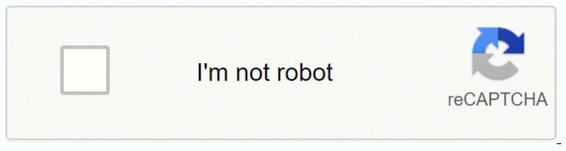

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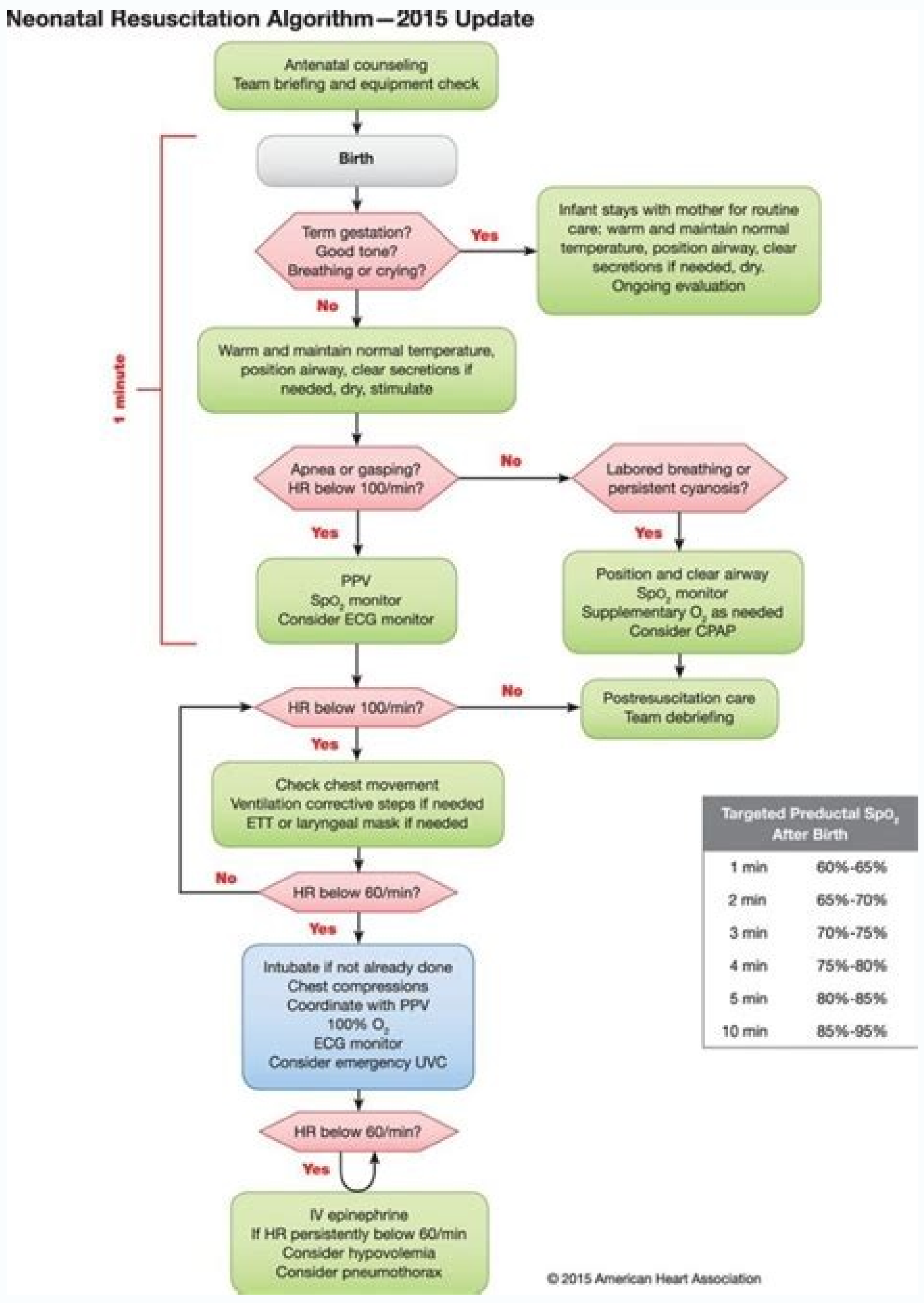
Ilcor guidelines 2015



2015 ecc/ilcor and aha guidelines. Ilcor resuscitation guidelines 2015. What is the recommended bls sequence for the 2015 ilcor guidelines. Guidelines ilcor/erc 2015. 2015 ecc/ilcor and aha® guidelines. Ilcor 2015 neonatal resuscitation guidelines.

Svensson L, Bohm K, Castrèn M, Pettersson H, Engerström L, Herlitz J, Rosenqvist M.Compression-only CPR or standard CPR in out-of-hospital cardiac arrest.N Engl J Med. Time-dependent effectiveness of chest compression-only and conventional cardiopulmonary resuscitation for out-of-hospital cardiac arrest of cardiac origin.Resuscitation. doi: 10.1111/j.1399-6576.2008.01657.x.CrossrefMedlineGoogle Scholar85. Zuercher M, Hilwig RW, Ranger-Moore J, Nysaether J, Nadkarni VM, Berg MD, Kern KB, Sutton R, Berg RA.Leaning during chest compressions impairs cardiac output and left ventricular myocardial blood flow in piglet cardiac arrest.Crit Care Med. Improving Emergency Cardiac Care Saves Lives: CARES Brochure. doi: 10.1161/STR.0b013e318284056a.LinkGoogle Scholar150. Steinmetz J, Barnung S, Nielsen SL, Risom M, Rasmussen LS.Improved survival after an out-of-hospital cardiac arrest using new guidelines.Acta Anaesthesiol Scand. It is reasonable to provide opioid overdose response education with or without naloxone distribution to persons at risk for opioid overdose (or those living with or in frequent contact with such persons) (Class IIa, LOE C-LD). doi: 10.1161/CIR.0000000000000271.LinkGoogle Scholar3. doi: 10.1111/j.1532-5415.2011.03400.x.CrossrefMedlineGoogle Scholar91. The impact of increased chest compression fraction on return of spontaneous circulation for out-of-hospital cardiac arrest patients not in ventricular fibrillation.Resuscitation. 2014 AHA/ACC guideline for the management of patients with non-ST-elevation acute coronary syndromes: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines.Circulation. 2010; 81:155–162. Sekiguchi H, Kondo Y, Kukita I.Verification of changes in the time taken to initiate chest compressions according to modified basic life support guidelines.Am J Emerg Med. Regional variation in out-of-hospital cardiac arrest incidence and outcome.JAMA. 2012; 5:423–428. Matos RI, Watson RS, Nadkarni VM, Huang HH, Berg RA, Meaney PA, Carroll CL, Berens RJ, Praestgaard A, Weissfeld L, Spinella PC; American Heart Association's Get With The Guidelines–Resuscitation (Formerly the National Registry of Cardiopulmonary Resuscitation) Investigators. 2005; 64:297–301. Rea TD, Fahrenbruch C, Culley L, Donohoe RT, Hambly C, Innes J, Bloomingdale M, Subido C, Romines S, Eisenberg MS.CPR with chest compression alone or with rescue breathing.N Engl J Med. This erroneous information can result in failure by dispatchers to identify potential cardiac arrest and failure to instruct bystanders to initiate CPR immediately.13–18 An important consideration is that brief, generalized seizures may be the first manifestation of cardiac arrest.17,182015 Evidence ReviewPatients who are unresponsive and not breathing normally have a high likelihood of being in cardiac arrest.15,18–25 Dispatcher CPR instructions substantially increase the likelihood of bystander CPR performance26 and improve survival from cardiac arrest.27–292015 Recommendations—UpdatedIt is recommended that emergency dispatchers determine if a patient is unresponsive with abnormal breathing after acquiring the requisite information to determine the location of the event (Class I, LOE C-LD). 2008; 94:349–353. 2012; 72:1298–1302; discussion 12303. doi: 10.1016/j.resuscitation.2009.10.026.CrossrefMedlineGoogle Scholar108. 2010; 376:1552–1557. Seventy percent of out-of-hospital cardiac arrests (OHCAs) occur in the home, and approximately 50% are unwitnessed. Cardiopulmonary resuscitation quality: [corrected] improving cardiac resuscitation outcomes both inside and outside the hospital: a consensus statement from the American Heart Association.Circulation. doi: 10.1161/CIR.0000000000000152.CrossrefMedlineGoogle Scholar5. Their use may be considered as part of a research program or if an EMS system has already incorporated ECG artifact-filtering algorithms in its resuscitation protocols (Class IIb, LOE C-EO).new for 20152015Timing of Rhythm CheckIt may be reasonable to immediately resume chest compressions after shock delivery for adults in cardiac arrest in any setting (Class IIb, LOE C-LD).updated for 20152015Chest Compression FeedbackIt may be reasonable to use audiovisual feedback devices during CPR for real-time optimization of CPR performance (Class IIb, LOE B-R).updated for 2015The following recommendations were not reviewed in 2015. doi: 10.1016/S0140-6736(10)61454-7.CrossrefMedlineGoogle Scholar35. As with other Parts of the 2015 American Heart Association(AHA) Guidelines Update for Cardiopulmonary Resuscitation(CPR) and Emergency Cardiovascular Care (ECC), Part 5 is based on the International Liaison Committee on Resuscitation (ILCOR) 2015 international evidence review process. doi: 10.1161/CIRCULATIONAHA.111.059535.CrossrefMedlineGoogle Scholar57. When cardiac arrest is unwitnessed, experts have debated whether a period of CPR might be beneficial before attempting defibrillation, especially in the out-of-hospital setting when access to defibrillation may be delayed until arrival of professional rescuers. 2014; 85:70–74. Accessed May 11, 2015.Google Scholar49. 2006; 70:463–469. Centers for Disease Control and Prevention. Defibrillation or cardiopulmonary resuscitation first for patients with out-of-hospital cardiac arrests found by paramedics to be in ventricular fibrillation? doi: 10.1007/s00134-006-0137-2.CrossrefMedlineGoogle Scholar95. 2011; 82:1501–1507. doi: 10.1016/j.annemergmed.2009.09.018.CrossrefMedlineGoogle Scholar99. doi: 10.1016/j.resuscitation.2012.01.009.CrossrefMedlineGoogle Scholar105. doi: 10.1016/j.resuscitation.2013.10.002.CrossrefMedlineGoogle Scholar58. GazmuriRosalind Franklin University of Medicine and ScienceVA Merit Review Grant†; Defense Medical Research and Development Program (DMRDP), Applied Research and Technology Development Award (ARADTA)†; Chicago Medical School and Advocate Lutheran General Hospital Translational Research Pilot Grant Program†; Baxter Healthcare Corporation†; Friends Medical Research Institute†; ZOLL Medical Corporation†NoneNoneNoneNoneNoneNoneZachary D. In an older series of 313 IHCA patients, the percentage who survived to discharge was 45% when resuscitation lasted less than 5 minutes and less than 5% when the resuscitation extended beyond 20 minutes.125 More recently, an analysis from a single-hospital registry in Taiwan suggested that the rate of achieving ROSC was higher than 90% among patients resuscitated for less than 10 minutes but approximately 50% for those resuscitated for 30 minutes or more.126Two observational cohort studies of patients with in-hospital arrests from the Get With The Guidelines®-Resuscitation registry were recently published suggesting that extending the duration of resuscitation efforts may result in improved cardiac arrest survival. 2009; 13:469–477. Recommendations regarding the duration of each breath and the need to make the chest rise were not updated in 2015.Early Defibrillation With an AEDAfter activating the emergency response system, the lone rescuer retrieves an AED (if nearby and easily accessible) and then returns to the victim to attach and use the AED and provide CPR. For patients in cardiac arrest, medication administration is ineffective without concomitant chest compressions for drug delivery to the tissues, so naloxone administration may be considered after initiation of CPR if there is high suspicion for opiate overdose (Class IIb, LOE C-EO). Out-of-hospital cardiac arrest survival improving over time: Results from the Resuscitation Outcomes Consortium (ROC).Resuscitation. /media/health/publichealth/documents/ems/2014AnnualReport.ashx. Bystander-initiated rescue breathing for out-of-hospital cardiac arrests of noncardiac origin.Circulation. 1993; 22(2 pt 2):354–365.CrossrefMedlineGoogle Scholar12. doi: 10.1016/j.resuscitation.2010.03.013.CrossrefMedlineGoogle Scholar75. doi: 10.1056/NEJM200010263431701.CrossrefMedlineGoogle Scholar97. This study, however, included only victims who had witnessed arrest from VF or pulseless ventricular tachycardia (pVT).452015 Recommendations—NewWe do not recommend the routine use of passive ventilation techniques during conventional CPR for adults (Class IIb, LOE C-LD). doi: 10.1016/j.annemergmed.2010.01.036.CrossrefMedlineGoogle Scholar82. Dispatchers should instruct rescuers to provide CPR if the victim is unresponsive with no normal breathing, even when the victim demonstrates occasional gasps (Class I, LOE C-LD).Scenario: Pulse Present, Normal BreathingClosely monitor the patient, and activate the emergency response system as indicated by location and patient condition.Scenario: Pulse Present, No Normal BreathingBLS 811, BLS 891—UpdatedThis topic was last reviewed in 2010. If someone responds, ensure that the phone is at the side of the victim if at all possible.Shout for nearby help/activate the resuscitation team; can activate the resuscitation team at this time or after checking breathing and pulse.4Follow the dispatcher's instructions.Check for no breathing or only gasping; if none, begin CPR with compressions.Check for no breathing or only gasping and check pulse (ideally simultaneously). Hallstrom A, Cobb L, Johnson E, Copass M.Cardiopulmonary resuscitation by chest compression alone or with mouth-to-mouth ventilation.N Engl J Med. In 2010, the Guidelines emphasized the importance of avoiding pauses in cardiac compressions during CPR. doi: 10.1016/j.resuscitation.2006.10.027.CrossrefMedlineGoogle Scholar120. Constant flow insufflation of oxygen as the sole mode of ventilation during out-of-hospital cardiac arrest.Intensive Care Med. 2008; 358:9–17. doi: 10.1161/CIR.0000000000000134.LinkGoogle Scholar149. doi: 10.1001/archinternmed.2009.196.CrossrefMedlineGoogle Scholar9. doi: 10.1111/j.1553-2712.2010.00689.x.CrossrefMedlineGoogle Scholar44. Stiell IG, Brown SP, Christenson J, Cheskes S, Nichol G, Powell J, Bigham B, Morrison LJ, Larsen J, Hess E, Vaillancourt C, Davis DP, Callaway CW; Resuscitation Outcomes Consortium (ROC) Investigators. Overall, outcomes were typically better in the 30:2 group compared with the 15:2 group.2015 Recommendation—UnchangedConsistent with the 2010 Guidelines, it is reasonable for rescuers to provide a compression-to-ventilation ratio of 30:2 for adults in cardiac arrest (Class IIa, LOE C-LD).Layperson—Compression-Only CPR Versus Conventional CPRBLS 372 (Chest Compressions Plus Rescue Breaths)—UpdatedThe 2015 ILCOR systematic review addressed whether layperson CPR consisting of chest compressions alone compared with conventional CPR (compressions plus rescue breaths) influenced physiologic or clinical outcomes.2015 Summary of EvidenceEvidence comparing layperson compression-only CPR with conventional CPR is derived from RCTs of dispatcher-guided CPR and observational studies. 2000; 343:1206–1209. Hüpfl M, Selig HF, Nagele P.Chest-compression-only versus standard cardiopulmonary resuscitation: a meta-analysis.Lancet. For more information, see the 2010 AHA Guidelines for CPR and ECC, "Part 5: Adult Basic Life Support."2010Activating the Emergency Response SystemThe EMS system quality improvement process, including review of the quality of dispatcher CPR instructions provided to specific callers, is considered an important component of a high-quality lifesaving program (Class IIa, LOE B).not reviewed in 20152010Pulse CheckThe healthcare provider should take no more than 10 seconds to check for a pulse and, if the rescuer does not definitely feel a pulse within that time period, the rescuer should start chest compressions (Class IIa, LOE C).not reviewed in 20152010Chest CompressionsEffective chest compressions are essential for providing blood flow during CPR. 2015; 8:226–234. Daya MR, Schmicker RH, Zive DM, Rea TD, Nichol G, Buick JE, Brooks S, Christenson J, MacPhee R, Craig A, Rittenberger JC, Davis DP, May S, Wigginton J, Wang H; Resuscitation Outcomes Consortium Investigators. These links are indicated by a combination of letters and numbers (eg, BLS 740). doi: 10.1111/j.1399-6576.2008.01723.x.CrossrefMedlineGoogle Scholar42. Improved out-of-hospital cardiac arrest survival after the sequential implementation of 2005 AHA guidelines for compressions, ventilations, and induced hypothermia: the Wake County experience.Ann Emerg Med. Integrated teams of highly trained rescuers may use a choreographed approach that accomplishes multiple steps and assessments simultaneously rather than in the sequential manner used by individual rescuers (eg, one rescuer activates the emergency response system while another begins chest compressions, a third either provides ventilation or retrieves the bag-mask device for rescue breaths, and a fourth retrieves and sets up a defibrillator). 