary information from the high-performance team.
Analyze	Facilitate students' reflection on and analysis of their actions.	• Review an accurate record of events. • Report observations (both correct and incorrect steps). • Assist students in thoroughly reflecting on and examining performance during the simulation as well as in reflecting on their perceptions during the debriefing. • Direct and/or redirect students during the debriefing to ensure continuous focus on session objectives.
Summarize	Facilitate identification and review of the lessons learned that can be taken into actual practice.	• Summarize comments or statements from students. • Have students identify positive aspects of their high-performance team or individual behaviors. • Have students identify areas of their high-performance team or individual behaviors that require change or correction.

Lesson 8
8C: Learning Station: High-Performance Teams: Cardiac Arrest and Post–Cardiac Arrest Care—Details for Case Rotations

Students Practice

Use Table 13 in the lesson plans to determine case rotations for this learning station.

Table 13. Timing and Tasks for Cardiac Arrest and Post–Cardiac Arrest Care Learning Station

Case rotation (6 rotations, up to 25 minutes each)	Directions for case rotations (Instructors must conduct the scenario in real time)
Case prebriefing (Figure 3 in the lesson plans) (up to 5 minutes)	• Prebrief for up to 5 minutes as needed (set timer if needed). • Set case plan and goals including objective timing goals.
Start case scenario (10 minutes)	• Review assigned team roles from the rotation chart for this case. – Ensure that students understand the expectations for their assigned roles (eg, "Your role is to use the bag-mask device to give ventilations that cause the chest to rise"). • Introduce the case by reading the case scenario. • Set the timer to 10 minutes if needed. • Ask the Team Leader to begin managing the case. • Observe and coach – Effective team performance – Appropriate case management – High-quality skills performance, including high-quality CPR in real time throughout the scenario with real time audiovisual feedback on CPR quality • Guide the Team Leader through management of the case. • Stop the case after 10 minutes.
Case debriefing (up to 10 minutes)	• Debrief for up to 10 minutes as needed (set timer if needed). • Conduct a team debriefing at the end of the case. – Refer to Debriefing Tools in the instructor manual.

Repeat for each of the remaining 5 cases.

Figure 3. Prebriefing and structured debriefing tasks: a flow chart.

Lesson 9
9A: Learning Station: High-Performance Teams: Megacode Practice

175 minutes

Instructor Tips

- **Conduct learning station cases in real time (do not skip through the case).**
- For Megacode practice case scenarios, refer to the Appendix of the instructor manual.
- Each scenario should last 10 minutes, with prebriefing lasting up to 5 minutes as needed, and debriefing should last for up to 10 minutes as needed.
- Learning can be achieved just as effectively during structured debriefing as during the scenario.

Discussion

- Highlight effective patient management through several algorithms.
- **Demonstrate a Megacode case as a Team Leader and then assign a case to each student in that station.**
- Review team roles, responsibilities, and assignments for each case (refer to Lesson Plans 9C and 9D).
  - Case scenarios can be found in the Appendix of the instructor manual.
- Present a Megacode practice case for each student or team to manage (refer to Lesson Plan 9C).
- Students may use the Handbook of ECC, reference cards, or crash cart cards.
- Conduct prebriefing before starting the case.
  - Teams should discuss the plan for managing each case including objective timing goals.
- If possible, use real equipment in a realistic setting for your students.
- Monitor the rate and depth of chest compressions along with CCF by using an audiovisual feedback device with real time feedback. In addition, monitor chest recoil if possible and ventilations.

Lesson 9
9B: Learning/Testing Station: High-Performance Teams: Megacode Practice—Instructor Demo

Instructor Tips

When debriefing students:

- Ask your audience open-ended questions that focus on their perspectives to engage their minds and increase energy focus.
- When answering a question, acknowledge the individual with eye contact, and then answer to the entire room, coming back to the questioner periodically.

Students Practice

Use Table 14 in the lesson plans to determine timing and tasks for this learning station.

