Aha circulation acls guidelines

I often get the question: Are the 2019 ACLS Guidelines different from the 2020 ACLS Guidelines? So here's the answer to that question. They're the same. Most of the links on this site will say that the site is up to date with the 2015-2020 ACLS Guidelines. The 2015 ACLS guidelines are the most recent published guidelines. Therefore, the 2020 ACLS guidelines are actually the 2015 ACLS guidelines. Every five years the American Heart Association has a meeting, and they will develop new guidelines for PPC, BLS, ACLS and PALS. These guidelines are based on data collected over the previous 5 years. You can view the new 2015-2020 ACLS guidelines here. Before these ACLS guidelines are released, the American Heart Association publishes an Executive Summary that appears in the journal Circulation. This Summary provides an overview of the most important changes made to the update. It also provides a short snippet of how the changes apply to BLS, ACLS, and PALS. 2020 ACLS Guidelines 2016, 2017, 2018, 2019 and 2020 ACLS Guidelines So now you understand that until the beginning of mid-2021, ACLS providers will be responsible to learn and master the 2015 ACLS protocols. The 2019 American Heart Association Update has arrived! 1 CanadiEM is working with AHA to create a series of three infographic articles highlighting new changes in guidelines. Our infographic visually summarizes recommendations new to the 2019 update. The first part of our infographic series focuses on updates to the 2019 ACLS Adult Guidelines. You can find the full AHA article here. Updates to the 2019 Adult ACLS Guidelines include: Use of advanced airway during CPRThe role of vasopressors during CPRThe use of extracorporeal PPC To view the full 2019 AHA focused update guidelines, visit . Stay tuned for our other infographics in the series: Pediatric ALS Updates, and Care Systems updates. You can find all the 2019 AHA Infographic Update Guidelines here! This infographic was reviewed by AHA and CanadiEM. This post was uploaded by Andy Tolmie. Panchal A, Berg K, Hirsch K, et al. 2019 American Heart Association focused update on advanced cardiovascular life support: Use of Advanced Airways, Vasopressors and extracorporeal cardiopulmonary resuscitation during cardiac arrest: Update of the Guidelines of the American Association for cardiopulmonary resuscitation and emergency cardiovascular care. Circulation. November 2019:CIR0000000000000000732. doi:10.1161/CIR.0000000000000000732 (visited 5098 times, 9 visits today) Abstract Basics of Cardiac Resuscitation include the immediate provision of high-quality cardiopulmonary cardiopulmonary cardiopulmonary combined with rapid defibrillation (as needed). These foundations of therapy laid the groundwork for other possible interventions such as medications, advanced airways, extracorporeal cardiopulmonary resuscitation, and post-cardiac care, including targeted temperature management, cardiorespiratory support, and percutaneous coronary intervention. Since 2015, more and more studies have been published evaluating some of these interventions, requiring a reassessment of their use and impact on survival after cardiac arrest. This 2019 focused update of the American Heart Association's advanced cardiovascular life support guidelines summarizes recent published evidence and recommendations on the use of advanced respiratory tracts, vasopressors, and extracorporeal cardiopulmonary resuscitation during cardiac arrest. It includes revised recommendations for all three areas, including the choice of advanced respiratory devices and strategies during cardiac arrest (e.g. bag-mask ventilation, over-prepared airways, or endotracheal intonation), training and retraining required, administration of a standard dose of epinephrine, and decisions related to the use of extracorporeal cardiopulmonary resuscitation and its potential impact on cardiac arrest. This 2019 focused update of the American Heart Association's Advanced Cardiovascular Life Support (ACLS) guidelines for cardiopulmonary resuscitation (CPR) and emergency cardiovascular care-based evidence, identified in systematic reviews and as a result of the 2019 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Medicine with recommendations for treatment from the International Committee for Resuscitation Communications (ILCOR).1 The Advanced Life Support Consensus on Science project with treatment recommendations has been posted online for public discussion,2-4 and summary, Containing the final formulation of the Consensus on Science with Recommendations for Treatment recommendations was published simultaneously with this targeted update.1Expert writing for this 2019 ACLS focused update reviewed as the 2019 Consensus on Science with Treatment Recommendations Web based on documents and studies included in systematic reviews.5-7 Discussion of the written group and reviews of the evidence were conducted with the structure and resources of out-of-dow and hospital resuscitation systems. that use these ACLS Guidelines. In addition, the written group identified classes of recommendations and levels of evidence (table) in accordance with the latest recommendations of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines8, using the process 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. 9Blable. 9Bluble. Recommendation class and level of evidence for clinical strategies, interventions, treatment or diagnostic testing in patient care (updated in August 2015) This 2019 document updates recommendations on the use of advanced respiratory tracts, vasopressors and extracorporeal CPR (ECPR) only during cardiac arrest. These updates are in addition to those published in the 2017 and 2018 guidelines focused updates.10,11 All other recommendations and algorithms, Published in Part 7: Adult Advanced Cardiovascular Life Support in the 2015 AHA Guidelines update12 and Part 8: Adult Advanced Cardiovascular Life Support in the 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care13 remain official recommendations of the American Heart Association's Emergency Cardiovascular Science Subcommittee and Written Groups. Using Advanced Airways in Cardiac Arrest For effective use of advanced airways, health care providers must maintain their knowledge and skills through frequent practice. Air control during cardiac arrest usually begins with a basic strategy, such as bag-mask ventilation (BMV). In addition to BMV, it may be helpful for vendors to master advanced airway strategies and second (backup) strategies to use if they are unable to install the first choice of airway supplement. After inserting advanced airway providers should immediately conduct a thorough assessment to make sure that the