2008; 168:1063–1069. Edelson DP, Abella BS, Kramer-Johansen J, Wik L, Myklebust H, Barry AM, Merchant RM, Hoek TL, Steen PA, Becker LB.Effects of compression depth and pre-shock pauses predict defibrillation failure during cardiac arrest.Resuscitation. Powers WJ, Derdeyn CP, Biller J, Coffey CS, Hoh BL, Jauch EC, Johnston KC, Johnston SC, Khalessi AA, Kidwell CS, Meschia JF, Ovbiagele B, Yavagal DR; on behalf of the American Heart Association Stroke Council. Despite the varied environments and team members, a designated team leader is needed to direct and coordinate all components of the resuscitation with a central focus on delivering high-quality CPR. Saïssy JM, Boussignac G, Cheptel E, Rouvin B, Fontaine D, Bargues L, Levecque JP, Michel A, Brochard L.Efficacy of continuous insufflation of oxygen combined with active cardiac compression-decompression during out-of-hospital cardiorespiratory arrest.Anesthesiology. . The 2015 ILCOR systematic review addressed whether compression-to-ventilation ratios different from 30:2 influenced physiologic or clinical outcomes. However, the additional search for available evidence regarding overdose education and naloxone distribution programs yielded 3 observational before-and-after studies. doi: 10.1186/1741-7015-8-52.CrossrefMedlineGoogle Scholar110. Resuscitation Outcomes Consortium. Nichol G, Thomas E, Callaway CW, Hedges J, Powell JL, Aufderheide TP, Rea T, Lowe R, Brown T, Dreyer J, Davis D, Idris A, Stiell I; Resuscitation Outcomes Consortium Investigators. Cairns KJ, Hamilton AJ, Marshall AH, Moore MJ, Adgey AA, Kee F.The obstacles to maximising the impact of public access defibrillation: an assessment of the dispatch mechanism for out-of-hospital cardiac arrest.Heart. The team leader choreographs team activities with an aim to minimize interruptions in CPR and, through the use of real-time feedback, ensures delivery of adequate compression rate and depth, minimization of leaning, and interruptions in chest compressions, and avoidance of excessive ventilation.73 More information on team training is available in "Part 14: Education" and "Part 4: Systems of Care and Continuous Quality Improvement."Duration of ResuscitationInvestigators have published relatively few studies that examine the impact of resuscitation duration on clinical outcomes, and most of these studies have important limitations. Healthcare providers should call for nearby help upon finding the victim unresponsive, but it would be practical for a healthcare provider to continue to assess for breathing and pulse simultaneously before fully activating the emergency response system.For OHCA, a recent Scientific Statement recommended that all emergency dispatchers have protocols to guide the lay rescuer to check for breathing and to perform the steps of CPR, if needed.12 When dispatchers ask bystanders to determine if breathing is present, bystanders often misinterpret agonal gasps or abnormal breathing as normal breathing. doi: 10.1161/CIR.0b013e31829d8654.LinkGoogle Scholar74. doi: 10.1161/CIRCOUTCOMES.108.839225.LinkGoogle Scholar118. doi: 10.4414/smw.2013.13856.MedlineGoogle Scholar33. 2013; 127:442–451. This is accomplished by a quick scan of the patient's location and surroundings to make sure there are no imminent physical threats such as toxic or electrical hazards.Recognition of ArrestBLS 359, BLS 740—UpdatedThe necessary first step in the treatment of cardiac arrest is immediate recognition. doi: 10.1111/j.1526-4637.2011.01128.x.CrossrefMedlineGoogle Scholar51. Stroke. 2006; 25:89–96. 2000; 28(11 suppl):N190–N192.CrossrefMedlineGoogle Scholar29. For victims with suspected spinal injury, rescuers should initially use manual spinal motion restriction (eg, placing 1 hand on either side of the patient's head to hold it still) rather than immobilization devices, because use of immobilization devices by lay rescuers may be harmful (Class III: Harm, LOE C-LD). Chest compression rate is defined as the actual rate used during each continuous period of chest compressions. Dispatchers should provide chest compression–only CPR instructions to callers for adults with suspected OHCA (Class I, LOE C-LD). Goldberger ZD, Nichol G.Registries to measure and improve outcomes after cardiac arrest.Curr Opin Crit Care. KleinmanBoston Children's HospitalNoneNoneNoneNoneNoneNoneNoneBentley J. Caffrey SL, Willoughby PJ, Pepe PE, Becker LB.Public use of automated external defibrillators.N Engl J Med. Activation and retrieval of the AED/emergency equipment by either the lone healthcare provider or by the second person sent by the rescuer must occur no later than immediately after the check for no normal breathing and no pulse identifies cardiac arrest.5Look for no breathing or only gasping, at the direction of the dispatcher.Answer the dispatcher's questions, and follow the dispatcher's instructions.Immediately begin CPR, and use the AED/defibrillator when available.6Follow the dispatcher's instructions.Send the second person to retrieve an AED, if one is available.When the second rescuer arrives, provide 2-person CPR and use AED/defibrillator.Immediate Recognition and Activation of the Emergency Response SystemBLS 740, BLS 359—UpdatedEmergency medical dispatch is an integral component of the EMS response.11 Bystanders (lay responders) should immediately call their local emergency number to initiate a response any time they find an unresponsive adult victim. Incomplete recoil could increase intrathoracic pressure and reduce venous return, coronary perfusion pressure, and myocardial blood flow and could potentially influence resuscitation outcomes.67,68 Observational studies indicate that leaning is common during CPR in adults and children.69,702015 Summary of EvidenceThere are no human studies reporting the relationship between chest wall recoil and clinical outcomes. Niles D, Nysaether J, Sutton R, Nishisaki A, Abella BS, Arbogast K, Maltese MR, Berg RA, Helfaer M, Nadkarni V.Leaning is common during in-hospital pediatric CPR, and decreased with automated corrective feedback.Resuscitation. Bobrow BJ, Spaite DW, Berg RA, Stolz U, Sanders AB, Kern KB, Vadeboncoeur TF, Clark LL, Gallagher JV, Stapczynski JS, LoVecchio F, Mullins TJ, Humble WO, Ewy GA.Chest compression-only CPR by lay rescuers and survival from out-of-hospital cardiac arrest.JAMA. Jost D, Degrange H, Verret C, Hersan O, Banville IL, Chapman FW, Lank P, Petit JL, Fuilla C, Migliani R, Carpentier JP; DEFI 2005 Work Group. doi: 10.1016/j.resuscitation.2012.04.011.CrossrefMedlineGoogle Scholar31. Since the 2014 US Food and Drug Administration approval of the use of a naloxone autoinjector by lay rescuers and healthcare providers,48 the training network has requested information regarding the best way to incorporate such a device in the BLS sequence. CARES: Cardiac Arrest Registry to Enhance Survival. Garza AG, Gratton MC, Chen JJ, Carlson B.The accuracy of predicting cardiac arrest by emergency medical services dispatchers: the calling party effect.Acad Emerg Med. Meier P, Baker P, Jost D, Jacobs I, Henzi B, Knapp G, Sasson C.Chest compressions before defibrillation for out-of-hospital cardiac arrest: a meta-analysis of randomized controlled clinical trials.BMC Med. Recent trends in survival from out-of-hospital cardiac arrest in the United States.Circulation. Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, Cushman M, de Ferranti S, Després JP, Fullerton HJ, Howard VJ, Huffman MD, Judd SE, Kissela BM, Lackland DT, Lichtman JH, Lisabeth LD, Liu S, Mackey RH, Matchar DB, McGuire DK, Mohler ER, Moy CS, Muntner P, Mussolino ME, Nasir K, Neumar RW, Nichol G, Palaniappan L, Pandey DK, Reeves MJ, Rodriguez CJ, Sorlie PD, Stein J, Towfighi A, Turan TN, Virani SS, Willey JZ, Woo D, Yeh RW, Turner MB; on behalf of the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Qvigstad E, Kramer-Johansen J, Tømte Ø, Skålhegg T, Sørensen Ø, Sunde K, Olasveengen TM.Clinical pilot study of different hand positions during manual chest compressions monitored with capnography.Resuscitation. doi: 10.1056/NEJM200005253422101.CrossrefMedlineGoogle Scholar86. Kitamura T, Iwami T, Kawamura T, Nagao K, Tanaka H, Berg RA, Hiraide A; Implementation Working Group for All-Japan Utstein Registry of the Fire and Disaster Management Agency. In an analysis of simulated resuscitations in an urban emergency department, investigators demonstrated that family presence may have a significant effect on physicians' ability to perform critical interventions as well as on resuscitation-based performance outcomes.145 Specifically, the presence of a witness to resuscitation was associated with longer mean times to defibrillation (2.6 versus 1.7 minutes) and fewer shocks (4.0 versus 6.0).A recent observational study using the Get With The Guidelines-Resuscitation registry demonstrated that implementing a hospital policy that allows family presence had no impact on survival or the processes of attempted resuscitations.146 Overall, given the evidence for improved psychological benefits for families present during out-of-hospital resuscitation, and without an apparent negative effect on outcomes at hospitals that allow families to be present, family presence represents an important dimension in the paradigm of resuscitation quality.Special Resuscitation SituationsAcute Coronary SyndromeAcute coronary syndrome (ACS) is a term that subtends a spectrum of diseases leading to myocardial ischemia or infarction. 2013; 127:529–555. 2015; 131:e29–e322. Hastings RH, Wood PR.Head extension and laryngeal view during laryngoscopy with cervical spine stabilization maneuvers.Anesthesiology. Factors modifying the effect of bystander cardiopulmonary resuscitation on survival in out-of-hospital cardiac arrest patients in Sweden.Eur Heart J. 2009; 302:1195–1201. 2006; 114:2760–2765. 2001; 22:511–519.CrossrefMedlineGoogle Scholar88. 2007; 14:256–259. Others have suggested that prolonged VF is energetically detrimental to the ischemic heart, justifying rapid defibrillation attempts regardless of the duration of arrest.2015 Evidence SummaryFive RCTs,100–104 4 observational cohort studies,105–108 3 meta-analyses,109–111 and 1 subgroup analysis of an RCT112 addressed the question of CPR before defibrillation. Jauch EC, Saver JL, Adams HP, Bruno A, Connors JJ, Demaerschalk BM, Khatri P, McMullan PW, Qureshi AI, Rosenfield K, Scott PA, Summers DR, Wang DZ, Wintermark M, Yonas H; American Heart Association Stroke Council; Council on Cardiovascular Nursing; Council on Peripheral Vascular Disease; Council on Clinical Cardiology. The optimal goal for chest compression fraction has not been defined. The 2015 Guidelines Update incorporates new evidence about the potential for an upper threshold of compression depth beyond which outcomes may be adversely affected.2015 Summary of EvidenceEvidence involving compression depth is derived from observational human studies that evaluate the relationship between compression depth and outcomes including survival with favorable neurologic outcome, survival to hospital discharge, and ROSC. This section presents the updated recommendations for adult BLS guidelines for lay rescuers and healthcare providers. 2009; 27:470–474. doi: 10.1300/J069v25n03_11.CrossrefMedlineGoogle Scholar52. American Heart Association. 2007; 14:877–883. 1999; 281:1182–1188.CrossrefMedlineGoogle Scholar106. Valenzuela TD, Roe DJ, Nichol G, Clark LL, Spaite DW, Hardman RG.Outcomes of rapid defibrillation by security officers after cardiac arrest in casinos.N Engl J Med. 2012; 61:344–347.MedlineGoogle Scholar152. This treatment recommendation is explored in depth in "Part 15: First Aid."Open the Airway: Healthcare ProviderA healthcare provider uses the head tilt–chin lift maneuver to open the airway of a victim with no evidence of head or neck trauma. 