Table 14. Timing and Tasks for Instructor Case Scenario Demonstration

Demonstrate a case scenario with you as Team Leader and students playing team roles	
Case prebriefing (up to 5 minutes)	• Prebrief for up to 5 minutes as needed (set timer if needed). • Set case plan and goals, including objective timing goals.
Start demonstration of a case scenario (10 minutes)	• Introduce the case. • Assign a Team Leader. • Assign team member roles to students. • Set the timer to 10 minutes (if needed). • Begin the case. • Students should demonstrate case management, showing – Effective team performance – Appropriate application of algorithm – High-quality skills performance, including high-quality CPR in real time throughout the scenario • Stop the case after 10 minutes.
Case debriefing (up to 10 minutes) Total time for case demonstration: up to 25 minutes	• Debrief for up to 10 minutes as needed (set timer if needed). • Go over the Megacode Practice Learning Station Checklist. • Discuss prebriefing goals vs actual results. • Discuss applying learning to the next case. • Summarize the case, emphasizing proper roles of Team Leader and team members.

Lesson 9
9C: Learning Station: High-Performance Teams: Megacode Practice—Practice Cases

Instructor Tips

- Make sure students understand their roles and responsibilities in managing a Megacode case.
- This is the last opportunity to facilitate learning before the Megacode Testing. Use this time to address critical areas where students may still be weak.

Students Practice

- Present Megacode practice cases for each student, one at a time, up to 25 minutes each (including up to 5 minutes for prebriefing as needed, the 10-minute case, and up to a 10-minute debriefing as needed).
- Determine the Team Leader for the first case (refer to rotations on the next lesson plan).
- The Team Leader organizes other students into team roles.
- Perform case prebriefing: set goals for the case, including objective timing goals.
- Provide the team with an individual case.
- Students may use the Handbook of ECC, reference cards, or emergency crash cart cards.
- The Team Leader assigns and directs the team through the entire Megacode case.
- Rotate through all students practicing as Team Leader for the remaining 5 cases, depending on the number of students.
- The Timer/Recorder announces 2-minute intervals and checks off critical actions on the Megacode Testing Checklist.
- Give feedback and answer questions.
- Perform structured debriefing and have students apply learning to the next case.

Lesson 9
9D: Learning Station: High-Performance Teams: Megacode Practice—Rotations

Instructor Tips

- Cases may be run in a different order, but assigned Team Leader roles should not be changed.
- **Each student must have the opportunity to run a complete Megacode case as a Team Leader.**
- When students rotate roles during practice, designate specific areas in the room that provide ample space for practice and enable the instructor to observe and monitor performance effectively.

Students Practice

Use Table 15 in the lesson plans to determine case rotations for this learning station.

Table 15. Student Rotations for High-Performance Teams Learning Station

Team role	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Team Leader	Student 2	Student 3	Student 4	Student 5	Student 6	Student 1
Airway	Team Leader assigns other students to each team role.					
IV/IO/Medications						
Monitor/Defibrillator/ CPR Coach						
Compressor						
Timer/Recorder						

Testing Details and Testing Station Setups

Instructor Tips

- Organize students into 2 groups of 6 for the Megacode Testing Stations, depending on the number of students and instructors in the class.
- In this station, the focus changes from facilitating learning to evaluating student performance. Students must perform the test from beginning to end. Do not interrupt students while they are completing the test. Address any deficiencies during remediation.
- **Conduct testing station cases in real time.**

Megacode Testing Stations and Exam (Open-Resource Exam)

- Explain the testing rotation for the Megacode Test and exam.
- Remind students that the passing grade for the open-resource exam is 84%.

Recommended Testing Station Setup

- 2 Megacode stations, 2 instructors, 6 students each (consider 2 instructors per station to optimize student assessment)
- Other testing setups are permissible as long as
  - The open-resource exam is proctored and secure
  - The open-resource exam is not interrupted to move a student to the Megacode Test

High-Performance Teams: Megacode Testing and Megacode Testing Details 12 to 75 minutes

Megacode Testing Stations

- Provide a Megacode case scenario.
- Use the Megacode Testing Checklist to test the team until they pass.
- You must conduct the scenario in real time and measure CCF.
- Monitor CPR quality with audiovisual feedback device(s) with real-time feedback.
- Students may use the Handbook of ECC, reference cards, or emergency crash carts, with restrictions (refer to the instructor manual).
- The Timer/Recorder announces 2-minute intervals.
- Take no longer than 12 minutes to test and give students feedback on their performance (pass or fail).
- Do not give hints or provide coaching during the test.
- Refer students for remediation as needed.