airway device is properly positioned and effective. This assessment should minimize the interruption of chest compressions. Assessment by physical examination consists of visualizing the enlargement of the chest on a bilateral basis and listening to the epigastrium (the sounds of breathing should not be heard) and lung fields on a bilateral basis (breathing sounds should be equal and adequate). The device should also be used to confirm the correct placement (see Endotracheal Intubation Versus BMV-Updated 2019). Providers must observe persistent dropographic wave forms with ventilation to confirm and monitor the endotrachal tube (ETT) placement in the field, in the vehicle, upon arrival at the hospital, and after any patient transfer to reduce the risk of unrecognized tube irrelevance or movement. The use of capnography to confirm and monitor the correct placement of the supraddal airways (SGAs) has been subjected to limited evaluation, and its usefulness will depend on the design of the airways.14.15 However, effective ventilation through the SGA device should lead to a capnograph wave form during CPR and after the return of spontaneous circulation (ROSC). Of how advanced airways are in place during cardiac arrest, providers performing CPR should no longer supply CPR cycles (i.e. compression is interrupted by pauses for ventilation). Instead, the compression provider should give continuous chest compressions at speeds of 100 to 120 per minute without pauses Ventilation. The ventilation is then provided at a rate of 10 breaths per minute (1 breath every 6 seconds). Asynchronous breaths are delivered if ventilation cannot be successfully delivered only when compressed. Providers should avoid delivering excessive ventilation during CPR because it can jeopardize venous return and cardiac output and reduce cerebral blood flow, causing direct vascularation.16Choice Advanced Airway-Updated 2019BMV without an advanced respiratory device may not allow adequate ventilation in all patients during resuscitation from cardiac arrest and does not protect against pulmonary aspiration of acuteness. As a result, advanced airway devices are often placed by suppliers during CPR. However, placing advanced airways during active compressions is a complex task, often requiring interruption of chest compressions. Emerging intubation can result in non-positioning of ETT or device. ILCOR commissioned a systematic review7 assessed the impact on overall cardiac arrest survival and neurological outcomes when providers used advanced respiratory devices such as ETT or SGA compared to BMV and other respiratory control strategies during resuscitation attempts for out-of-hospital cardiac arrest (OHCA) and in cardiac hospital (IHCA). Summary of Evidence - Updated 2019Endotracheal Intubation Versus BMVOne large randomized controlled trial (RCT) 2043 subjects with OHCA versus BMV (with predetermined potential salvation insubation) with the end of intubation (ETI) in the system, ETI's success in this study was 98%, illustrating what appears to be a relatively optimal parameter for ETI's potential success as an intervention. In this context, there were no general differences in 28-day survival (relative risk ,RR), 1.02 (95% CI, 0.71-1.47) or 28-day survival with favorable neurological function (RR, 1.03 (95% CI, 0.68-1.55) between groups, processed ETI and BMV.17B supplement to the randomized controlled study Jabre et al.17 systematic review has identified a number of observational studies assessing the use of BMV compared to ETI.7 Many of these studies have suggested a link between ETI and the worst outcome, but the choice of bias and confusion severely limit the certainty of data.7 Confusion on the indications is also problematic, because ETI is likely to be used in patients with a more severe disease. Almost all studies have had resuscitation or immortal time bias, which are forms of bias/confusion that can occur in observational intervention assessment studies if the timing is not taken into account. More information to give a systematic Granfeldt et al.,7 works by Donnino et al.,18 and analysis conducted by Levesque et al.19 provide additional information. SGA DevicesTwo's large RCTs compared the use of the SGA strategy with ETI's Emergency systems.20,21 There was a significant heterogeneity in design in various studies, excluding data pooling. One RCT of 9,296 subjects compared inserts i-gel (from Intersurgical Ltd, Berkshire, UK) SGA with ETI, finding no difference in survival (RR, 0.95 95% CI, 0.82-1.10) or survival with a good neurological outcome (RR, 0.92 95% CI, 0.77-1.09) in hospital discharge.20 Other RCTs enrolled 3004 patients with OHCA and compared ETI with the insertion of a laryngal tube (from VBMzinnik MedinikTech GmbHH , Sul Neck , Germany), finding both higher survival rates for hospital discharge (RR, 1.34 (95% CI, 1.07-1.68); 27 more patients per 1000 (95% CI, 6-48)) and higher hospital survival discharge with good neurological results (RR, 1.42 (95% KI, 1.07-1.89); 21 more patients per 1000 (95% KI, 3-38)) when discharged from the hospital when the laryngal tube was used.21Thicy study Jabre et al17 illustrated the high success rates of ETI (98%) Benger et al20 and Wang et al21 studies were conducted in conditions with much lower success rates. In particular, the recorded success rate of ETI in the Benger et al test was 69%, and in the Wang et al trial it was 52%. In addition, the definition of intubation success also differed between these tests. Like the method used in systematic review7, we viewed these studies as occurring in conditions with historically high or low intubation success. With historically lower ETI success rates, the results of these recent studies may not accurately reflect the effectiveness of ETI compared to SGA devices. Recommendations - Updated 2019Ther BMV or advanced respiratory strategy can be considered during adult cardiac arrest in any setting (class 2b; B-R evidence level). If advanced airways are used, SGA can be used for adults with OHCA in conditions with low tracheal intubation success or minimal learning opportunities to accommodate ETT (class 2a; B-R evidence level). If advanced airways are used, SGA or ETT can be used for adults with OHCA in conditions with high trachea success rates or optimal learning opportunities to accommodate ETT (class 2a; B-R evidence level). If advanced airways are used in the hospital by expert suppliers trained in these procedures, either SGA or ETT (Class 2a; B-R evidence level) can be used. Frequent experience or frequent retraining is recommended to service providers who perform ETI (Class 1; B-NR Evidence Level). Emergency medical systems that perform pre-hospital ethonication should provide