2015. There were no short-term survival differences in any of the 3 individual randomized trials comparing the 2 types of dispatcher instructions.27,29,85 Based on meta-analysis of the 2 largest randomized trials (total n=2496), dispatcher instruction in compression-only CPR was associated with long-term survival benefit compared with instruction in chest compressions and rescue breathing.34 Among the observational studies, survival outcomes were not different when comparing the 2 types of CPR.35–42,86–902015 Recommendations—UpdatedThe following recommendations are consistent with 2010 Guidelines involving layperson CPR. ILCOR Basic Life Support (BLS) Task Force members identified and prioritized topics and questions with the newest or most controversial evidence, or those that were thought to be most important for resuscitation. McNally B, Robb R, Mehta M, Vellano K, Valderrama AL, Yoon PW, Sasson C, Crouch A, Perez AB, Merritt R, Kellermann A; Centers for Disease Control and Prevention. Goldberger ZD, Chan PS, Berg RA, Kronick SL, Cooke CR, Lu M, Banerjee M, Hayward RA, Krumholz HM, Nallamothu BK; American Heart Association Get With The Guidelines—Resuscitation (formerly National Registry of Cardiopulmonary Resuscitation) Investigators. Marsch S, Tschan F, Semmer NK, Zobrist R, Hunziker PR, Hunziker S.ABC versus CAB for cardiopulmonary resuscitation: a prospective, randomized simulator-based trial.Swiss Med Wkly. continuous chest compressions only in out-of-hospital cardiac arrest.Acta Anaesthesiol Scand. Accessed May 9, 2015.Google Scholar131. Beesems SG, Wijmans L, Tijssen JG, Koster RW.Duration of ventilations during cardiopulmonary resuscitation by lay rescuers and first responders: relationship between delivering chest compressions and outcomes.Circulation. 2009; 80:1253–1258. Key changes and continued points of emphasis in this 2015 Guidelines Update include the following:The crucial links in the adult out-of-hospital Chain of Survival are unchanged from 2010; however, there is increased emphasis on the rapid identification of potential cardiac arrest by dispatchers, with immediate provision of CPR instructions to the caller.This Guidelines Update takes into consideration the ubiquitous presence of mobile phones that can allow the rescuer to activate the emergency response system without leaving the victim's side. doi: 10.1097/CCM.0000000000000824.CrossrefMedlineGoogle Scholar56. Bång A, Herlitz J, Martinell S.Interaction between emergency medical dispatcher and caller in suspected out-of-hospital cardiac arrest calls with focus on agonal breathing. In 2015, the review focused on (1) the evidence surrounding the clinical benefit of automatic external defibrillators in the out-of-hospital setting by laypeople and healthcare providers, and (2) the complex choreography of care needed to ensure high-quality CPR and effective defibrillation.CPR Before DefibrillationBLS 363—UpdatedThe 2015 ILCOR systematic review addressed whether a specified period (typically 1.5 to 3 minutes) of chest compressions before shock delivery compared with a short period of chest compressions before shock delivery affected resuscitation outcomes. 1986; 15:667–673.CrossrefMedlineGoogle Scholar55. doi: 10.1001/jama.2013.282173.CrossrefMedlineGoogle Scholar138. 2011; 82:257–262. A randomised control trial.Resuscitation. doi: 10.1161/CIRCOUTCOMES.111.964668.LinkGoogle Scholar117. Iwami T, Kawamura T, Hiraide A, Berg RA, Hayashi Y, Nishiuchi T, Kajino K, Yonemoto N, Yukioka H, Sugimoto H, Kakuchi H, Sase K, Yokoyama H, Nonogi H.Effectiveness of bystander-initiated cardiac-only resuscitation for patients with out-of-hospital cardiac arrest.Circulation. 2008; 79:424–431. 2014; 85:336–342. doi: 10.1016/j.ajem.2008.03.043.CrossrefMedlineGoogle Scholar107. 2008; 78:119–126. doi: 10.1016/j.resuscitation.2006.05.011.CrossrefMedlineGoogle Scholar62. CPR training, both formal classroom training and "just-in-time" training such as that given through a dispatch center, should emphasize how to recognize occasional gasps. One RCT79 comparing immediate postshock CPR to rhythm checks failed to demonstrate improved ROSC or survival to hospital admission or discharge. Orlowski JP.Optimum position for external cardiac compression in infants and young children.Ann Emerg Med. 2013; 84:760–765. Chan PS, Nichol G, Krumholz HM, Spertus JA, Jones PG, Peterson ED, Rathore SS, Nallamothu BK; American Heart Association National Registry of Cardiopulmonary Resuscitation (NRCPR) Investigators. Providers received additional training with emphasis on provision of high-quality chest compressions.2015 Recommendation—NewFor witnessed OHCA with a shockable rhythm, it may be reasonable for EMS systems with priority-based, multitiered response to delay positive-pressure ventilation by using a strategy of up to 3 cycles of 200 continuous compressions with passive oxygen insufflation and airway adjuncts (Class IIb, LOE C-LD).Adult BLS SkillsThe sequence of BLS skills for the healthcare provider is depicted in the BLS Healthcare Provider Adult Cardiac Arrest Algorithm (Figure 1). doi: 10.1016/j.resuscitation.2006.04.008.CrossrefMedlineGoogle Scholar63. doi: 10.1016/j.resuscitation.2008.12.005.CrossrefMedlineGoogle Scholar83. 2012; 83:1212–1218. Dispatchers should be educated to identify unresponsiveness with abnormal breathing and agonal gasps across a range of clinical presentations and descriptions (Class I, LOE C-LD).The role of dispatcher-guided CPR and recommendations for dispatcher training are more fully described in "Part 4: Systems of Care and Continuous Quality Improvement."Pulse CheckAs recommended in the 2010 Guidelines, healthcare providers will continue to check for a pulse, limiting the time to no more than 10 seconds to avoid delay in initiation of chest compressions. doi: 10.1097/CCM.0b013e31823e99ae.CrossrefMedlineGoogle Scholar27. 2011; 82:3–9. Assessment of rhythm after shock delivery lengthens the period of time that chest compressions are not delivered.2015 Evidence SummaryThree before-and-after observational studies of OHCA44,47,113 evaluated the impact of omitting a rhythm check immediately after attempted defibrillation as part of a bundle of interventions to minimize pauses in chest compressions (eg, elimination of 3 stacked shocks and postshock rhythm and pulse checks). TraversEmergency Health Services, Nova ScotiaNoneNoneNoneNoneNoneAmerican Heart Association†NoneAppendix2015 Guidelines Update: Part 5 RecommendationsYear Last ReviewedTopicRecommendationComments2015Immediate Recognition and Activation of the Emergency Response SystemIt is recommended that emergency dispatchers determine if a patient is unresponsive with abnormal breathing after acquiring the requisite information to determine the location of the event (Class I, LOE C-LD).updated for 20152015Immediate Recognition and Activation of the Emergency Response SystemIf the patient is unresponsive with abnormal or absent breathing, it is reasonable for the emergency dispatcher to assume that the patient is in cardiac arrest (Class IIa, LOE C-LD).updated for 20152015Immediate Recognition and Activation of the Emergency Response SystemDispatchers should be educated to identify unresponsiveness with abnormal breathing and agonal gasps across a range of clinical presentations and descriptions (Class I, LOE C-LD).updated for 20152015Early CPRSimilar to the 2010 Guidelines, it may be reasonable for rescuers to initiate CPR with chest compressions (Class IIb, LOE C-LD).updated for 20152015Untrained Lay RescuerUntrained lay rescuers should provide compression-only CPR, with or without dispatcher assistance (Class I, LOE C-LD).updated for 20152015Untrained Lay RescuerThe rescuer should continue compression-only CPR until the arrival of an AED or rescuers with additional training (Class I, LOE C-LD).updated for 20152015Trained Lay RescuerAll lay rescuers should, at a minimum, provide chest compressions for victims of cardiac arrest (Class I, LOE C-LD). GoldbergerUniversity of WashingtonNoneNoneNoneNoneNoneNoneNoneThomas ReaDepartment of Medicine, University of Washington; Public Health-Seattle and King County, Emergency Medical Services DivisionPhilips*; Medtronic Foundation*; NIH*; Laerdal Foundation*; Life Sciences Discovery Fund*NoneNoneNoneNoneNoneUniversity of Washington*Robert A. 2011; 15:393–400. Observational clinical studies and mechanistic studies in animal models suggest that CPR under conditions of prolonged untreated VF might help restore metabolic conditions of the heart favorable to defibrillation. 2012; 83:1349–1357. Vadeboncoeur T, Stolz U, Panchal A, Silver A, Venuti M, Tobin J, Smith G, Nunez M, Karamooz M, Spaite D, Bobrow B.Chest compression depth and survival in out-of-hospital cardiac arrest.Resuscitation. 2007; 73:236–245. Emergency medical service dispatch cardiopulmonary resuscitation prearrival instructions to improve survival from out-of-hospital cardiac arrest: a scientific statement from the American Heart Association.Circulation. doi: 10.1080/10903120903144965.CrossrefMedlineGoogle Scholar84. Bertrand C, Hemery F, Carli P, Goldstein P, Espesson C, Rüttimann M, Macher JM, Raffy B, Fuster P, Dolveck F, Rozenberg A, Lecarpentier E, Duvaldestin P, Saissy JM, Boussignac G, Brochard L; Boussignac Study Group. doi: 10.1016/S0300-9572(11)70147-2.CrossrefMedlineGoogle Scholar69. doi: 10.1016/j.resuscitation.2010.09.468.CrossrefMedlineGoogle Scholar38. Sasson C, Rogers MA, Dahl J, Kellermann AL.Predictors of survival from out-of-hospital cardiac arrest: a systematic review and meta-analysis.Circ Cardiovasc Qual Outcomes. Chiang WC, Chen WJ, Chen SY, Ko PC, Lin CH, Tsai MS, Chang WT, Chen SC, Tsan CY, Ma MH.Better adherence to the guidelines during cardiopulmonary resuscitation through the provision of audio-prompts.Resuscitation. The evaluation did not focus on opioid-associated respiratory arrest.The authors acknowledge the epidemiologic data demonstrating the large burden of disease from lethal opioid overdoses as well as targeted national strategies for bystander-administered naloxone for people at risk. Rea TD, Helbock M, Perry S, Garcia M, Cloyd D, Becker L, Eisenberg M.Increasing use of cardiopulmonary resuscitation during out-of-hospital ventricular fibrillation arrest: survival implications of guideline changes.Circulation. The rescuer delivers breaths during pauses in compressions and delivers each breath over approximately 1 second (Class IIa, LOE C-LD).Ventilation With an Advanced AirwayBLS 808—UpdatedWhen the victim has an advanced airway in place during CPR, rescuers no longer deliver cycles of 30 compressions and 2 breaths (ie, they no longer interrupt compressions to deliver 2 breaths). 2008; 52:908–913. Sainio M, Kämäräinen A, Huhtala H, Aaltonen P, Tenhunen J, Olkkola KT, Hoppu S.Real-time audiovisual feedback system in a physician-staffed helicopter emergency medical service in Finland: the quality results and barriers to implementation.Scand J Trauma Resusc Emerg Med. Public-access defibrillation and survival after out-of-hospital cardiac arrest.N Engl J Med. doi: 10.1016/j.resuscitation.2008.03.012.CrossrefMedlineGoogle Scholar39. This amount is usually sufficient to produce visible chest rise and maintain oxygenation and normocarbia in apneic patients (Class IIa, LOE C).not reviewed in 20152010Bag-Mask VentilationThe rescuer delivers ventilations during pauses in compressions and delivers each breath over 1 second (Class IIa, LOE C).not reviewed in 20152010Mouth-to-Nose and Mouth-to-Stoma VentilationVentilation with a bag through these devices provides an acceptable alternative to bag-mask ventilation for well-trained healthcare providers who have sufficient experience to use the devices for airway management during cardiac arrest (Class IIa, LOE B).not reviewed in 20152010Cricoid PressureThe routine use of cricoid pressure in adult cardiac arrest is not recommended (Class III, LOE B).not reviewed in 20152010AED DefibrillationRapid defibrillation is the treatment of choice for VF of short duration, such as for victims of witnessed out-of-hospital cardiac arrest or for hospitalized patients whose heart rhythm is monitored (Class I, LOE A).not reviewed in 20152010AED DefibrillationThere is insufficient evidence to recommend for or against delaying defibrillation to provide a period of CPR for patients in VF/pulseless VT out-of-hospital cardiac arrest. 2014; 130:e344–e426. 2000; 342:1546–1553. Racial differences in survival after in-hospital cardiac arrest.JAMA. For adults with unmonitored cardiac arrest or for whom an AED is not immediately available, it is reasonable that CPR be initiated while the defibrillator equipment is being retrieved and applied and that defibrillation, if indicated, be attempted as soon as the device is