Megacode Test Rotations

Use Table 16 in the lesson plans to determine case rotations for this test, if needed.

Table 16. Student Rotations for High-Performance Teams Testing

Team role	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Team Leader	Student 5	Student 6	Student 1	Student 2	Student 3	Student 4
Airway	Team Leader assigns other students to each team role.					
IV/IO/Medications						
Monitor/ Defibrillator/CPR Coach						
Compressor						
Timer/Recorder						

Exam and Exam Details

45 minutes

Exam

Exams are administered online. Refer to the *Program Administration Manual* on **Atlas.heart.org** for more information about delivering exams.

Exam Details

- The exam is an open-resource exam.
  - Resources could include the provider manual, either in printed form or as an eBook on a personal device, any notes the student took during class, the Handbook of ECC, the latest *AHA Guidelines for CPR and ECC*, etc. *Open resource* does not mean open discussion with other students or the instructor.
- Students may not talk to each other during the exam.
- Answer any questions.
- Students who scored less than 84% need immediate remediation.
  - Make sure the student understands the errors and corrects the answers.
  - Give a second test.
- Do not interrupt the exam to have a student go to the Megacode Testing Station.

Remediation (REM)

Instructor Tip

- For Megacode retesting, at least 3 students are needed to conduct the test.

Exam

The following information applies primarily to online exams and does not apply to HeartCode students:

- Review course material for each student who needs remediation.
- Retest students as necessary.
- Give feedback.
- Evaluate competency.

Lesson VAS
Learning Station: Vascular Access (Optional)

Instructor Tip

- Participation in this lesson is not required to complete the ACLS Course.

Play Intraosseous Access Video

- Address what students will learn from the video.
- Play the video.
- Answer students' questions.

Students Practice

- Have students practice IO insertion skills on appropriate manikins.
- Ensure that each student can prepare equipment to administer an IO bolus rapidly.
- Have students verbalize the correct adult medication dose.
- Ensure that each student can perform IO access correctly and confirm when the needle has reached the marrow cavity.
- Ensure that each student can prepare equipment to administer an IO bolus, including 3-way stopcock and syringes.
- Observe each student; provide corrective feedback.

Optional

Lesson COP
Learning Station: Coping With Death (Optional)

Instructor Tips

- Remind students that if they have recently experienced the loss of a loved one, this video might be difficult to view.
- Participation in this lesson is not required to complete the ACLS Course.
- Students may choose not to view this video, at their discretion.

Play Coping With Death Part 1 Video

- Address what students will learn from the video.
- Answer students' questions.

Discussion: Part 1

- Discuss how the news of the death of the patient could be delivered more effectively:
  - Family was not allowed in the room during the resuscitation attempt
  - Family was not informed that they had a choice about whether to stay in the room
  - News was delivered in the hallway, with no privacy
  - Vague terms were used to describe the death
  - The words dead or died were never used
  - Physician left family for "another emergency"
  - Physician left family with no support and no one to answer their questions
- Ask if there are any questions.

Play Coping With Death Part 2 Video

- Play the video.
- Answer students' questions.

Lesson SA
Systematic Approach

15 minutes

Learning Objective

- Apply the BLS, Primary, and Secondary Assessments sequence for a systematic evaluation of adult patients

Instructor Tips

- Ask students to use the provider manual in this section to help further engage them and help with retention of information.
- Make sure not to interrupt the video if you have any comments to add; write them down and discuss them at the end of the video. Students do not learn well when they are trying to listen to 2 things at once.

Play Systematic Approach Video

- Ask students to open the provider manual to Part 1: Overview of ACLS.
- Play the video.

Discussion

- Answer students' questions from the video.
- Remind students that they will be functioning as Team Leader and different members as they rotate through the learning and testing stations.
- Review and summarize key points.
- Refer to the Systematic Approach section of Part 1 in the provider manual.