a continuous quality improvement programme to minimize complications track the overall success rates of SGA and ETT (Class 1; C-EO Evidence Level). THE RCTs included in this assessment allow the supplier to be rejected on the basis of clinical clinical Reported. It is impossible to assess the individual potential benefit of the patient (or harm) that was guided by each decision to place advanced airways. The characteristics of the patient and the service provider can influence the outcome on a case-by-case basis. For example, a provider with poor ETI skills is more likely to serve the patient better without trying ETI. Similarly, for a patient with a witness in hospital ventricular fibrillation, providers should prioritize immediate CPR with defibrillation as the final therapy for delaying defibrillation to ensure the placement of advanced airways. In contrast, a patient with hypoxic-driven arrest with profuse vomiting in the airways may require qualified providers to consider a quick ETI. Thus, a final decision on both the type and timing of modern airways will require consideration of the hostess characteristics of the patient and the supplier, which are not easy to determine in the global recommendation. Based on these problems, there is a specific need to better understand how the characteristics of the patient interact with the rescue training, experience, technical means and skills to solve and overcome specific problems for advanced respiratory control during resuscitation. Recommendations for advanced airway placement during cardiac arrest suggest that the provider has initial training and the skills and current experience to insert the airways and check the correct position with a minimum break in chest compression. BMV ventilation also requires skill and skill. Thus, the choice of BMV instead of advanced airway insertion will be determined by the skill and experience of the supplier and the needs of the patient. An important aspect of all these aircraft management decisions should be a clear and clear plan of situations in which the initial airway structure fails. The rationale for tracking the overall success of ETI systems is to make informed decisions about whether the practice should allow the procedure or move to using SGA for cardiac arrest patients; recommendations will vary depending on the overall success of the system. In addition, frequent experience and training are essential to maintaining high overall success rates for aircraft management and should be part of a continuous quality improvement system. At present, there is insufficient evidence to make a specific recommendation for the ideal frequency of retraining. This is a knowledge gap that needs to be addressed in future investigations. Use of vasopressors in cardiac arrestIn 2018 ILCOR ordered a systematic review and meta-analysis of the use of vasopressor during cardiac arrest as part of update process to evaluate published literature. This systematic ILCOR review, published in 2019.5, deals with the use of epinephrine and vasopressin vasopressin during cardiac arrest. New recommendations in this 2019 ACLS ACLS the update applies only to the use of these vasopressors for cardiac resuscitation. Summary of evidence: The standard dose of epinephrine-Updated 2019Epinephrine was supposed to have beneficial effects during cardiac arrest primarily due to its α-adrenargic (i.e. vasocse) effects. These effects can increase coronary and perfusion brain pressure during CPR. The importance and safety of β-adrenergic effects of epinephrine are controversial as they can increase the demand for myocardial oxygen and reduce subendicardy perfusion and can be proarrhythmic. Similarly, α-adnergic effects of the drug can cause vasocpower at the microvascular level, leading to greater tissue ischemia. The recommendations of the ACLS in 2010 and 2015 AHA guidelines update12 will suggest that it is prudent to consider administering 1 mg doses of intravenous/intra-osseous epinephrine every 3 to 5 minutes during adult CPR. At the time of the 2015 evidence assessment, 1 RCT22 showed that epinephrine increased ROSC and hospitalization, but this trial was stopped early and therefore insufficient to detect any differences in long-term survival or good neurological outcome.22Two RCTs22.23 were identified in the 2019 systematic review, which evaluated the effects of epinephrine in OHCA.5 There were also a number of non-uninuded comparative studies, but a high risk of bias and heterogeneity of the design excluded them from combining them in a meta-analysis.52 RCKI22.23 comparisons of epinephrine use (up to 10 standard doses of 1 mg every 3-5 minutes) with placebo during cardiac arrest were included in the meta-analysis. In bullet tests, the use of epinephrine for patients with any initial rhythm significantly increased survival in hospital discharge (RR, 1.44 (95% CI, 1.11-1.86); 10 more by 1000 (95% CI, 2-19),) Hospital Survival (RR, 2.88 (95% CI, 2.57-3.22); 156 more per 1000 (95% CI, 131-185) and ROSC (RR, 3.09 (95% CI, 2.82-3. 39; 243 more per 1000 (95% KI, 211-277)5 However, there was no significant difference between the groups in the survival of hospital discharge with a favorable neurological outcome. In this study, epinephrine improved survival by 30 days (RR, 1.40 (95% KI, 1.07-1.84); 9 more per 1,000 (95% KI) , 2-18). Although there was an increase in survivors with poor neurological function when discharged in the epinephrine group, there was no difference in survival with a favorable or adverse neurological outcome in a 3-month period of time. In fact, the difference in survival with a favorable neurological outcome came close to the value in the group (RR, 1.30 (95% KI, 0.94-1.80); another 5 per 1000 1000 CI, 1 less-13 more).23Epinephrine effect and arrest rhythms There may be a difference in the effect of epinephrine on favorable neurological outcomes based on the rhythm of arrest. In court, PARAMEDIC 2, among people with an unshockable rhythm treated with epinephrine, an increase in survival with a favorable neurological outcome at three months of approaching statistical significance (RR, 3.03 95% CI, 0.98-9.38; 3 more in 1000 95% CI, 0 few-11 more).24 There was no difference in this outcome for those with shockable rhythms. The systematic review also analyzed short-term results in the pool analysis of 2 RCTs based on the presentation of the rhythm.5 This subgroup analysis, although informative, has limitations because the number of patients is small, so the analysis is not sufficiently powerful, and therefore the conclusions are less definitive than the overall conclusions. In this analysis, epinephrine improved survival in hospital discharges in those with non-sockable rhythms (RR, 2.56 95% KI, 1.37-4.80; another 6 per 1000 95% KI, 1-15) but not those with shock-in-rhythms. Epinephrine increased ROSC in patients with both non-sockable (RR, 4.45 95% 95% KI, 3.91-5.08); 254 more per 1000 95% CI, 214-301) and shock (RR, 1.68 95% CI, 1.48-1.92;185 more by 1000 (95% CI, 130-250)) rhythms.22.23 There was a statistically significant interaction between epinephrine and the initial rhythm, suggesting that epinephrine may be effective for non-sockable rhythms.5Rec recommendation: Standard dose of epinephrine-Updated 2019 We recommend that epinephrine be administered to patients at cardiac arrest (class 1; B-R. Based on the protocol used in clinical trials, it is reasonable to administer 1 mg every 3 to 5 minutes (class 2a; C-LD evidence level). The strength of the recommendation is based on a significant difference in 30-day survival and survival when discharged from the hospital, as well as on the short-term results of ROSC and survival in hospitalization. Although epinephrine has not been shown to definitively improve survival with a favorable neurological outcome, this result was difficult to assess given the small number of charred subjects at 3-month time. However, the results suggest a possible benefit, especially for patients with an initial non-sockable rhythm. Although the PARAMEDIC 2 trial did not report any increase in long-term survival with adverse neurological outcome, there was an increase in short-term survival with adverse neurological outcome.23 Very low survival with a favorable neurological outcome when discharged (1.9%-2.2%) in this study,23 may not be generalized to other health systems or places where survival may be higher; therefore, exposure to epinephrine can vary. Variations in post-cardiac arrest can also have a significant impact on the outcomes of patients with OHCA who survive to death Significant improvements in ROSC, short-term survival, long-term survival, and potentially good neurological outcomes support a strong recommendation for epinephrine, despite some remaining uncertainty about the overall effect on neurological outcomes. The systematic review did not identify RCF testing of epinephrine compared to placebo in IHCA.5 it is unclear how the results of the OHCA studies applied to IHCA; also it is unclear the potential impact of fluctuations in the timing of the drug, the presentation of rhythms and the presence of immediate reversible factors. The timing of the drug is noticeably shorter in the IHCA, suggesting that epinephrine may be more beneficial, especially for non-sockable rhythms, but this remains unknown. Conversely, witnesses to arrests, especially in the case of shock, can be curable without epinephrine, especially if a reversible cause is identified. Finally, these estimates did not address the potential value of the method of delivery of epinephrine (intra-osseous against intravenous) and whether there was a threshold dose of benefit or harm to epinephrine. These knowledge gaps need to be addressed and are important pathways for future research. Summary of evidence: A standard dose of epinephrine against high doses of epinephrine-ReviewedHigh doses of epinephrine is generally defined as doses ranging from 0.1 to 0.2 mg/kg. In theory, higher doses of epinephrine may increase coronary perfusion pressure, leading to increased ROSC and survival after cardiac arrest. However, the side effects of higher doses of epinephrine in the period after cardiac arrest can negate the potential benefits during the intra-host period. The 2010 guidelines did not recommend the use of high-dose epinephrine, Except in special circumstances, such as an overdose of a β blocker or a calcium channel blocker or when credited with real-time physiologically controlled parameters.13 In 2015, ILCOR evaluated the use of high-dose epinephrine compared to standard test doses,25 and 2015 AHA upgrade guidelines recommended against its use with class 3 force: No Benefit.12A number of test doses, 25 and 2015 AHA upgrade guidelines recommended against its use with class 3 force: No benefit.12A number of test doses, 25 and 2015 AHA upgrade guidelines recommended against its use with class 3 force: No benefit.12A number of test doses, 25 and 2015 AHA upgrade guidelines recommended against its use with class 3 force: No benefit.12A number of test doses, 25 and 2015 AHA upgrade guidelines recommended against its use with class 3 force: No benefit.12A number of test doses, 25 and 2015 AHA upgrade guidelines recommended against its use with class 3 force: No benefit.12A number of test doses, 25 and 2015 AHA upgrade guidelines recommended against its use with class 3 force: No Benefit.12A number of testes, comparing high doses with a standard dose of epinephrine found that high doses of epinephrine failed to lead to improved survival for discharge with a favorable neurological outcome (i.e., cerebral performance category score 1-2), 2 Some studies reported higher rates of short-term ROSC with high doses of epinrin. 26-31For the 2019 review, ILCOR determined that unless new studies were identified that were not considered in the 2015 review on the topic, this comparison would not be re-examined. In the systematic search, no new therefore, the recommendation for 2015 remains unchanged. Recommendation: Standard dose of epinephrine vs. high-dose epinephrine-Unsmooth dose Not recommended for regular use in cardiac arrest (class 3: No use; B-R proof level). Evidence Summary: Vasopressin vs. Epinephrine-Updated 2019Vasopressin is a non-adrenergic peripheral vasoconstricler that also causes coronary and renal vascularation. Vasopressin was removed from the American Heart Association's Adult Cardiac Algorithm in 2015 when initial trials failed to demonstrate significant benefits for vasopressin compared to or in addition to epinephrine. In the 2019 vasopressor systematic review5 identified 3 RCTs32-34 that were evaluated in a meta-analysis and 1 additional test did not combine,35 comparing the original vasopressin with the original epinephrine during CPR. There were no significant differences between the groups in any of the results. The certainty of this data was low to very low as a result of heterogeneity in the development of the study and inaccuracies as a result of the small sample sizes. Recommendation: Vasopressin vs. Epinephrine -Updated 2019Vasopressin may be considered in cardiac arrest, but offers no benefits as a replacement for adrenaline in cardiac arrest (class 2b; C-LD evidence level). RCIs comparing the original vasopressin with the original epinephrine failed to show any result of the benefits of using vasopressin compared to epinephrine. These tests tended to be small, and even when combined with meta-analysis, they