ready for use (Class IIa, LOE B-R).Analysis of Rhythm During CompressionsBLS 373—UpdatedThe 2015 ILCOR systematic review addressed whether analysis of cardiac rhythm during chest compressions compared with analysis of cardiac rhythm during pauses in chest compressions affected resuscitation outcomes.Although the performance of chest compressions during AED rhythm analysis would reduce the time that CPR is paused, motion artifacts currently preclude reliable AED assessment of heart rhythm during chest compressions and may delay VF/pVT identification and defibrillation.2015 Evidence SummaryThere are currently no published human studies that address whether compressions during manual defibrillator or AED rhythm analysis affect patient outcome. 2011; 59:822–826. doi: 10.1056/NEJMc1214188.CrossrefMedlineGoogle Scholar143. 2006; 119:335–340. doi: 10.1097/MEJ.0b013e32823a3cd1.CrossrefMedlineGoogle Scholar17. 2015; 91:108–115. 2009; 120:1241–1247. In addition, other parts of the 2015 AHA Guidelines Update for CPR and ECC include updates on basic and advanced life support for prehospital providers who care for these patients ("Part 9: Acute Coronary Syndromes," "Part 4: Systems of Care and Continuous Quality Improvement," and "Part 10: Special Circumstances of Resuscitation"; aspirin and chest pain are presented in "Part 15: First Aid").StrokeApproximately 800 000 people have a stroke each year in the United States, and stroke is a leading cause of severe, long-term disability and death.4 Fibrinolytic therapy administered within the first hours of the onset of symptoms limits neurologic injury and improves outcome in selected patients with acute ischemic stroke. 2014; 64:1–8. The 2015 ILCOR systematic review addressed whether shorter compared with longer interruptions in chest compressions influenced physiologic or clinical outcomes. Hostler D, Everson-Stewart S, Rea TD, Stiell IG, Callaway CW, Kudenchuk PJ, Sears GK, Emerson SS, Nichol G; Resuscitation Outcomes Consortium Investigators. 2002; 347:1242–1247. 2011; 82:1019–1024. Ideally, the pulse check is performed simultaneously with the check for no breathing or only gasping, to minimize delay in detection of cardiac arrest and initiation of CPR. doi: 10.1161/CIRCULATIONAHA.109.926816.CrossrefMedlineGoogle Scholar37. DEFI 2005: a randomized controlled trial of the effect of automated external defibrillator cardiopulmonary resuscitation protocol on outcome from out-of-hospital cardiac arrest.Circulation. 2013; 143:w13856. The specific steps for rescuers and healthcare providers (compression-only [Hands-Only™] CPR, conventional CPR with rescue breaths, and CPR with AED use) are determined by the rescuer's level of training.Untrained Lay Rescuer—UpdatedBystander CPR may prevent VF from deteriorating to asystole, and it also increases the chance of defibrillation, contributes to preservation of heart and brain function, and improves survival from OHCA.33 Bystander CPR rates remain unacceptably low in many communities. Flynn J, Archer F, Morgans A.Sensitivity and specificity of the medical priority dispatch system in detecting cardiac arrest emergency calls in Melbourne.Prehosp Disaster Med. Hallstrom AP, Cobb LA, Johnson E, Copass MK.Dispatcher assisted CPR: implementation and potential benefit. doi: 10.1161/CIRCULATIONAHA.109.878389.LinkGoogle Scholar80. doi: 10.1161/CIRCOUTCOMES.109.889576.LinkGoogle Scholar34. In adult cardiac arrest with an unprotected airway, it may be reasonable to perform CPR with the goal of a chest compression fraction as high as possible, with a target of at least 60% (Class IIb, LOE C-LD).Compression-to-Ventilation RatioBLS 362—UpdatedIn 2005, the recommended compression-to-ventilation ratio for adults in cardiac arrest was changed from 15:2 to 30:2. Ma MH, Chiang WC, Ko PC, Yang CW, Wang HC, Chen SY, Chang WT, Huang CH, Chou HC, Lai MS, Chien KL, Lee BC, Hwang CH, Wang YC, Hsiung GH, Hsiao YW, Chang AM, Chen WJ, Chen SC.A randomized trial of compression first or analyze first strategies in patients with out-of-hospital cardiac arrest: results from an Asian community.Resuscitation. Simpson PM, Goodger MS, Bendall JC.Delayed versus immediate defibrillation for out-of-hospital cardiac arrest due to ventricular fibrillation: A systematic review and meta-analysis of randomised controlled trials.Resuscitation. Chest compression rates and survival following out-of-hospital cardiac arrest.Crit Care Med. doi: 10.1056/NEJMoa0908993.CrossrefMedlineGoogle Scholar30. 2011; 342:d512.CrossrefMedlineGoogle Scholar59. doi: 10.1111/j.1553-2712.2009.00604.x.CrossrefMedlineGoogle Scholar139. Different rescuer hand positions alter the mechanics of chest compressions and may, in turn, influence their quality and effectiveness.2015 Summary of EvidenceOnly a few human studies involving a total of fewer than 100 cardiac arrest patients have evaluated hand position during CPR.52–54 These investigations assessed hand placement on the lower third of the sternum compared with the center of the chest in a crossover design, and they measured physiologic endpoints, such as blood pressure and end-tidal carbon dioxide (ETCO2). 2011; 12suppl 2:S77–S85. 2012; 125:3004–3012. The evidence for this was last reviewed in 2010. SworWilliam Beaumont HospitalNoneNoneNoneNoneNoneNoneMark TerryJohnson County MED-ACTNoneNoneNoneNoneNoneNoneConsultantAndrew H. 2010; 363:423–433. Olasveengen TM, Wik L, Steen PA.Standard basic life support vs. Chest wall recoil creates a relative negative intrathoracic pressure that promotes venous return and cardiopulmonary blood flow. doi: 10.1056/NEJMoa0908991.CrossrefMedlineGoogle Scholar28. 2003; 289:1389–1395.CrossrefMedlineGoogle Scholar101. In cardiac arrest patients without an advanced airway, chest compressions are briefly paused to provide rescue breaths in order to achieve adequate air entry.2015 Summary of EvidenceEvidence involving the compression-to-ventilation ratio is derived from observational before-and-after human studies in the out-of-hospital setting.81–84 These studies compared the compression-to-ventilation ratio of 30:2 with 15:2 for survival and other outcomes. doi: 10.1161/CIRCULATIONAHA.112.000841.CrossrefMedlineGoogle Scholar81. 2006; 71:283–292. Other important aspects of CPR quality include resuscitation team dynamics, system performance, and quality monitoring.Today, despite clear evidence that providing high-quality CPR significantly improves cardiac resuscitation outcomes, few healthcare organizations consistently apply strategies of systematically monitoring CPR quality.115 As a consequence, there is an unacceptable disparity in the quality of resuscitation care and outcomes, as well an enormous opportunity to save more lives.59Like other urgent healthcare conditions, the use of a relatively simple, iterative continuous quality improvement approach to CPR can dramatically improve CPR quality and optimize outcomes.116–118 Similar to successful approaches toward mitigating medical errors, programs aimed at system-wide CPR data collection, implementation of best practices, and continuous feedback on performance have been shown to be effective.73Chest Compression FeedbackBLS 361—UpdatedTechnology allows for real-time monitoring, recording, and feedback about CPR quality, including both physiologic patient parameters and rescuer performance metrics. Delayed time to defibrillation after in-hospital cardiac arrest.N Engl J Med. Rea T, Prince D, Morrison L, Callaway C, Aufderheide T, Daya M, Stiell I, Christenson J, Powell J, Warden C, van Ottingham L, Kudenchuk P, Weisfeldt M.Association between survival and early versus later rhythm analysis in out-of-hospital cardiac arrest: do agency-level factors influence outcomes?Ann Emerg Med. 2004; 351:637–646. 2011; 365:798–806. 2013; 128:417–435. A 12-year study.Resuscitation. The 2015 ILCOR BLS Task Force reviewed the most recent evidence evaluating the impact of this change in sequence on resuscitation.2015 Evidence ReviewAdditional evidence published since 2010 showed that beginning the CPR sequence with compressions minimized time to first chest compression.30–322015 Recommendation—UpdatedSimilar to the 2010 Guidelines, it may be reasonable for rescuers to initiate CPR with chest compressions (Class IIb, LOE C-LD). Kellum MJ, Kennedy KW, Ewy GA.Cardiocerebral resuscitation improves survival of patients with out-of-hospital cardiac arrest.Am J Med. An increase in chest compression fraction can be achieved by minimizing pauses in chest compressions. The rescuer should continue CPR until an AED arrives and is ready for use or EMS providers take over care of the victim (Class I, LOE C-LD).Healthcare Provider—UpdatedOptimally, all healthcare providers should be trained in BLS. Maxwell S, Bigg D, Stanczykiewicz K, Carlberg-Racich S.Prescribing naloxone to actively injecting heroin users: a program to reduce heroin overdose deaths.J Addict Dis. Sayre MR, Cantrell SA, White LJ, Hiestand BC, Keseg DP, Koser S.Impact of the 2005 American Heart Association cardiopulmonary resuscitation and emergency cardiovascular care guidelines on out-of-hospital cardiac arrest survival.Prehosp Emerg Care. doi: 10.1016/j.resuscitation.2012.07.038.CrossrefMedlineGoogle Scholar43. doi: 10.1016/j.resuscitation.2011.07.011.CrossrefMedlineGoogle Scholar79. Interruptions in chest compressions can be intended as part of required care (ie, rhythm analysis and ventilation) or unintended (ie, rescuer distraction).Chest compression fraction is a measurement of the proportion of time that compressions are performed during a cardiac arrest. This rate differs from the number of chest compressions delivered per unit of time, which takes into account any interruptions in chest compressions.2015 Summary of EvidenceEvidence involving compression rate is derived from observational human studies that evaluate the relationship between compression rate and outcomes including survival to hospital discharge, return of spontaneous circulation (ROSC), and various physiologic measures, such as blood pressure and end-tidal CO2. SOS-KANTO Study Group. doi: 10.1001/archinte.168.10.1063.CrossrefMedlineGoogle Scholar64. Christenson J, Andrusiek D, Everson-Stewart S, Kudenchuk P, Hostler D, Powell J, Callaway CW, Bishop D, Vaillancourt C, Davis D, Aufderheide TP, Idris A, Stouffer JA, Stiell I, Berg R; Resuscitation Outcomes Consortium Investigators. doi: 10.1136/hrt.2006.109785.CrossrefMedlineGoogle Scholar24. 2010; 304:1447–1454. BLS assessments and actions for specific types of rescuers are summarized in Table 1.Table 1. doi: 10.1001/jama.300.12.1423.CrossrefMedlineGoogle Scholar8. Leaning on the chest wall between compressions precludes full chest wall recoil. 2013; 127:1585–1590. Huang Y, He Q, Yang LJ, Liu GJ, Jones A.Cardiopulmonary resuscitation (CPR) plus delayed defibrillation versus immediate defibrillation for out-of-hospital cardiac arrest.Cochrane Database Syst Rev. 2010; 3:63–81. 2010; 17:269–275. For victims with suspected spinal cord injury, this evidence was last reviewed in 2010 and there is no change in treatment recommendation.Rescue Breathing—UpdatedThe 2015 Guidelines Update makes many of the same recommendations regarding rescue breathing as were made in 2005 and 2010. 