Lesson ACS
Acute Coronary Syndromes—Video Discussion 1

30 minutes

Learning Objective

- Discuss early recognition and management of ACS, including appropriate disposition

Instructor Tips

- Allow students to work together to answer questions and allow for self-discovery.
- When summarizing what the video has covered, be sure to allow students to lead this discussion at times by asking for what they observed/learned during the video segment.
- Students are often hesitant to answer questions at first. Before this lesson, write down additional leading questions to help prompt discussion. These video-based lessons are designed to allow you to challenge students, whether they are novice or experienced. Adjust the difficulty of your questions based on the knowledge level of the students in the course.

Play Acute Coronary Syndromes Part 1 Video

- Address what students will learn from the video.
- Play the video.
  - Address Part 1 questions (1, 2, and 3).
- Refer to Part 2: Preventing Arrest in the provider manual.
- Lead the discussion with the group.

Discussion: Part 1 Questions

Advise students to refer to the Acute Coronary Syndromes section of Part 2 in the provider manual. Capture key concepts from the discussion.

1. What is the difference between stable angina, unstable angina, and myocardial infarction?

   Angina is a tightness or discomfort (not a sharp pain) in the center of the chest and/or the surrounding area. The onset of discomfort associated with stable angina is often predictable; in many cases, it begins during exertion or with strong emotions. It is a symptom, not a diagnosis of coronary artery disease or acute ischemic symptoms. While often associated with myocardial ischemia, chest discomfort may have other causes. In the presence of coronary disease, the most common cause of angina is an obstructing or disrupted coronary plaque.

   Angina may be stable and predictably produced by exertion or emotion. At rest, a fixed coronary plaque generally allows enough blood supply. However, blood flow is insufficient during stress. When a plaque becomes unstable, ACS occurs. Due to a sudden reduction in the cross-sectional area of the blood vessel, blood flow is insufficient. This causes a clinical presentation called *unstable angina*, which is characterized by prolonged anginal pain that occurs at rest or with minimal effort. When the lack of blood flow is severe enough to cause damage to the heart muscle, a myocardial infarction is said to occur. This event often correlates with angina episodes of 15 minutes or longer.

2. This patient is having chest discomfort. What are the possible causes of chest discomfort that may be life threatening?

   Although most life-threatening chest discomfort is due to ACS, the initial emergency diagnosis may include several other disorders. When a diagnosis of ACS is uncertain, the following possible diagnoses should be considered in the initial evaluation as well as the continuing assessment:

   - Aortic dissection
   - Pulmonary embolism
   - Acute pericarditis with effusion and tamponade
   - Spontaneous pneumothorax
   - Esophageal rupture

3. What are the symptoms of acute coronary syndromes?

   The predominant symptom in most patients with ischemic syndromes is chest discomfort. This discomfort is often not described as a pain. Brief episodes of chest discomfort may be due to ischemia and may or may not progress to infarction. However, when symptoms are constant (ie, last for more than 15 to 20 minutes), myocardial infarction may be present. Symptoms suggestive of ACS include

   - Uncomfortable pressure, fullness, squeezing, or pain in the center of the chest lasting several minutes (usually more than a few minutes)
   - Chest discomfort spreading to the shoulders, neck, one or both arms, or jaw
   - Chest discomfort spreading into the back or between the shoulder blades
   - Light-headedness, dizziness, fainting, syncope, sweating, nausea, or vomiting
   - Unexplained, sudden shortness of breath, which may occur with or without chest discomfort
   - Less commonly, the discomfort occurs in the epigastrium (more common in women) and is described by the patient as indigestion
   - Patients with diabetes may present without chest discomfort but report weakness, fatigue, or severe prostration
   - Symptoms on the left or right side of the chest, stabbing, sharp pain, or discomfort in the throat or abdomen may occur in women, the elderly, and patients who have diabetes

Lesson ACS
Acute Coronary Syndromes—Video Discussion 2

Play Acute Coronary Syndromes Part 2 Video

- Address what students will learn from the video.
- Play the video.
  - Address the Part 2 questions (1, 2, and 3).
- Refer to Part 2: Preventing Arrest in the provider manual.
- Lead the discussion with the group.

Discussion: Part 2 Questions

Advise students to refer to the Acute Coronary Syndromes section of Part 2 in the provider manual. Capture key concepts from the discussion.