did not approach the sample size, which would be necessary to conclude that vasopressin did not yield any benefit. There is evidence that epinephrine improves survival compared to placebo, and there is no such evidence for vasopressin compared to placebo. Because there is also no evidence that vasopressin superior to epinephrine seems appropriate to use only epinephrine during cardiac arrest, thereby maintaining greater simplicity for suppliers in the treatment algorithm and in the necessary drugs. It should be noted that the combination of vasopressin and steroids during cardiac arrest was not evaluated in the 2019 vasopressor update. Summary of evidence: Epinephrine combined with vasopressin vs. epinephrine-only-Updated 2019Thre RKI36-38 were evaluated in a meta-analysis comparing the use of initial epinephrine plus vasopressin with epinephrine only during CPR.5 There was no significant difference between the groups for any of the results. The low to very low reliability of the evidence is the result of heterogeneity in the development of the study, some inconsistency of the results between studies and inaccuracies as a result of smaller sample sizes. Another RCR was available for analysis and was not included in the meta-analysis due to the significant number of patients receiving epinephrine randomization.35Recriation: Epinephrine combined with vasopressin vs. epinephrine Only-Updated 2019Vasopressin in combination with epinephrine can be considered during time arrest, but offers no benefits as a replacement only for epinephrine (class 2b; C-LD evidence level). RCTs, comparing the combination of vasopressin and epinephrine only with epinephrine, showed no benefit from the addition of vasopressin to epinephrine. However, these studies tended to be small, and even when combined with meta-analysis, they did not approach the sample size, which would be necessary to conclude that vasopressin did not provide any additional benefit. Since there is no evidence that vasopressin provides an additional benefit when added to epinephrine, the consensus of the writing team is that the use of epinephrine only as a vasopressor during cardiac arrest will maintain simplicity in the algorithm of heart failure treatment and necessary drugs. Summary of evidence: The timing of the administration's epinephrine-Updated 2019No RCI directly investigated the optimal timing of the introduction of epinephrine. Sixteen observational studies were identified, most of which were conducted in patients with OHCA, and all were deemed to have a critical risk of bias, excluding meta-analysis. Ten of these studies are 18.39-47 compared to the early (variably defined as 1-3, zlt;5, zlt;10, 5-18, and 5-20 minutes) and late administration of the first dose of epinephrine. All found higher ROSC rates when epinephrine was administered early. Differences in survival before discharge from hospital and favorable neurological outcome were further limited by very low rates of events and inconsistent results in studies. Four studies 48-51 evaluated the time before the first dose of epinephrine as a continuous variable, finding a slightly lower chance of ROSC for a 1-minute delay in epinephrine administration. Earlier treatment can cover many variables other than time itself. Among them, higher levels of overall health productivity (e.g. high-quality CPR, rapid access to blood vessels, improved team performance, and rapid airway control) could improve overall performance of resuscitation efforts for which epinephrine can simply serve as a surrogate. Although none of the RCTs comparing epinephrine with placebo assessed the timing of the introduction of epinephrine, The protocol in both cases is to administer epinephrine as soon as possible for non-shockable rhythms and after the third shock for shocking rhythms.22,23 Charges: Timing of Epinephrine Administration-Updated 2019C respect for timing, for heart failure with an unsockable rhythm, reasonably manage epinephrine as soon as possible (class 2a; C-LD' evidence level). As for the timing, for cardiac arrest with a shocking rhythm, it may be reasonable to administer epinephrine after initial defibrillation attempts failed (class 2b; evidence level Lack of other competing benefits for the unsofockable and higher ROSC rates and survival rates with epinephrine in unsockable rhythms form the basis of Class 2a recommendations for epinephrine administration as soon as possible to arrest with unsockable rhythms. In circumstances in which a reversible cause of an unshadable arrest (e.g. asphyxia) is identified and resolved immediately, the use and optimal time of epinephrine may differ. For shock rhythms, providing high-quality CPR and defibrillation should be a priority for immediate care, and the optimal epinephrine time is less clear. 2 available RCTs administer epinephrine after the third shock to those with initial shock rhythms. Whether giving epinephrine earlier for these shocking rhythms would be helpful, or even harmful, is unknown. Extracorporeal CPRNote: Evidence and recommendations for the use of extracorporeal membrane oxygenation during CPR (ECPR) reviewed in this ACLS targeted update are also included in Part 6: Alternative Methods and Assistive Devices for Cardiopulmonary Resuscitation in the 2015 AHA Guidelines Update.52 The following section updates the contents, related to the ECPR in the ACLS guidelines, but should also be used to update Part 6 2015 AHA guidelines update.52For these guidelines the term ECPR refers to the initiation of cardiopulmonary bypass surgery during a patient's resuscitation at a stop Heart. This includes the cannibalization of a large vein and artery and the onset of venoarter extracorporeal circulation and oxygenation (figure). The purpose of ECPR is to support end organ perfusion while using potentially reversible conditions. ECPR is a complex intervention that requires a highly skilled team, specialized equipment and interdisciplinary support within the health care system. Figure. A schematic image of the components of extracorporeal membrane oxygenators used for extracorporeal cardiopulmonary resuscitation (ECPR). Components include venous cannula, pump, oxygenator and arterial cannula. Summary of Evidence - Updated in 2019In 2018, ILCOR commissioned a systematic review as part of a targeted update process to evaluate published ECPR data; This review was published in 2018.6 Studies were included in a systematic review if they involved 5 patients in the ECPR group, reported ECPR timing due to cardiac arrest, and had randomized trials, non-randomized controlled trials, or observational studies (cohort and case studies) that included a control group. ECPR for OHCA No RCTs on the use of ECPR for