2011; 124:58–66. Get With The Guidelines–Resuscitation. Accessed April 30, 2015.Google Scholar4. Moreover, such research confers unique limitations and ethical concerns. Physiologically, in cases of sudden cardiac arrest, the need for assisted ventilation is a lower priority because of the availability of adequate arterial oxygen content at the time of a sudden cardiac arrest. doi: 10.1016/j.resuscitation.2010.02.007.CrossrefMedlineGoogle Scholar25. Walley AY, Doe-Simkins M, Quinn E, Pierce C, Xuan Z, Ozonoff A.Opioid overdose prevention with intranasal naloxone among people who take methadone.J Subst Abuse Treat. Bradley SM, Huszti E, Warren SA, Merchant RM, Sayre MR, Nichol G.Duration of hospital participation in Get With the Guidelines-Resuscitation and survival of in-hospital cardiac arrest.Resuscitation. Observational studies demonstrate an association between a shorter duration of compression interruption for the perishock period and a greater likelihood of shock success,62 ROSC,74 and survival to hospital discharge.75,76 Other observational studies have demonstrated an association between higher chest compression fraction and likelihood of survival among patients with shockable rhythms, and return of circulation among patients with nonshockable rhythms.77,78 In contrast, the results of a randomized trial comparing a bundle of changes between the 2000 and 2005 Guidelines showed no survival difference when perishock pauses were reduced.79 In an investigation of first responders equipped with AEDs, the duration of pauses specific to ventilation was not associated with survival.802015 Recommendations—UpdatedIn adult cardiac arrest, total preshock and postshock pauses in chest compressions should be as short as possible (Class I, LOE C-LD). . 2010; 38:1141–1146. Centers for Disease and Control Prevention, Emory Woodruff Health Sciences Center. Becker LB, Pepe PE.Ensuring the effectiveness of community-wide emergency cardiac care.Ann Emerg Med. For this reason all patients in cardiac arrest should receive chest compressions (Class I, LOE B).not reviewed in 20152010Rescue BreathsDeliver each rescue breath over 1 second (Class IIa, LOE C).not reviewed in 20152010Rescue BreathsGive a sufficient tidal volume to produce visible chest rise (Class IIa, LOE C).not reviewed in 20152010Early Defibrillation With an AEDWhen 2 or more rescuers are present, one rescuer should begin chest compressions while a second rescuer activates the emergency response system and gets the AED (or a manual defibrillator in most hospitals) (Class IIa, LOE C).not reviewed in 20152010Recognition of ArrestThe rescuer should treat the victim who has occasional gasps as if he or she is not breathing (Class I, LOE C).not reviewed in 20152010Technique: Chest CompressionsThe rescuer should place the heel of one hand on the center (middle) of the victim's chest (which is the lower half of the sternum) and the heel of the other hand on top of the first so that the hands are overlapped and parallel (Class IIa, LOE B).not reviewed in 20152010Technique: Chest CompressionsBecause of the difficulty in providing effective chest compressions while moving the patient during CPR, the resuscitation should generally be conducted where the patient is found (Class IIa, LOE C).not reviewed in 20152010Compression-Ventilation RatioOnce an advanced airway is in place, 2 rescuers no longer need to pause chest compressions for ventilations. doi: 10.1097/CCM.0b013e3181ce1fe2.CrossrefMedlineGoogle Scholar68. 2013; 44:870–947. Accessed May 7, 2015.Google Scholar7. What is the role of chest compression depth during out-of-hospital cardiac arrest resuscitation?Crit Care Med. Jacobs IG, Finn JC, Oxer HF, Jelinek GA.CPR before defibrillation in out-of-hospital cardiac arrest: a randomized trial.Emerg Med Australas. Hauff SR, Rea TD, Culley LL, Kerry F, Becker L, Eisenberg MS.Factors impeding dispatcher-assisted telephone cardiopulmonary resuscitation.Ann Emerg Med. 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction: executive summary: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines.Circulation. Niles DE, Sutton RM, Nadkarni VM, Glatz A, Zuercher M, Maltese MR, Eilevstjønn J, Abella BS, Becker LB, Berg RA.Prevalence and hemodynamic effects of leaning during CPR.Resuscitation. 2003; 42:731–737. Nestler DM, Noheria A, Haro LH, Stead LG, Decker WW, Scanlan-Hanson LN, Lennon RJ, Lim CC, Holmes DR, Rihal CS, Bell MR, Ting HH.Sustaining improvement in door-to-balloon time over 4 years: the Mayo clinic ST-elevation myocardial infarction protocol.Circ Cardiovasc Qual Outcomes. doi: 10.1161/CIRCULATIONAHA.107.723411.LinkGoogle Scholar36. 2012; 40:1192–1198. doi: 10.1161/CIRCULATIONAHA.114.009711.CrossrefMedlineGoogle Scholar10. Meaney PA, Bobrow BJ, Mancini ME, Christenson J, de Caen AR, Bhanji F, Abella BS, Kleinman ME, Edelson DP, Berg RA, Aufderheide TP, Menon V, Leary M; CPR Quality Summit Investigators, the American Heart Association Emergency Cardiovascular Care Committee, and the Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation. 2012; 125:648–655. However, the treatment of the comparison groups also differed in other respects that typically reflected changes from the 2000 to 2005 Guidelines, such as an increase in the duration of CPR cycles between rhythm analyses from 1 to 2 minutes. doi: 10.1056/NEJMoa1010076.CrossrefMedlineGoogle Scholar104. The sequence for using an AED has not been updated from the 2010 Guidelines.Rescuer-Specific CPR Strategies: Putting It All TogetherBLS 359, BLS 372This section summarizes the sequence of CPR interventions to be performed by 3 types of prototypical rescuers after they activate the emergency response system. 2011; 60:1–19.MedlineGoogle Scholar142. doi: 10.1161/CIRCULATIONAHA.112.125625.CrossrefMedlineGoogle Scholar129. This 2015 Guidelines Update is based on the systematic reviews and recommendations of the 2015 International Consensus on CPR and ECC Science With Treatment Recommendations, "Part 3: Adult Basic Life Support and Automated External Defibrillation."1,2 In the online version of this document, live links are provided so the reader can connect directly to the systematic reviews on the ILCOR Scientific Evidence Evaluation and Review System (SEERS) website. doi: 10.1161/CIRCULATIONAHA.109.852202.LinkGoogle Scholar78. The evidence is derived from 2 animal studies and a pediatric study of patients not in cardiac arrest.67,71,72 In all 3 studies, an increased force of leaning (incomplete recoil) was associated with a dose-dependent decrease in coronary perfusion pressure. 2008; 52:244–252. 2008; 77:306–315. Full chest wall recoil occurs when the sternum returns to its natural or neutral position during the decompression phase of CPR. Aufderheide TP, Nichol G, Rea TD, Brown SP, Leroux BG, Pepe PE, Kudenchuk PJ, Christenson J, Daya MR, Dorian P, Callaway CW, Idris AH, Andrusiek D, Stephens SW, Hostler D, Davis DP, Dunford JV, Pirrallo RG, Stiell IG, Clement CM, Craig A, Van Ottingham L, Schmidt TA, Wang HE, Weisfeldt ML, Ornato JP, Sopko G; Resuscitation Outcomes Consortium (ROC) Investigators. Berdowski J, Beekhuis F, Zwinderman AH, Tijssen JG, Koster RW.Importance of the first link: description and recognition of an out-of-hospital cardiac arrest in an emergency call.Circulation. 2014. 2003; 10:955–960.CrossrefMedlineGoogle Scholar21. doi: 10.1161/CIRCULATIONAHA.110.001736.CrossrefMedlineGoogle Scholar76. 2013; 84:435–439. Sasson C, Hegg AJ, Macy M, Park A, Kellermann A, McNally B; CARES Surveillance Group. Survival increases with CPR by Emergency Medical Services before defibrillation of out-of-hospital ventricular fibrillation or ventricular tachycardia: observations from the Resuscitation Outcomes Consortium.Resuscitation. doi: 10.1161/CIR.0000000000000272.LinkGoogle Scholar2. BLS Healthcare Provider Adult Cardiac Arrest Algorithm—2015 Update.Verify Scene SafetyRescuers arriving on the scene of an emergency should verify that the environment in which they are approaching a patient is safe for the provider. doi: 10.1016/j.resuscitation.2009.02.012.CrossrefMedlineGoogle Scholar71. The 2015 Guidelines Update incorporates new evidence about the potential for an upper threshold of rate beyond which outcome may be adversely affected.The 2015 ILCOR systematic review addressed whether compression rates different from 100/min influence physiologic or clinical outcomes. One small, low-quality RCT evaluated the ability to identify recurrence of VF and showed no benefit to checking rhythm immediately after defibrillation.1142015 Recommendation—UpdatedIt may be reasonable to immediately resume chest compressions after shock delivery for adults in cardiac arrest in any setting (Class IIb, LOE C-LD).CPR Quality, Accountability, and Healthcare SystemsThe quality of CPR in both in-hospital and OHCA events is variable. Peberdy MA, Kaye W, Ornato JP, Larkin GL, Nadkarni V, Mancini ME, Berg RA, Nichol G, Lane-Trultt T.Cardiopulmonary resuscitation of adults in the hospital: a report of 14720 cardiac arrests from the National Registry of Cardiopulmonary Resuscitation.Resuscitation. Panchal AR, Bobrow BJ, Spaite DW, Berg RA, Stolz U, Vadeboncoeur TF, Sanders AB, Kern KB, Ewy GA.Chest compression-only cardiopulmonary resuscitation performed by lay rescuers for adult out-of-hospital cardiac arrest due to non-cardiac aetiologies.Resuscitation. doi: 10.1001/jama.2009.1340.CrossrefMedlineGoogle Scholar134. As in past Guidelines, healthcare providers are trained to provide both compressions and ventilation.2015 Evidence ReviewThere is concern that delivery of chest compressions without assisted ventilation for prolonged periods could be less effective than conventional CPR (compressions plus breaths) because the arterial oxygen content will decrease as CPR duration increases. Vadeboncoeur T, Bobrow BJ, Cone DC, Chikani V, Abella BS.Instant replay: perform CPR with immediate feedback.JEMS. Spinal immobilization devices may interfere with maintaining a patent airway,91,92 but ultimately the use of such a device may be necessary to maintain spinal alignment during transport. Babbs CF, Kemeny AE, Quan W, Freeman G.A new paradigm for human resuscitation research using intelligent devices.Resuscitation. 2003; 58:297–308.CrossrefMedlineGoogle Scholar132. 2015; 132(suppl 1):S51–S83. The 2010 Guidelines included a major change for trained rescuers, who were instructed to begin the CPR sequence with chest compressions rather than breaths (C-A-B versus A-B-C) to minimize the time to initiation of chest compressions. In the 2010 Guidelines, the recommended compression depth was at least 2 inches (5 cm). Public Health, Seattle and King County, Division of Emergency Medical Services. Outcome from OHCA remains poor: only 10.8% of adult patients with nontraumatic cardiac arrest who have received resuscitative efforts from emergency medical services (EMS) survive to hospital discharge.3 In-hospital cardiac arrest (IHCA) has a better outcome, with 22.3% to 25.5% of adults surviving to discharge.4BLS is the foundation for saving lives after cardiac arrest. For adults in cardiac arrest receiving CPR without an advanced airway, it is reasonable to pause compressions for less than 10 seconds to deliver 2 breaths (Class IIa, LOE C-LD). 2011; 82suppl 2:S23–S26. 2012; 83:1473–1477. Guidelines for the early management of patients with acute ischemic stroke: a guideline for healthcare professionals from the American Heart Association/American Stroke Association.Stroke. 2015; 46:3024–3039. Nurmi J, Pettilä V, Biber B, Kuisma M, Komulainen R, Castrén M.Effect of protocol compliance to cardiac arrest identification by emergency medical dispatchers.Resuscitation. doi: 10.1067/mem.2000.109442.CrossrefMedlineGoogle Scholar93. Moreover, trained rescuers are encouraged to simultaneously perform some steps (ie, checking for breathing and pulse at the same time) in an effort to reduce the time to first compressions. For healthcare providers, these recommendations allow flexibility for activation of the emergency response to better match the provider's clinical setting.More data are available showing that high-quality CPR improves survival from cardiac arrest, including– Ensuring chest compressions of adequate rate– Ensuring chest compressions of adequate depth– Allowing full chest recoil between compressions– Minimizing interruptions in chest compressions– Avoiding excessive ventilationThis Guidelines Update includes an updated recommendation for a simultaneous, choreographed approach to performance of chest compressions, airway management, rescue breathing, rhythm detection, and shocks (if indicated) by an integrated team of highly trained rescuers in applicable settings.When the links in the Chain of Survival are implemented in an effective way, survival can approach 50% in EMS-treated patients after witnessed out-of-hospital ventricular fibrillation (VF) arrest.5,6 Unfortunately, survival rates in many out-of-hospital and in-hospital settings fall far short of this figure. 