1. Half of patients with ACS are not brought to the hospital by EMS. Why is early EMS dispatch important for patients with ACS?

   Patients with a STEMI have a complete occlusion of a coronary artery. Early opening of the artery reduces mortality and the size of infarction. In many cases, EMS can begin symptom-stabilizing care before the patient arrives at the hospital, which will permit earlier reperfusion therapy. Early opening of the artery reduces mortality and the size of infarction. Patients arriving by EMS receive earlier reperfusion. EMS rescuers should consider the risk of VF in the early hours after a STEMI.

   What are the most important components of a community ACS recognition program?

   ACS is the most common cause of cardiac arrest in adults. Every community should develop a program to respond to cardiac arrest and identify patients with possible ACS. Components of this program include

   - Recognizing symptoms of ACS
   - Activating the EMS system
   - Providing early CPR
   - Providing defibrillation with AEDs available through lay rescuer CPR and defibrillation programs

2. What are the goals of therapy for patients with ACS?

   Improving systems of care enables early initiation of reperfusion therapy for patients with possible ACS and increases the likelihood of target goal achievement. These goals (discussed in detail in the ACS video) are

   - Relief of ischemic chest discomfort
   - Prevention of major adverse cardiac events, such as heart failure, low left ventricular ejection fraction, and death
   - Treatment of acute, life-threatening complications of ACS, such as VF/pulseless VT, symptomatic bradycardia, and unstable tachycardia
   - Triage for early reperfusion therapy

   Reperfusion therapy opens an occluded coronary artery with either drugs or mechanical means. "Clot buster" drugs are called *fibrinolytics*. Percutaneous coronary intervention (PCI) is a procedure used to open blocked or narrowed coronary (heart) arteries. PCI, performed in the heart catheterization suite following coronary angiography, allows balloon dilation and/or stent placement for an occluded coronary artery. PCI performed as the initial reperfusion method is called *primary PCI*.

3. What role does aspirin play in ACS? What are the indications and contraindications?

   The most common cause of ACS is the rupture of a lipid-laden plaque with a thin cap. After rupture, a monolayer of platelets covers the surface of the ruptured plaque (platelet adhesion). Additional platelets are recruited (platelet aggregation) and activated. Aspirin irreversibly binds to platelets and partially inhibits platelet function.

   Studies have shown that aspirin reduces mortality during MI. The recommended dose is 162 to 325 mg. Aspirin is indicated in all patients with possible ACS.

   Contraindications include true aspirin allergy and recent or active gastrointestinal bleeding.

Lesson ACS
Acute Coronary Syndromes—Video Discussion 3

Play Acute Coronary Syndromes Part 3 Video

- Address what students will learn from the video.
- Play the video.
  - Address the Part 3 questions (1, 2, and 3).
- Refer to Part 2: Preventing Arrest in the provider manual.
- Lead the discussion with the group.

Discussion: Part 3 Questions

Advise students to refer to the Acute Coronary Syndromes section of Part 2 in the provider manual. Capture key concepts from the discussion.

1. Let's review. What is the initial drug therapy for ACS? We have already discussed aspirin.

   Other initial agents may include oxygen (to keep the saturation 90% or greater), nitroglycerin, and opiates (eg, morphine/fentanyl).

   What are the doses and indications/contraindications/cautions for nitroglycerin?

   Nitroglycerin is administered via the sublingual route, either in a tablet or spray form. Three doses may be administered after repeating assessments of blood pressure and heart rate. Conditions where nitroglycerin administration should be used with caution or withheld in patients with ACS include

   - Inferior MI and right ventricular (RV) infarction: Use nitroglycerin with caution in patients with known inferior wall STEMI. For these patients, perform a right-sided ECG to assess the degree of RV involvement. If RV infarction is confirmed by right-sided precordial leads or clinical findings by an experienced professional, nitroglycerin and other vasodilators (morphine) or volume-depleting drugs (diuretics) are contraindicated. Patients with acute RV infarction are very dependent on RV-filling pressures (preload) to maintain cardiac output and blood pressure.
   - Hypotension, bradycardia, or tachycardia: Avoid use of nitroglycerin in patients with hypotension (systolic blood pressure less than 90 mm Hg), and use with caution (relative contraindication) for marked bradycardia (less than 50/min), or marked tachycardia (heart rate greater than 110/min).
   - Recent use of phosphodiesterase inhibitor (often used for erectile dysfunction and pulmonary hypertension): If the patient has recently taken a phosphodiesterase inhibitor (eg, sildenafil or vardenafil within 24 hours; tadalafil within 48 hours), nitrates may cause severe hypotension refractory to vasopressor agents.