OHCA. Fifteen observational studies involving patients from Asia, Europe and North America with average ages of 46 to 59 were identified, were enrolled between 1999 and 2015. Some studies included overlapping cohorts or time frames. Studies varied according to ecPR, ECPR, 31 to 955 patients, including 3,398 patients in total. Five studies included only patients with cardiac arrest and short non-flow times.53-57 Most studies also required cardiac arrest,53,55-62 and many limited the patient's age to a maximum of 75 years.53,54,54,61,62Ausia were analyzed for results, with short-term and long-term neurological outcomes and survival outcomes, synthesized separately. Eight studies with 1,294 patients assessed short-term favorable neurological outcomes when discharged from hospital or 1 month,54,57-59,61-64 and 6 studies with 1,303 patients assessed long-term favorable neurological outcomes (3 months, 6 months, and 1 year).55-57.59,60.63 In all studies, favorable neurological outcome was defined as a cerebral performance score of category 1 or 2. The data were available from 12 studies of 2,739 patients who assessed survival in hospital discharge or 1 month53-55,57-60,63-67 and 6 studies of 1,212 patients, which reported long-term survival.53.55,57,59,60,63Alli studies were found to have a very serious risk of bias, caused mainly by confounding.6 In addition, in the course of studies, there was significant heterogeneity in the design of the study, and for survival outcomes, there was a significant discrepancy in the results. Thus, the overall certainty of the evidence was assessed by the reviewers as very low in all results, and no meta-analysis was carried out. Since the only available evidence is non-scourge studies, the results presented should be considered as intervention-related rather than related to it. In 3 studies, ECPR has been associated with an improvement in the favorable neurological outcome in both the short-term, So on the long-term follow-up, 57.59.63 and in 3 additional studies that do not include long-term follow-up, ECPR has also been associated with an improvement in short-term favorable neurological outcome.54,61.62 Two studies have shown no benefit from short-term neurological outcomes associated with ECPR,58,64 and 3 studies reported beneficial effects on long-term neurological outcome related to ECPR.55.56.60Two studies reported short- and long-term survival benefits, related to ECPR,59.60 and 1 study reported long-term survival benefits associated with ECPR, but, interestingly, did not demonstrate benefits for short-term survival outcomes.55 EcPR use was not associated with short-term survival in 9 studies54.55,57,58,63-67 and was not associated with long-term survival in 2 studies55,57,58,63-67 and was not associated with long-term survival in 2 studies57.57,63-67. ,63 The study noted the link of lower rates of both short-term and long-term survival with ECPR.53ECPR for IHCAThere no ECPR use for IHCA. Seven observational studies were carried out. These studies included patients from Asia and with an average age of 57 to 72 years who were enrolled between 2001 and 2013. Some studies include overlapping cohorts or time frames. The cohorts of the study ranged from 20 to 353 patients, including a total of 705 patients. Studies varied in inclusion criteria, such as the cause of cardiac arrest, and many limited the age of enrollment of a patient to a maximum of 75 or 80 years.68-71 When only non-scourge studies are available, any results are considered to be related or unrelated to intervention and not triggered by intervention. Studies were analyzed based on results, short-term and long-term neurological outcomes and survival results synthesized separately. Data from 4 studies in 619 patients reported both short-term favorable neurological outcomes (discharge from hospital or 1 month) and long-term favorable neurological outcomes (3 months, 6 months and 1 year) associated with ECPR.69-72 In all studies, a favorable neurological outcome was defined as a cerebral performance assessment of 1 to 2. Five studies of 685 patients reported survival in hospital discharge or 1 month and long-term survival.68-70,72,73All studies were rated as having a very serious risk of bias, resulting primarily from confusion. The overall certainty of the evidence was assessed by the reviewers as very low for all results.6 Given these estimates and the heterogeneity of the results, individual studies were difficult to interpret and no meta-analysis was conducted. In 3 studies, ECPR was not associated with beneficial effects on short-term or long-term neurological outcomes,68.69.72 while 1 study70 reported related short- and long-term neurological outcomes benefits. Four studies showed no increase in short-term or long-term survival associated with ECPR,68,69,72.73, and only 1 study reported improvement in these results. Recommendations - Updated 2019 There is insufficient evidence to recommend the regular use of ECPR for patients with cardiac arrest. ECPR can be considered for individual patients as a life-saving therapy when conventional PPC efforts are not in conditions in which it can be promptly implemented and supported by qualified providers (class 2b; C-LD evidence level). Despite numerous studies reporting favorable results using ECPR, the vast majority of studies come from separate centers with different inclusion criteria and settings, with decisions to implement ECPR taken on a case-by-case basis. Clinical and patient factors influencing the decision to conduct ECPR can also influence the outcome. For this and other reasons, all the studies included are estimated to have risk of bias as a result of confusion. In addition, heterogeneity between studies has reduced their external validity (generalization). All of these factors have hindered the meta-analysis.6 Although there is currently no evidence that Make up individual patients, most of the studies analyzed in the systematic review included young patients with fewer comorbidities.6 For example, a young subject without comorbidities with a sudden stop of secondary alleged cardiac arrhythmia can be considered a better candidate than an elderly patient with metastatic malignancy and cardiac arrest. It is clear that more data are needed from higher methodological studies, including randomized trials. Data is also needed to address the complexity of cost efficiency, resource allocation and ethics associated with the use of ECPR in intensive care. Writing by DisclosuresWriting Group MemberEmploymentResearch GrantOther Research SupportSpeakers' Bureau/HonorariaExpert WitnessOwnOwn InterestConsultant/Advisory BoardOtherAshish R. PanchalThe Ohio University Wexner Medical CenterNoneNoneNoneNoneNoneKatherine