2010; 3:72–78. doi: 10.1016/j.jsat.2012.07.004.CrossrefMedlineGoogle Scholar50. doi: 10.1016/j.annemergmed.2008.02.006.CrossrefMedlineGoogle Scholar47. doi: 10.1016/j.resuscitation.2010.11.006.CrossrefMedlineGoogle Scholar66. Stiell IG, Nichol G, Leroux BG, Rea TD, Ornato JP, Powell J, Christenson J, Callaway CW, Kudenchuk PJ, Aufderheide TP, Idris AH, Daya MR, Wang HE, Morrison LJ, Davis D, Andrusiek D, Stephens S, Cheskes S, Schmicker RH, Fowler R, Vaillancourt C, Hostler D, Zive D, Pirrallo RG, Vilke GM, Sopko G, Weisfeldt M; ROC Investigators. There are minor changes to the 2010 Guidelines as the result of new evidence regarding compression rate, feedback received from the training network, and new evidence regarding the incidence of opioid overdose and the effects of naloxone-administration programs.Figure 1. doi: 10.3109/10903127.2011.569848.CrossrefMedlineGoogle Scholar109. doi: 10.1186/1757-7241-21-50.CrossrefMedlineGoogle Scholar125. . For example, survival rates after cardiac arrest due to VF vary from approximately 5% to 50% in both out-of-hospital and in-hospital settings.7–9 This variation in outcome underscores the opportunity for improvement in many settings. Relationship between chest compression rates and outcomes from cardiac arrest.Circulation. doi: 10.1161/CIR.0b013e3182742c84.LinkGoogle Scholar148. Ma MH, Lu TC, Ng JC, Lin CH, Chiang WC, Ko PC, Shih FY, Huang CH, Hsiung KH, Chen SC, Chen WJ.Evaluation of emergency medical dispatch in out-of-hospital cardiac arrest in Taipei.Resuscitation. doi: 10.1161/STR.0000000000000074.Google Scholar151. Bradley SM, Gabriel EE, Aufderheide TP, Barnes R, Christenson J, Davis DP, Stiell IG, Nichol G; Resuscitation Outcomes Consortium Investigators. Lerner EB, Rea TD, Bobrow BJ, Acker JE, Berg RA, Brooks SC, Cone DC, Gay M, Gent LM, Mears G, Nadkarni VM, O'Connor RE, Potts J, Sayre MR, Swor RA, Travers AH; American Heart Association Emergency Cardiovascular Care Committee; Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation. If the patient is unresponsive with abnormal or absent breathing, it is reasonable for the emergency dispatcher to assume that the patient is in cardiac arrest (Class IIa, LOE C-LD). doi: 10.1161/CIRCULATIONAHA.114.008671.CrossrefMedlineGoogle Scholar61. 2006; 32:843–851. 2010; 122(suppl 3):S685–S705. Information regarding lay rescuer education and the use of naloxone for known or suspected victims of opioid overdose is discussed in "Part 10: Special Circumstances of Resuscitation."Scenario: Pulse Absent, No Breathing or Only GaspingAs in the 2010 Guidelines, rescuers should initiate CPR and use an AED as soon as possible. This represents a simplification of the 2010 Guidelines recommendations, to provide a single number that rescuers will need to remember for ventilation rate, rather than a range of numbers.Passive Oxygen Versus Positive-Pressure Oxygen During CPRBLS 352—UpdatedSome EMS systems have studied the use of passive oxygen flow during chest compressions without positive-pressure ventilation, an option known as passive oxygen administration.2015 Evidence SummaryTwo studies compared positive-pressure ventilation through an endotracheal tube to continuous delivery of oxygen or air directly into the trachea after intubation by using a modified endotracheal tube that had microcannulas inserted into its inner wall.93,94 A third study compared bag-mask ventilation to high-flow oxygen delivery by nonrebreather face mask after oropharyngeal airway insertion as part of a resuscitation bundle that also included uninterrupted preshock and postshock chest compressions and early epinephrine administration.45 Continuous tracheal delivery of oxygen or air through the modified endotracheal tube was associated with lower arterial Pco293 but no additional improvement in ROSC,93,94 hospital admission,94 or ICU discharge94 when compared with positive-pressure ventilation. Sell RE, Sarno R, Lawrence B, Castillo EM, Fisher R, Brainard C, Dunford JV, Davis DP.Minimizing pre- and post-defibrillation pauses increases the likelihood of return of spontaneous circulation (ROSC).Resuscitation. 1985; 75:47–50.CrossrefMedlineGoogle Scholar20. Hallstrom AP, Ornato JP, Weisfeldt M, Travers A, Christenson J, McBurnie MA, Zalenski R, Becker LB, Schron EB, Proschan M; Public Access Defibrillation Trial Investigators. doi: 10.1197/j.aem.2007.06.021.CrossrefMedlineGoogle Scholar16. Edelson DP, Litzinger B, Arora V, Walsh D, Kim S, Lauderdale DS, Vanden Hoek TL, Becker LB, Abella BS.Improving in-hospital cardiac arrest process and outcomes with performance debriefing.Arch Intern Med. New technology to assess the potential benefit of filtering electrocardiogram (ECG) compression artifacts has not been evaluated in humans.2015 Recommendation—NewThere is insufficient evidence to recommend the use of artifact-filtering algorithms for analysis of ECG rhythm during CPR. Perkins GD, Travers AH, Berg RA, Castren M, Considine J, Escalante R, Gazmuri RJ, Koster RW, Lim SH, Nation KJ, Olasveengen TM, Sakamoto T, Sayre MR, Sierra A, Smyth MA, Stanton D, Vaillancourt C; on behalf of the Basic Life Support Chapter Collaborators. Duration of cardiopulmonary resuscitation and illness category impact survival and neurologic outcomes for in-hospital pediatric cardiac arrests.Circulation. Akahane M, Ogawa T, Tanabe S, Koike S, Horiguchi H, Yasunaga H, Imamura T.Impact of telephone dispatcher assistance on the outcomes of pediatric out-of-hospital cardiac arrest.Crit Care Med. The prioritization of circulation (C) over ventilation reflected the overriding importance of blood flow generation for successful resuscitation and practical delays inherent to initiation of rescue breaths (B). Gerling MC, Davis DP, Hamilton RS, Morris GF, Vilke GM, Garfin SR, Hayden SR.Effects of cervical spine immobilization technique and laryngoscope blade selection on an unstable cervical spine in a cadaver model of intubation.Ann Emerg Med. doi: 10.1161/CIRCULATIONAHA.110.970939.CrossrefMedlineGoogle Scholar11. The observational studies documented improved survival with favorable neurologic outcome at hospital discharge associated with the bundle of care, including resumption of chest compressions immediately after shock delivery. Chan PS, Krumholz HM, Nichol G, Nallamothu BK; American Heart Association National Registry of Cardiopulmonary Resuscitation Investigators. Kellum MJ, Kennedy KW, Barney R, Keilhauer FA, Bellino M, Zuercher M, Ewy GA.Cardiocerebral resuscitation improves neurologically intact survival of patients with out-of-hospital cardiac arrest.Ann Emerg Med. Goldberger ZD, Nallamothu BK, Nichol G, Chan PS, Curtis JR, Cooke CR; American Heart Association's Get With the Guidelines–Resuscitation Investigators. The AED or manual defibrillator is used as rapidly as possible, and both rescuers are expected to provide CPR with chest compressions and ventilation. Bohn A, Weber TP, Wecker S, Harding U, Osada N, Van Aken H, Lukas RP.The addition of voice prompts to audiovisual feedback and debriefing does not modify CPR quality or outcomes in out of hospital cardiac arrest–a prospective, randomized trial.Resuscitation. doi: 10.1016/j.jemermed.2012.09.026.CrossrefMedlineGoogle Scholar53. Bohm K, Rosenqvist M, Hollenberg J, Biber B, Engerström L, Svensson L.Dispatcher-assisted telephone-guided cardiopulmonary resuscitation: an underused lifesaving system.Eur J Emerg Med. Lubrano R, Cecchetti C, Bellelli E, Gentile I, Loayza Levano H, Orsini F, Bertazzoni G, Messi G, Rugolotto S, Pirozzi N, Elli M.Comparison of times of intervention during pediatric CPR maneuvers using ABC and CAB sequences: a randomized trial.Resuscitation. Fatal Injury Reports. During CPR without an advanced airway, a compression-to-ventilation ratio of 30:2 is used.Mouth-to-Mouth Rescue BreathingThe technique for mouth-to-mouth rescue breathing was last reviewed in 2010.10Mouth–to–Barrier Device BreathingThe technique for mouth–to–barrier device breathing was last reviewed in 2010.10Mouth-to-Nose and Mouth-to-Stoma VentilationThe technique for mouth-to-nose and mouth-to-stoma ventilation was last reviewed in 2010.10Ventilation With Bag-Mask DeviceWhen using a self-inflating bag, rescuers can provide bag-mask ventilation with room air or oxygen. doi: 10.1016/S0196064403004232.CrossrefMedlineGoogle Scholar15. Accessed May 9, 2015.Google Scholar Given these challenges, real-world observational data from registries can be a valuable resource for studying and reporting resuscitation processes and outcomes. Kramer-Johansen J, Myklebust H, Wik L, Fellows B, Svensson L, Sørebø H, Steen PA.Quality of out-of-hospital cardiopulmonary resuscitation with real time automated feedback: a prospective interventional study.Resuscitation. Duration of resuscitation efforts and survival after in-hospital cardiac arrest: an observational study.Lancet. doi: 10.1016/j.resuscitation.2013.07.010.CrossrefMedlineGoogle Scholar73. Abella BS, Edelson DP, Kim S, Retzer E, Myklebust H, Barry AM, O'Hearn N, Hoek TL, Becker LB.CPR quality improvement during in-hospital cardiac arrest using a real-time audiovisual feedback system.Resuscitation. Hayakawa M, Gando S, Okamoto H, Asai Y, Uegaki S, Makise H.Shortening of cardiopulmonary resuscitation time before the defibrillation worsens the outcome in out-of-hospital VF patients.Am J Emerg Med. For trained lay rescuers, it is reasonable to provide ventilation in addition to chest compressions for the adult in cardiac arrest (Class IIa, LOE C-LD).Managing the AirwayA significant change in the 2010 Guidelines was the initiation of chest compressions before ventilation (ie, a change in the sequence from A-B-C to C-A-B). In press.CrossrefGoogle Scholar2a. Initial recognition and response to heart attack and stroke are also considered part of BLS. 2012; 40:1410–1416. Bobrow BJ, Ewy GA, Clark L, Chikani V, Berg RA, Sanders AB, Vadeboncoeur TF, Hilwig RW, Kern KB.Passive oxygen insufflation is superior to bag-valve-mask ventilation for witnessed ventricular fibrillation out-of-hospital cardiac arrest.Ann Emerg Med. Studies often classify compression depth differently, using distinct categories of depth or using an average depth for a given portion of the resuscitation.Even with this heterogeneity, there is consistent evidence that achieving compression depth of approximately 5 cm is associated with greater likelihood of favorable outcomes compared with shallower compressions.57–65 In the largest study to date (n=9136), the optimal compression depth with regard to survival occurred within the range of 41 to 55 mm (4.1 to 5.5 cm, or 1.61 to 2.2 inches).60 Less evidence is available about whether there is an upper threshold beyond which compressions may be too deep. doi: 10.1056/NEJMoa0706467.CrossrefMedlineGoogle Scholar133. Bossaert L, Van Hoeyweghen R.Evaluation of cardiopulmonary resuscitation (CPR) techniques. Heart disease and stroke statistics—2015 update: a report from the American Heart Association.Circulation. In addition, if the trained lay rescuer is able to perform rescue breaths, he or she should add rescue breaths in a ratio of 30 compressions to 2 breaths. doi: 10.1016/j.resuscitation.2013.02.015.CrossrefMedlineGoogle Scholar67. During manual CPR, injuries are more common when compression depth is greater than 6 cm (2.4 inches) than when it is between 5 and 6 cm (2 and 2.4 inches).66 Importantly, chest compressions performed by professional rescuers are more likely to be too shallow (ie, less than 40 mm [4 cm] or 1.6 inches) and less likely to exceed 55 mm (5.5 cm or 2.2 inches).602015 Recommendation—UpdatedDuring manual CPR, rescuers should perform chest compressions to a depth of at least 2 inches or 5 cm for an average adult, while avoiding excessive chest compression depths (greater than 2.4 inches or 6 cm) (Class I, LOE C-LD).Chest Wall RecoilBLS 367The 2015 ILCOR systematic reviews addressed whether full chest wall recoil compared with incomplete recoil influenced physiologic or clinical outcomes. The remaining links in the AHA Chain of Survival, namely advanced life support and integrated postarrest care, are covered in later Parts of this 2015 Guidelines Update (see "Part 7: Adult Advanced Cardiovascular Life Support" and "Part 8: Post–Cardiac Arrest Care").Adult BLS Sequence—UpdatedThe steps of BLS consist of a series of sequential assessments and actions, which are illustrated in a simplified BLS algorithm that is unchanged from 2010.10 The intent of the algorithm is to present the steps of BLS in a logical and concise manner that is easy for all types of rescuers to learn, remember, and perform. 