2. What are the possible ECG groups that help triage initial ACS? What are they called?

   Analysis of the ECG ST segment allows triage of patients with ACS into 1 of 2 diagnostic and treatment groups: STEMI and NSTE-ACS (unstable angina and non–ST-segment elevation MI/NSTEMI and normal or nondiagnostic ECG). (Refer to the ACS Algorithm.)

   Why is it recommended that EMS send advance notification of the ECG to the receiving facility?

   Time is a critical factor in producing a positive outcome for a patient with ACS, especially for patients with STEMI. The AHA recommends that EMS systems implement 12-lead ECG programs to assist in the early recognition of those patients who could benefit most from treatment at a specialty cardiac center. EMS rescuers who lack training in advanced ECG interpretation can still acquire and transmit the 12-lead ECG to the emergency department for interpretation there. With an ECG diagnostic for STEMI, EMS rescuers should activate the local STEMI response plan at the earliest opportunity.

   Early ECG interpretation and notification of the receiving hospital speeds the time to reperfusion therapy, saves heart muscle, and may reduce mortality.

3. Why is STEMI special and the focus of this case?

   Reperfusion therapy for STEMI is perhaps the most important advance in the treatment of cardiovascular disease in cardiovascular therapy. Early fibrinolytic therapy or direct catheter-based reperfusion has been established as a standard of care for patients with acute myocardial infarction.

   Reperfusion therapy reduces mortality and saves heart muscle. The shorter the time to reperfusion, the greater the benefit. For example, a 47% reduction in mortality was noted when fibrinolytic therapy was provided in the first hour after onset of symptoms.

   Guidelines have set goals for first medical contact to balloon inflation within 90 minutes. STEMI systems of care (EMS systems and emergency department initial triage) have a major impact on these goals.

Lesson Stroke
Acute Stroke—Video Discussion 1

30 minutes

Learning Objective

- Discuss early recognition and management of stroke, including appropriate disposition

Instructor Tips

- Allow students to work together to answer questions and allow for self-discovery.
  - Encourage student-to-student interaction.
- These video-based lessons are designed to allow you to challenge students, whether they are novice or experienced. Adjust the difficulty of your questions based on the knowledge level of the students in the course.

Play Stroke Part 1 Video

- Address what students will learn from the video.
- Play the video.
  - Address the Part 1 questions (1, 2, and 3).
- Refer to Part 2: Preventing Arrest in the provider manual.
- Lead the discussion with the group.

Discussion: Part 1 Questions

Advise students to refer to the Acute Stroke section of Part 2 in the provider manual. Capture key concepts from the discussion.

1. What signs and symptoms is this patient having?

   Students should recognize that the patient is having difficulty speaking and moving. These are some of the warning signs of stroke. Ask students what some other warning signs or symptoms of stroke are.

   How are they typical of stroke?

   The signs and symptoms of a stroke may be subtle. They can include

   - Sudden weakness or numbness of the face, arm, or leg, especially on one side of the body
   - Sudden confusion
   - Trouble speaking or understanding
   - Sudden trouble seeing in one or both eyes
   - Sudden trouble walking
   - Dizziness or loss of balance or coordination
   - Sudden severe headache with no known cause

2. What are the major types of stroke?

   The major types of stroke are

   - Ischemic stroke: Accounts for approximately 62% of all strokes globally and is usually caused by an occlusion of an artery to a region of the brain
   - Hemorrhagic stroke: Accounts for about 38% of strokes globally and occurs when a blood vessel in the brain suddenly ruptures into the surrounding tissue. Thrombolytics (either alteplase or tenecteplase) are contraindicated in this type of stroke

   In addition:

   - Transient ischemic attack is a temporary blockage of blood flow to the brain, spinal cord, or retina. The clot usually dissolves on its own or gets dislodged, and the symptoms usually only last a few minutes. A transient ischemic attack doesn't cause permanent damage but can serve as a warning stroke that signals a potential future stroke. The key distinguishing factor is with symptom resolution; it is a lack of permanent damage that defines the transient ischemic attack rather than how quickly the symptoms resolve.