M. BergBeth Israel Diaconess Medical CenterNIH (cardiac clinical trial grant research drug thiamine not related to guidelines) NoneNoneNoneNoneOneJos G. CabanasWake County Emergency MedicineNoneNoneNoneNoneNoneNoneNPaoneul S. ChanMid America Heart Institute and University of Missouri-Kansas-CityNHLBI†NoneNoneNoneNoneMarina Del RiosUniversity Illinois at the Chicago College of MedicineNIH (receives 6% salary support for hypertension research) DonninoBeth Israel Deaconess Medical CenterNoneNoneNoneNoneNoneMary Fran HazinskiVanderbilt University School NursingNoneNoneNoneNoneNone American Heart Association Emergency Cardiovascular Care Programs†NoneKaren G. Hirschstanford University American Heart Association (research support of post-cardiac heart association cardiovascular care arrest study) NoneNoneNoneNoneNoneNonePeter J. KudenchukUniversity Washington Medical CenterNIH/NHLBI/NINDS (PI at the University of Washington for SIREN Network) NoneNoneNoneNoneMichael C. KurzUniversity alabama at Birmingham'all Medical Foundation†; Soll Medical Corporation†; NIH (research grants, both received and pending) †None'oll Medical Corp†NoneRapid Oxygen Corp'NoMark S. LinkUT Southwestern Medical CenterNoneNoneNoneNoneNonePeter T. MorleyUniversity Of Melbourne Clinical School, Royal Melbourne Hospital (Australia) NoneNoneNoneNoneNoneOneReviewer DisclosuresReviewerEmploymentResearch GrantOther Research SupportSpeakers' Bureau/HonorariaExpert WitnessOwnership InterestConsultant/Advisory BoardOJanet E. BrayMonash University (Australia) NoneNoneNoneNoneNoneNoneAoneAlan C. HeffnerAtrium HealthNoneOneThe Difficult Airway Course Faculty-Medicolegal review of cases related to cardiac arrest McNallyEmory UniversityCardiac Arrest Registry for Survival Enhancement (CARES receives funding from the American Red Cross and the American Heart Association) †NoneNoneNonEnoneNenonNeRobert D.D. Forest UniversityNoneNoneNoneNoneNoneJoseph. OrnatoVirginia University Of the Commonwealth Health SystemNoneNoneNoneNoneNoneNoneMary Ann PeberdyVirginia Commonwealth UniversityNoneNoneNoneNoneThomas ReaUniversity WashingtonFederal pending grant (pending grant to further study of respiratory techniques) NoneNoneNoneNoneNoneNoneFootnotes American Heart Association does its best to avoid any actual or potential conflicts of interest that may arise as a result of external relationships or the personal, professional, or business interest of a member of the writing panel. In particular, all members of the written group are required to complete and submit a disclosure questionnaire showing all such relationships that may be perceived as real or potential conflicts of interest. This document was approved by the Scientific Advisory and Coordinating Committee of the American Heart Association on 19 July, 2019, and the Executive Committee of the American Heart Association August 9, 2019.American Heart Association asks for this document to be given as follows: Panchal AR, Berg KM, Hirsch KG, Kudenchuk PJ, Del Rios M, Caba'as JG, Link MS, Kurz MC, CHAN, Morley PT, Hazinski MF, Donnino MW. 2019 American Heart Association focused updates on advanced cardiovascular life support: the use of advanced respiratory tracts, vasopressors, and extracorporeal cardiopulmonary resuscitation during cardiac arrest: the renewal of the American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2019;140:e881-e894. doi: 10.1161/CIR.0000000000000732.Copies: This document is available on the website of the American Heart Association (professional.heart.org). A copy of the document is available at via either Search Guidelines and Statements or Review on the topic area. To purchase additional reprints, call 843-216-2533 or email kelle. (e-mail is protected) com. An expert review of documents ordered by the AHA (e.g. scientific statements, clinical practice guidelines, systematic reviews) is conducted by the AHA Office of Scientific Operations. For more information on AHA statements and development guidelines, visit . Select menu guidelines and statements, then click the Publication Development button. Permits: Multiple copies, modifications, modifications, modifications, enhancements and/or distribution of this document are not allowed without explicit authorization from the American Heart Association. Instructions for obtaining a permit are . Link to Copyright Permit Request Form появляется во втором абзаце (. Ссылки1. Пари J, Maconochie I, Wyckoff Wyckoff OlasveengenTM, Singletary EM, Greif R, Aickin R, Bhanji F, Donnino MW, Mancini ME et al. 2019 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Medicine with Treatment Recommendations: CV from Basic Life Support; Extended life support; Pediatric life support; Support for newborns' lives; Education, implementation and commands; and first aid to task forces. Circulation. 2019; 140:e826-e880. doi: 10.1161/CIR.0000000000000734LinkGoogle Scholar2. Soar J, Nicholson TC, Parr MJ, Berg KM, Buttiger BW, Callaway CW, Deakin CD, Drennan I, Neumar RW, O'Neill BJ, et al. Advanced Respiratory Control during Adult Heart Failure: Consensus on Science with Treatment Recommendations. International Resuscitation Communications Committee (ILCOR) Advanced Life Support Task Force.April 4, 2019. . Access to August 23, 2019.Google Scholar3. Welsford M, Berg KM, Neumar RW, Paiva EF, Andersen LW, Buttiger BW, Callaway CW, Deakin CD, Drennan I, Kleinman M, et al. Vasopressors in Adult Cardiac Arrest: Consensus on Science with Treatment Recommendations.International Resuscitation Communications Committee (ILCOR) Extended Task Force for Life Support. April 4, 2019. . Access to August 23, 2019.Google Scholar4. Donnino MW, Andersen LW, Deakin CD, Berg KM, Buttiger BW, Callaway CW, Drennan I, Neumar RW, Nicholson TC, O'Neill BJ, et al. Extracorporeal Cardiopulmonary Resuscitation (ECPR) for adult cardiac arrest: Consensus on science with treatment recommendations. The International Resuscitation Communications Committee (ILCOR) Extended Life Support Task Force.21 March 2019. . Access to August 23, 2019.Google Scholar5. Holmberg MJ, Issa MS, Moskowitz A, Morley P, Welsford M, Neumar RW, Piva EF, Coker A, Hansen CK, Andersen LW, et al; On behalf of the International Resuscitation Liaison Committee Advanced Staff of the Life Support Task Force. Vasopressors during cardiac arrest in adults: systematic review and meta-analysis. Resuscitation. 2019; 139:106–121. doi: 10.1016/j.resuscitation.2019.04.008CrossrefMegyneMagle Scholar6. Holmberg MJ, Jeri G, Viberg S, Gergerian AM, Donnino MW, Nolan JP, Deakin CD, Andersen LW; International Communications Committee for Resuscitation (ILCOR) Advanced Life Support and Pediatric Task Force. Extracorporeal cardiopulmonary resuscitation in cardiac arrest: a systematic review. Resuscitation. 