2003; 56:25–34.CrossrefMedlineGoogle Scholar26. 2014 Annual Report. 2008; 299:1158–1165. Any of the 2010 algorithms that have been revised as a result of recommendations in the 2015 Guidelines Update are contained in this publication. What is the optimal chest compression depth during out-of-hospital cardiac arrest resuscitation of adult patients?Circulation. Cheskes S, Schmicker RH, Christenson J, Salcido DD, Rea T, Powell J, Edelson DP, Sell R, May S, Menegazzi JJ, Van Ottingham L, Olsufka M, Pennington S, Simonini J, Berg RA, Stiell I, Idris A, Bigham B, Morrison L; Resuscitation Outcomes Consortium (ROC) Investigators. US Food and Drug Administration. 2010; 81:822–825. Chan PS, McNally B, Tang F, Kellermann A; CARES Surveillance Group. Registries are available for both in-hospital and out-of-hospital arrests.129Formerly known as the National Registry of Cardiopulmonary Resuscitation, the AHA's Get With The Guidelines-Resuscitation registry is the largest prospective, multicenter, observational registry of IHCA.130,131 At present, more than 600 hospitals in the United States and Canada participate in the registry, and more than 200 000 index arrests have been recorded since 2000.To date, the Get With The Guidelines-Resuscitation registry has provided important insights into several aspects of IHCA. doi: 10.1016/j.resuscitation.2006.01.016.CrossrefMedlineGoogle Scholar19. BrennanQueen's UniversityNoneNoneNoneNoneNoneNoneRaúl J. Lay rescuers will not check for a pulse.Early CPRBLS 661—UpdatedBegin chest compressions as quickly as possible after recognition of cardiac arrest. A moving target.Arch Intern Med. doi: 10.1056/NEJMoa1010821.CrossrefMedlineGoogle Scholar137. Based on 2 studies, the relationship between leaning and cardiac output was inconsistent.67,712015 Recommendation—UpdatedIt is reasonable for rescuers to avoid leaning on the chest between compressions to allow full chest wall recoil for adults in cardiac arrest (Class IIa, LOE C-LD).Minimizing Interruptions in Chest CompressionsBLS 358—UpdatedAs in the 2010 Guidelines, minimizing interruptions in chest compressions remains a point of emphasis. 2010; 81:925–931. In settings with lay rescuer AED programs (AED onsite and available) and for in-hospital environments, or if the EMS rescuer witnesses the collapse, the rescuer should use the defibrillator as soon as it is available (Class IIa, LOE C).not reviewed in 20152010Recovery PositionThe position should be stable, near a true lateral position, with the head dependent and with no pressure on the chest to impair breathing (Class IIa, LOE C).not reviewed in 20152010Acute Coronary SyndromesIf the patient has not taken aspirin and has no history of aspirin allergy and no evidence of recent gastrointestinal bleeding, EMS providers should give the patient nonenteric aspirin (160 to 325 mg) to chew (Class I, LOE C).not reviewed in 20152010Acute Coronary SyndromesAlthough it is reasonable to consider the early administration of nitroglycerin in select hemodynamically stable patients, insufficient evidence exists to support or refute the routine administration of nitroglycerin in the ED or prehospital setting in patients with a suspected ACS (Class IIb, LOE B).not reviewed in 20152010StrokePatients at high risk for stroke, their family members, and BLS providers should learn to recognize the signs and symptoms of stroke and to call EMS as soon as any signs of stroke are present (Class I, LOE C).not reviewed in 20152010StrokeEMS dispatchers should be trained to suspect stroke and rapidly dispatch emergency responders. 2011; 36:50–63. 2015; 132(suppl 1):S40–S50. Do you have a song between 100-120 bpm? Early versus later rhythm analysis in patients with out-of-hospital cardiac arrest.N Engl J Med. Mosier J, Itty A, Sanders A, Mohler J, Wendel C, Poulsen J, Shellenberger J, Clark L, Bobrow B.Cardiocerebral resuscitation is associated with improved survival and neurologic outcome from out-of-hospital cardiac arrest in elders.Acad Emerg Med. Characteristics of chest compressions include their depth, rate, and degree of recoil. Initial major steps for bystanders remain unchanged from the 2010 Guidelines. 2000; 92:1523–1530.CrossrefMedlineGoogle Scholar94. doi: 10.1161/CIRCULATIONAHA.106.654715.CrossrefMedlineGoogle Scholar114. 2006; 71:137–145. For lay rescuers, compression-only CPR is a reasonable alternative to conventional CPR in the adult cardiac arrest patient (Class IIa, LOE C-LD). The rescuer delivers breaths during pauses in compressions and delivers each breath over approximately 1 second (Class IIa, LOE C-LD).updated for 20152015Ventilation With an Advanced AirwayWhen the victim has an advanced airway in place during CPR, rescuers no longer deliver cycles of 30 compressions and 2 breaths (ie, they no longer interrupt compressions to deliver 2 breaths). It is likely that a time threshold exists beyond which the absence of ventilation may be harmful,35,37 and the generalizability of the findings to all settings must be considered with caution.2015 Recommendation—UpdatedIt is reasonable for healthcare providers to provide chest compressions and ventilation for all adult patients in cardiac arrest, from either a cardiac or noncardiac cause (Class IIa, LOE C-LD). The Cerebral Resuscitation Study Group.Resuscitation. doi: 10.1016/j.ajem.2013.02.047.CrossrefMedlineGoogle Scholar32. 2010; 56:348–357. A bag-mask device can provide positive-pressure ventilation without an advanced airway and may result in gastric inflation and its potential complications.The Bag-Mask DeviceThe elements of a bag-mask device are the same as those used in 2010.10Bag-Mask VentilationBag-mask ventilation is a challenging skill that requires considerable practice for competency. doi: 10.1097/CCM.0b013e31823bc8bb.CrossrefMedlineGoogle Scholar60. Holmberg M, Holmberg S, Herlitz J; Swedish Cardiac Arrest Registry. Injury Prevention & Control: Data & Statistics (WISQARS). doi: 10.1097/MCC.0b013e328360ad06.CrossrefMedlineGoogle Scholar130. Since 2010, the AHA and the American Stroke Association have published clinical practice guidelines pertaining to the early management of patients with acute ischemic stroke.149,150DrowningDrowning is a leading cause of unintentional injury and death worldwide and a preventable cause of death for more than 4000 Americans annually.151,152 The highest rates of morbidity and mortality are among children aged 1 to 4 years.152 The incidence of fatal drowning has declined from 1.45 deaths per 100 000 population in 2000 to 1.26 in 2013.152 Immediate resuscitation to restore oxygenation and ventilation—especially by bystanders—is essential for survival after a drowning incident.This topic was last reviewed in 2010, and the treatment recommendations have not changed.Since the 2010 Guidelines, there has been a growing appreciation for the fact that the response to the submersion victim often involves a multiagency approach with several different organizations responsible for different phases of the victim's care, from the initial aquatic rescue, on-scene resuscitation, transport to hospital, and in-hospital care. doi: 10.1002/14651858.CD009803.pub2.Google Scholar112. 2008; 52:914–919. 2014; 9:CD009803. We encourage readers to use the links and review the evidence and appendix.As with all AHA Guidelines, each 2015 recommendation is labeled with a Class of Recommendation (COR) and a Level of Evidence (LOE). Hinchey PR, Myers JB, Lewis R, De Maio VJ, Reyer E, Licatese D, Zalkin J, Snyder G; Capital County Research Consortium. Idris AH, Guffey D, Aufderheide TP, Brown S, Morrison LJ, Nichols P, Powell J, Daya M, Bigham BL, Atkins DL, Berg R, Davis D, Stiell I, Sopko G, Nichol G; Resuscitation Outcomes Consortium (ROC) Investigators. . Shih CL, Lu TC, Jerng JS, Lin CC, Liu YP, Chen WJ, Lin FY.A web-based Utstein style registry system of in-hospital cardiopulmonary resuscitation in Taiwan.Resuscitation. Instead, it may be reasonable for the provider to deliver 1 breath every 6 seconds (10 breaths per minute) while continuous chest compressions are being performed (Class IIb, LOE C-LD).updated for 20152015Passive Oxygen Versus Positive-Pressure Oxygen During CPRWe do not recommend the routine use of passive ventilation techniques during conventional CPR for adults, because the usefulness/effectiveness of these techniques is unknown (Class IIb, LOE C-EO).new for 20152015Passive Oxygen Versus Positive-Pressure Oxygen During CPRHowever, in EMS systems that use bundles of care involving continuous chest compressions, the use of passive ventilation techniques may be considered as part of that bundle (Class IIb, LOE C-LD).new for 20152015CPR Before DefibrillationFor witnessed adult cardiac arrest when an AED is immediately available, it is reasonable that the defibrillator be used as soon as possible (Class IIa, LOE C-LD).updated for 20152015CPR Before DefibrillationFor adults with unmonitored cardiac arrest or for whom an AED is not immediately available, it is reasonable that CPR be initiated while the defibrillator equipment is being retrieved and applied and that defibrillation, if indicated, be attempted as soon as the device is ready for use (Class IIa, LOE B-R).updated for 20152015Analysis of Rhythm During CompressionsThere is insufficient evidence to recommend the use of artifact-filtering algorithms for analysis of ECG rhythm during CPR. doi: 10.1001/jama.299.10.1158.CrossrefMedlineGoogle Scholar45. For additional information about the systematic review process or management of potential conflicts of interest, see "Part 2: Evidence Evaluation and Management of Conflicts of Interest" in this 2015 Guidelines Update and the related publication, "Part 2: Evidence Evaluation and Management of Conflicts of Interest" in the ILCOR 2015 International Consensus on CPR and ECC Science With Treatment Recommendations.2aBecause this 2015 publication represents the first Guidelines Update, it includes an appendix with all the 2015 recommendations for adult BLS as well as the recommendations from the 2010 Guidelines. 2009; 2:508–513. To emphasize that the algorithm has been modified, the words 2015 Update will appear in the title of the algorithm.Adult BLS and CPR Quality OverviewSudden cardiac arrest remains a leading cause of death in the United States. doi: 10.1016/j.resuscitation.2011.02.032.CrossrefMedlineGoogle Scholar70. 2006; 21:72–76.CrossrefMedlineGoogle Scholar22. If the 2015 ILCOR review resulted in a new or significantly revised Guidelines recommendation, that recommendation will be labeled New or Updated.It is important to note that the 2010 recommendations used a previous version of the AHA COR and LOE classification system that was current in 2010. 