   Is there any treatment that can reduce disability?

   - *Stroke* is a general term. It refers to acute neurologic impairment that follows interruption in blood supply to a specific area of the brain. Although expeditious care for stroke is important for all patients, this case emphasizes reperfusion therapy for acute ischemic stroke because rapid therapy with a fibrinolytic agent can reduce disability from stroke.

3. If this patient is having a stroke, what are some goals for stroke care?

   The goal of stroke care is to minimize brain injury and maximize the patient's recovery. The Stroke Chain of Survival described by the AHA and the American Stroke Association is similar to the Chain of Survival for sudden cardiac arrest. It links actions to be taken by patients, family members, and health care professionals to maximize stroke recovery. These links are

   - Rapid recognition and reaction to stroke warning signs and symptoms
   - Rapid use of the local emergency response number and activation of the EMS system
   - Rapid EMS-system recognition, triage, transport, and prearrival notification of the receiving hospital
   - Rapid diagnosis and treatment in the hospital

Lesson Stroke
Acute Stroke—Video Discussion 2

Play Stroke Part 2 Video

- Address what students will learn from the video.
- Play the video.
  - Address the Part 2 questions (1, 2, and 3).
- Refer to Part 2: Preventing Arrest in the provider manual.
- Lead the discussion with the group.

Discussion: Part 2 Questions

Advise students to refer to the Acute Stroke section of Part 2 in the provider manual. Capture key concepts from the discussion.

1. What are the critical EMS assessments and actions to provide the best outcome for this patient with a potential stroke?
   - Identify signs: Define and recognize the signs of transient ischemic attack and stroke.
   - Assess ABCs: Administer oxygen if the oxygen saturation is 94% or less or the oxygen saturation is unknown.
   - Complete stroke assessment: Perform a rapid out-of-hospital stroke assessment and stroke severity score.
   - Establish time: Determine when the patient was last known to be at neurologic baseline. This represents time zero. If the patient wakes from sleep and is found with symptoms of stroke, time zero is the last time the patient was seen to be normal.
   - Transport: Transport the patient to a stroke center on the basis of stroke assessment, stroke severity score, and local stroke protocols. Consider bringing a witness, family member, or caregiver with the patient to confirm the time of onset of stroke symptoms.
   - Alert hospital: Provide prehospital notification to the receiving hospital so they can activate their stroke team.
   - Check glucose: During transport, support cardiopulmonary function, monitor neurologic status, and, if authorized by medical control, check blood glucose.
2. What type of hospital is appropriate for this patient?
   - A stroke center has the capability to rapidly triage and treat patients by using a multidisciplinary approach.

   Why is advance notification so important?
   - Evidence indicates a favorable benefit when patients with stroke are triaged directly to designated stroke-prepared centers (primary/comprehensive centers).
   - Advance notification allows activation of the facility stroke plan and team, minimizing delay in evaluation and treatment.

3. What stroke screen was used in the video?
   - Cincinnati Prehospital Stroke Scale (CPSS)

   What are the 3 important physical findings?
   - The CPSS identifies stroke on the basis of 3 physical findings:
     - Facial droop (have the patient smile or try to show teeth)
     - Arm drift (have the patient close eyes and hold both arms out)
     - Abnormal speech (have the patient say, "You can't teach an old dog new tricks")

   Using the CPSS, medical personnel can evaluate the patient in less than 1 minute. The presence of 1 finding on the CPSS indicates a 72% probability of stroke.

   The presence of all 3 findings indicates that the probability of stroke is greater than 85%.

Lesson Stroke
Acute Stroke—Video Discussion 3

Play Stroke Part 3 Video

- Address what students will learn from the video.
- Play the video.
  - Address the Part 3 questions (1, 2, and 3).
- Lead the discussion with the group.