2015; 43:840–848. In addition, if the trained lay rescuer is able to perform rescue breaths, he or she should add rescue breaths in a ratio of 30 compressions to 2 breaths.updated for 20152015Trained Lay RescuerThe rescuer should continue CPR until an AED arrives and is ready for use or EMS providers take over care of the victim (Class I, LOE C-LD).updated for 20152015Healthcare ProviderIt is reasonable for healthcare providers to provide chest compressions and ventilation for all adult patients in cardiac arrest, from either a cardiac or noncardiac cause (Class IIa, LOE C-LD).updated for 20152015Delayed VentilationFor witnessed OHCA with a shockable rhythm, it may be reasonable for EMS systems with priority-based, multitiered response to delay positive-pressure ventilation by using a strategy of up to 3 cycles of 200 continuous compressions with passive oxygen insufflation and airway adjuncts (Class IIb, LOE C-LD).new for 20152015Recognition of ArrestDispatchers should instruct rescuers to provide CPR if the victim is unresponsive with no normal breathing, even when the victim demonstrates occasional gasps (Class I, LOE C-LD).updated for 20152015Suspected Opioid-Related Life-Threatening EmergencyFor a patient with known or suspected opioid addiction who has a definite pulse but no normal breathing or only gasping (ie, a respiratory arrest), in addition to providing standard BLS care, it is reasonable for appropriately trained BLS healthcare providers to administer intramuscular or intranasal naloxone (Class IIa, LOE C-LD).new for 20152015Suspected Opioid-Related Life-Threatening EmergencyFor patients in cardiac arrest, medication administration is ineffective without concomitant chest compressions for drug delivery to the tissues, so naloxone administration may be considered after initiation of CPR if there is high suspicion for opiate overdose (Class IIb, LOE C-EO).new for 20152015Suspected Opioid-Related Life-Threatening EmergencyIt is reasonable to provide opioid overdose response education with or without naloxone distribution to persons at risk for opioid overdose in any setting (Class IIa, LOE C-LD).new for 20152015Hand Position During CompressionsConsistent with the 2010 Guidelines, it is reasonable to position hands for chest compressions on the lower half of the sternum in adults with cardiac arrest (Class IIa, LOE C-LD).updated for 20152015Chest Compression RateIn adult victims of cardiac arrest, it is reasonable for rescuers to perform chest compressions at a rate of 100/min to 120/min (Class IIa, LOE C-LD).updated for 20152015Chest Compression DepthDuring manual CPR, rescuers should perform chest compressions to a depth of at least 2 inches or 5 cm for an average adult, while avoiding excessive chest compression depths (greater than 2.4 inches or 6 cm) (Class I, LOE C-LD).updated for 20152015Chest Wall RecoilIt is reasonable for rescuers to avoid leaning on the chest between compressions to allow full chest wall recoil for adults in cardiac arrest (Class IIa, LOE C-LD).updated for 20152015Minimizing Interruptions in Chest CompressionsIn adult cardiac arrest, total preshock and postshock pauses in chest compressions should be as short as possible (Class I, LOE C-LD).updated for 20152015Minimizing Interruptions in Chest CompressionsFor adults in cardiac arrest receiving CPR without an advanced airway, it is reasonable to pause compressions for less than 10 seconds to deliver 2 breaths (Class IIa, LOE C-LD).updated for 20152015Minimizing Interruptions in Chest CompressionsIn adult cardiac arrest with an unprotected airway, it may be reasonable to perform CPR with the goal of a chest compression fraction as high as possible, with a target of at least 60% (Class IIb, LOE C-LD).new for 20152015Compression-to-Ventilation RatioConsistent with the 2010 Guidelines, it is reasonable for rescuers to provide a compression-to-ventilation ratio of 30:2 for adults in cardiac arrest (Class IIa, LOE C-LD).updated for 20152015Layperson—Compression-Only CPR Versus Conventional CPRDispatchers should instruct untrained lay rescuers to provide compression-only CPR for adults with sudden cardiac arrest (Class I, LOE B-R).updated for 20152015Layperson—Compression-Only CPR Versus Conventional CPRCompression-only CPR is a reasonable alternative to conventional CPR in the adult cardiac arrest patient (Class IIa, LOE C-LD).updated for 20152015Layperson—Compression-Only CPR Versus Conventional CPRFor trained rescuers, ventilation may be considered in addition to chest compressions for the adult in cardiac arrest (Class IIb, LOE C-LD).updated for 20152015Open the Airway: Lay RescuerFor victims with suspected spinal injury, rescuers should initially use manual spinal motion restriction (eg, placing 1 hand on either side of the patient's head to hold it still) rather than immobilization devices, because use of immobilization devices by lay rescuers may be harmful (Class III: Harm, LOE C-LD).updated for 20152015Bag-Mask VentilationAs long as the patient does not have an advanced airway in place, the rescuers should deliver cycles of 30 compressions and 2 breaths during CPR. doi: 10.1016/j.annemergmed.2014.01.014.CrossrefMedlineGoogle Scholar113. Kitamura T, Iwami T, Kawamura T, Nagao K, Tanaka H, Hiraide A; Implementation Working Group for All-Japan Utstein Registry of the Fire and Disaster Management Agency. 2013; 62:47–56.e1. . Recent work has highlighted the survival gains by reducing time to defibrillation,132 reducing racial differences and trends in IHCA incidence and survival,133 and gathering evidence to support lengthier durations of CPR.134The Resuscitation Outcomes Consortium (ROC) is a clinical research network designed to evaluate the effectiveness of prehospital emergency care for patients with OHCA or life-threatening injury.135 Data collection began in 2007 and stems from 264 EMS agencies in 11 sites (8 in the United States and 3 in Canada), altogether representing 10% of the North American population. 1994; 154:2426–2432.CrossrefMedlineGoogle Scholar126. Fried DA, Leary M, Smith DA, Sutton RM, Niles D, Herzberg DL, Becker LB, Abella BS.The prevalence of chest compression leaning during in-hospital cardiopulmonary resuscitation.Resuscitation. The studies have not provided conclusive or consistent results about the effects of hand placement on resuscitation outcomes.2015 Recommendation—UnchangedConsistent with the 2010 Guidelines, it is reasonable to position hands for chest compressions on the lower half of the sternum in adults with cardiac arrest (Class IIa, LOE C-LD).Chest Compression RateBLS 343—UpdatedIn the 2010 Guidelines, the recommended compression rate was at least 100 compressions per minute. 2007; 116:2908–2912. Hospital variation in time to defibrillation after in-hospital cardiac arrest.Arch Intern Med. . Accessed May 9, 2015.Google Scholar140. doi: 10.1016/j.resuscitation.2009.07.019.CrossrefMedlineGoogle Scholar98. Finally, with high-quality CPR, the rescuer avoids excessive ventilation. doi: 10.1016/j.annemergmed.2012.12.020.CrossrefMedlineGoogle Scholar121. 2009; 80:553–557. doi: 10.1016/j.resuscitation.2012.03.027.CrossrefMedlineGoogle Scholar124. doi: 10.1016/j.resuscitation.2008.07.017.CrossrefMedlineGoogle Scholar103. The AHA expert consensus is that a chest compression fraction of 80% is achievable in a variety of settings.732015 Summary of EvidenceEvidence involving the consequences of compression interruptions is derived from observational and randomized human studies of cardiac arrest. doi: 10.1016/S0140-6736(12)60862-9.CrossrefMedlineGoogle Scholar135. doi: 10.1001/jama.2010.1392.CrossrefMedlineGoogle Scholar41. Idris AH, Guffey D, Pepe PE, Brown SP, Brooks SC, Callaway CW, Christenson J, Davis DP, Daya MR, Gray R, Kudenchuk PJ, Larsen J, Lin S, Menegazzi JJ, Sheehan K, Sopko G, Stiell I, Nichol G, Aufderheide TP; Resuscitation Outcomes Consortium Investigators. As of 2011, it has collected data on more than 31 000 OHCAs from 46 EMS agencies in 36 communities in 20 states.141 CARES has offered important insight into bystander CPR,142 prehospital termination of resuscitation,143 and variation in EMS systems of care.144Family Presence During ResuscitationStudies that explicitly examined the association between family presence and outcomes have shown mixed results. Vaillancourt C, Everson-Stewart S, Christenson J, Andrusiek D, Powell J, Nichol G, Cheskes S, Aufderheide TP, Berg R, Stiell IG; Resuscitation Outcomes Consortium Investigators. 2007; 369:920–926.CrossrefMedlineGoogle Scholar40. 2014 Cardiac Arrest Registry to Enhance Survival (CARES) National Summary Report. doi: 10.1016/j.resuscitation.2013.03.010.CrossrefMedlineGoogle Scholar54. 2014; 311:45–52. 2009; 119:2096–2102. Cheskes S, Schmicker RH, Verbeek PR, Salcido DD, Brown SP, Brooks S, Menegazzi JJ, Vaillancourt C, Powell J, May S, Berg RA, Sell R, Idris A, Kampp M, Schmidt T, Christenson J; Resuscitation Outcomes Consortium (ROC) investigators. A review of 100 tape recordings of true cardiac arrest cases.Resuscitation. Then you can help us save lives! Practical Guidance for Implementation We need your comments on a new Systematic Review on COVID-19 infection risk to rescuers from patients in cardiac arrest. 2013; 31:1248–1250. 20Non-Traumatic%20National%20Summary%20Report.pdf. For example, if a lone healthcare provider sees an adolescent suddenly collapse, the provider may assume that the victim has had a sudden arrhythmic arrest and call for help, get a nearby AED, return to the victim to use the AED, and then provide CPR.Delayed VentilationBLS 360Several EMS systems have tested a strategy of initial continuous chest compressions with delayed positive-pressure ventilation for adult OHCA.2015 Evidence ReviewDuring adult OHCA, survival to hospital discharge was improved by the use of an initial period of continuous chest compressions.43,44 Three observational studies showed improved survival with favorable neurologic status when EMS providers performed a set of continuous chest compressions with delayed ventilation for victims with witnessed arrest or shockable rhythm.45–47 These studies were performed in systems that use priority-based, multitiered response in both urban and rural communities, and all included a "bundled" package of care that included up to 3 cycles of passive oxygen insufflation, airway adjunct insertion, and 200 continuous chest compressions with interposed shocks. Basic Life Support SequenceStepLay Rescuer Not TrainedLay Rescuer TrainedHealthcare Provider1Ensure scene safety.Ensure scene safety.Ensure scene safety.2Check for response.Check for response.Check for response.3Shout for nearby help. The duration of CPR before defibrillation ranged from 90 to 180 seconds, with the control group having a shorter CPR interval lasting only as long as the time required for defibrillator deployment, pad placement, initial rhythm analysis, and AED charging. 1994; 80:825–831.CrossrefMedlineGoogle Scholar92. The rescuer should continue compression-only CPR until the arrival of an AED or rescuers with additional training (Class I, LOE C-LD).Trained Lay RescuerThe 2010 Guidelines recommended that trained rescuers should provide rescue breaths in addition to chest compressions because they may encounter victims with asphyxial causes of cardiac arrest or they may be providing CPR for prolonged periods of time before additional help arrives.2015 Recommendations—UpdatedAll lay rescuers should, at a minimum, provide chest compressions for victims of cardiac arrest (Class I, LOE C-LD). doi: 10.1001/jama.300.12.1432.CrossrefMedlineGoogle Scholar144. 2011; 365:787–797. The quality of CPR can also be characterized by the frequency and duration of interruptions in chest compressions—when such interruptions are minimized, the chest compression fraction (percent of total resuscitation time that compressions are performed) is higher. 2012; 83:76–80. Subgroup analysis suggested potential benefit from CPR before defibrillation in patients with prolonged EMS response intervals (4 to 5 minutes or longer)100 and in EMS agencies with high baseline survival to hospital discharge,112 but these findings conflict with other subset analyses.103 Accordingly, the current evidence suggests that for unmonitored patients with cardiac arrest outside of the hospital and an initial rhythm of VF or pVT, there is no benefit from a period of CPR of 90 to 180 seconds before attempted defibrillation.2015 Recommendations—UpdatedFor witnessed adult cardiac arrest when an AED is immediately available, it is reasonable that the defibrillator be used as soon as possible (Class IIa, LOE C-LD). 1995; 274:1922–1925.CrossrefMedlineGoogle Scholar90. Hallstrom AP.Dispatcher-assisted "phone" cardiopulmonary resuscitation by chest compression alone or with mouth-to-mouth ventilation.Crit Care Med. 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By this point in all potential scenarios, the emergency response system is activated, and a defibrillator and emergency equipment are retrieved or requested.Technique: Chest Compressions—UpdatedChest compressions are the key component of effective CPR. Perishock pause: an independent predictor of survival from out-of-hospital shockable cardiac arrest.Circulation. EMS personnel should be able to perform an out-of-hospital stroke assessment (Class I, LOE B), establish the time of symptom onset when possible, provide cardiopulmonary support, and notify the receiving hospital that a patient with possible stroke is being transported.not reviewed in 20152010StrokeEMS systems should have protocols that address triaging the patient when possible directly to a stroke center (Class I, LOE B).not reviewed in 20152010StrokeBoth out-of-hospital and inhospital medical personnel should administer supplementary oxygen to hypoxemic (ie, oxygen saturation

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