Discussion: Part 3 Questions

Advise students to refer to the Acute Stroke section of Part 2 in the provider manual. Capture key concepts from the discussion.

1. Let's review. What is the initial emergency department assessment and stabilization?
   - Assess ABCDs: Assess the ABCDs and evaluate baseline vital signs.
   - Provide oxygen: Provide supplemental oxygen if the patient is hypoxemic, ie, oxygen saturation is 94% or less, or in patients with an unknown oxygen saturation value.
   - Establish IV access and obtain blood samples: Establish IV access and obtain blood samples for baseline blood count, coagulation studies, and blood glucose, but do not let this delay obtaining a CT scan of the brain.
   - Check glucose: Promptly treat hypoglycemia.
   - Perform neurologic screening: National Institutes of Health Stroke Scale or Canadian Neurological Scale.
   - Activate stroke team: Activate the stroke team or arrange consultation with a stroke expert.
   - Order CT brain scan: Order an emergent CT scan of the brain and have it read promptly by a radiologist.
   - Obtain 12-lead ECG: Obtain a 12-lead ECG, which may identify a recent acute myocardial infarction or arrhythmias (eg, atrial fibrillation) as a cause of embolic stroke. Life-threatening arrhythmias can follow or accompany stroke, particularly intracerebral hemorrhage. If the patient is hemodynamically stable, treatment of non–life-threatening arrhythmias (bradycardia, VT, and atrioventricular conduction blocks) may not be necessary. This should not delay getting the CT scan of the brain.

2. What are the possible outcomes of the CT scan?

   - Emergent CT or magnetic resonance imaging scans of patients with suspected stroke should be promptly interpreted by an expert. The presence of hemorrhage versus no hemorrhage determines the next steps in treatment and whether the patient is a candidate for thrombolytic therapy.

   Which test result makes the patient a candidate for thrombolytic therapy?

   - No, hemorrhage is not present.

   If the CT scan shows no evidence of hemorrhage, the patient may be a candidate for thrombolytic therapy.

   - Yes, hemorrhage is present.

   If hemorrhage is noted on the CT scan, the patient is not a candidate for thrombolytics. Consult a neurologist or neurosurgeon and consider transfer for appropriate care.

3. What does thrombolytics therapy do for patients with ischemic stroke?

   Several studies have demonstrated a higher likelihood of good-to-excellent functional outcome when a thrombolytic was given to adults with acute ischemic stroke within 3 hours of symptom onset. These results occurred only when a thrombolytic was given by physicians in hospitals with a stroke protocol that rigorously adhered to the eligibility criteria and therapeutic regimen of the National Institute of Neurological Disorders and Stroke protocol. Evidence from prospective randomized studies in adults also documents a greater likelihood of benefit when treatment begins earlier.

   Studies have also shown improved clinical outcome in carefully selected patients when thrombolytic administration occurred between 3 hours and 4½ hours after symptom onset, although the degree of benefit was smaller than seen in the group receiving treatment at 3 hours or less.

Lesson Stroke
Acute Stroke—Review of 8 D's

Instructor Tip

- Advise students to refer to the Acute Stroke section of Part 2 in the provider manual. Capture key concepts from the discussion.

Discussion

In a large group, with all students, discuss the following:

- Patients with acute ischemic stroke have a time-dependent benefit for fibrinolytic therapy similar to that of patients with ST-segment elevation MI, but this time-dependent benefit is much shorter.
- The critical time period for administration of IV fibrinolytic therapy begins with the onset of symptoms.
  - Detection: Rapid recognition of stroke signs and symptoms
  - Dispatch: Early activation and dispatch of EMS by phoning the local emergency response number
  - Delivery: Rapid EMS stroke identification, management, triage, transport, and prehospital notification
  - Door: Urgent emergency department triage to a high-acuity area and immediate assessment by the stroke team
  - Data: Rapid clinical evaluation, laboratory testing, and brain imaging
  - Decision: Establishing stroke diagnosis and determining optimal therapy selection
  - Drug/Device: Administration of fibrinolytic and/or endovascular therapy if eligible
  - Disposition: Rapid admission to the stroke unit or critical care unit, or emergency interfacility transfer for endovascular therapy