2018; 131:91–100. doi: 10.1016/j.resuscitation.2018.07.029CrossrefMedgleGugle Scholar7. Granfeldt A, Avis SR, Nicholson TC, Holmberg MJ, Moskowitz A, Coker A, Berg KM, Parr MJ, Donnino MW, J Soar, etc.; On behalf of Communications Committee Advanced Life Support Task Force Employees. Extended control of the airways during cardiac arrest in adults: a systematic review. Resuscitation. 2019; 133-143:139.Google Scholar8. Halperin JL, Levin GN, Al-Khatib SM, Birtcher KK, Bozkurt B, Brindis RG, Cigarroa JE, Curtis LH, Fleischer LA, Gentile F, et al. Further Evolution of ACC/AHA Clinical Practice Guidelines Classification Systems: Report by the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. 2016; 133:1426–1428. doi: 10.1161/CIR.0000000000000312LinkGoogle Scholar9. Morrison LJ, Gent LM, Lang E, Nunnally ME, Parker MJ, Callaway CW, Nadkarni VM, Fernandez AR, Billy JE, Egan JR, et al. Part 2: Evidence Assessment and Conflict Management: 2015 American Heart Association Guidelines Update for Cardiovascular Resuscitation and Emergency Vascular Care. Circulation. 2015; 132 (suppl 2):S368-S382. doi: 10.1161/CIR.0000000000000253LinkGoogle Scholar10. Kleinman ME, Goldberger DD, Ri T, Swor RA, Beavers BJ, Brennan EE, Terry M, Hemphill R, Gazmuri RJ, Hazinski MF, et al. 2017 American Heart Association focused updates on adult basic life support and cardiopulmonary resuscitation quality: update of the American Heart Association Guidelines for Cardiac Resuscitation and Emergency Heart Resuscitation 2018;137:e14. Circulation. 2018; 137:e7-e13. doi: 10.1161/CIR.0000000000000539AbstractGoogle Scholar11. Panchal AR, Berg KM, Kudenchuk PJ, Del Rios M, Hirsch KG, Link MS, Kurz MC, Chan PS, Cabanas JG, Morley PT, et al 2018 American Heart Association focused updates on advanced cardiovascular life support use of antiarrhythmic drugs during and immediately after cardiac arrest: updating the American Heart Association Guidelines for Cardiovascular Resuscitation and Emergency 2018; 138:e740-e749. doi: 10.1161/CIR.0000000000000613LinkGoogle Scholar12. Link MS, Berkow LC, Kudenchuk PJ, Halperin HR, Hess EP, Moitra, VK Neumar RW, O'Neil BJ, Paxton JH, Silvers SM et al. Part 7: Adult Advanced Cardiovascular Life Support: 2015 American Heart Association Guidelines Update for Cardiovascular Resuscitation and Emergency Cardiovascular Care Published In Circulation Appears in Circulation. 2015;132:e385. Circulation. 2015; 132 (suppl 2):S444-S464. doi: 10.1161/CIR.0000000000000261LinkGoogle Scholar13. Neumar RW, Otto CW, Link MS, Kronick SL, Shuster M, Callaway CW, Kudenchuk PJ, Ornato JP, McNally B, Silvers SM, etc. Part 8: Adult Advanced Cardiovascular Life Support: 2010 American Heart Association Guidelines for Cardiovascular Pulmonary and emergency cardiovascular care published corrections appear in circulation. 2011;123:e236 and circulation. 2013;128:e480. Circulation. 2010; 122:S729-S767. Doy: Doy: Scholarship14. Frascone RJ, Russi C, Lick C, Conterato M, Wewerka SS, Griffith KR, Myers L, Conners J, Saltzman JG. Comparison of pre-fat insertion success rates and time for insertion between standard endotrachel inotubide and supragothic airways. Resuscitation. 2011; 82:1529–1536. doi: 10.1016/j.resuscitation.2011.07.009CrossrefMedgleGugle Scholar15. Vitaleni VD, Vlk S, Davis SI, Richmond New Jersey. The unrecognized failed to control the airways with the help of a overhead breathing apparatus. Resuscitation. 2017; 119:1–4. doi: 10.1016/j.resuscitation.2017.07.019CrossrefMedlineGoogle Scholar16. Aufderheide TP, Sigurdsson G, Pirrallo RG, Yiannopoulos D, McKnite S, Von Brisen C, Sparks CW, Konrad CJ, Provo TA, Lurie KG. Hyperventilation of induced hypotension during cardiopulmonary resuscitation. Circulation. 2004; 109:1960–1965. doi: 10.1161/01.CIR.0000126594.79136.61LinkGoogle Scholar17. Jabre P, Penaloza A, Pinero D, Duchateau FX, Borron SW, Javaudin F, Richard O, de Longueville D, Bouilleau G, Devaud ML, etc. Effect of bag-mask ventilation against endotracheal inotheal inotheal inocubement during cardiopulmonary resuscitation on neurological outcome after extra-hearted cardiac arrest Jama. 2018; 319:779–787. doi: 10.1001/jama.2018.0156CrossrefMedlineGoogle Scholar18. Donnino MW, Salcicciholi JD, Howell MD, Cocchi MN, Giberson B, Berg K, Gautam S, Callaway C; The American Heart Association get on with the guidelines-resuscitation investigators. The time of introduction of epinephrine and the result after cardiac arrest in a hospital with non-shocking rhythms: retrospective analysis of a large register of data in the hospital. BMJ. 2014; 348:g3028. doi: 10.1136/bmj.g3028CrossrefMedlineGoogle Scholar19. Levesque LE, Hanley JA, Kezouh A, Suissa S. The problem of immortal time shift in cohort studies: for example, the use of statins to prevent the progression of diabetes. BMJ. 2010; 340:b5087. doi: 10.1136/bmj.b5087CrossrefMedlineGoogle Scholar20. Benger JR, Kirby K, Black S, Brett SJ, Clout M, Lazarus MJ, Nolan JP, Reeves B.C., Robinson M, Scott LJ, et al. Influence of the strategy of the suprafactory respiratory device against tracheal ionization during extra-hospital cardiac arrest on functional result: randomized clinical study AIRWAYS-2. Jama. 2018; 320:779–791. doi: 10.1001/jama.2018.11597CrossrefMedlineGoogle Scholar21. Van On, Schmicker RH, Daya MR, Stevens SW, Idris AH, Carlson JN, Colella MR, Herren H, Hansen M, Richmond NJ, et al. Influence of the strategy of the initial insertion of the laryngal tube against endotracheal intubation on 72-hour survival in adults with non-fatal cardiac arrest: a randomized clinical trial. Jama. 2018; 320:769–778. doi: 10.1001/jama.2018.7044CrossrefMedlineGoogle Scholar22. Jacobs IG, Finn JC, Jelinek GA, HF, Thompson PL. The effect of adrenaline on survival in an out-of-hospital cardiac arrest: a randomized double-blind placebo-controlled trial. Resuscitation. Resuscitation. 82:1138–1143. doi: 10.1016/j.resuscitation.2011.06.029CrossrefMedgleGugle Scholar23. Perkins GD, Ji C, Deakin CD, Kninn, Klan JP, Scomparin C, Regan S, Long J, Slowter A, Pocock H, et al; PARAMEDIC2 employees. Randomized study of epinephrine in out-of-hospital cardiac arrest. N Engl J Med. 2018; 379:711–721. doi: 10.1056/NEJMoa1806842CrossrefMedlineGoogle Scholar24. Perkins GD, Kenna C, Ji C, Deakin CD, Nolan JP, quinn T, Fothergill R, Gunson I, Pocock H, Rees N, et al. Effects of adrenaline in from hospital cardiac arrest with shocking and non-shocking rhythms: findings from PACA and PARAMEDIC-2 randomized controlled trials. Resuscitation. 2019; 140:55–63. doi: 10.1016/j.resuscitation.2019.05.007CrossrefMedgleGugl Scholar25. Callaway CW, Soar J, Aibiki M, Buttiger BW, Brooks SC, Deakin CD, Donnino MW, Drajer S, Kloeck W, Morley PT, et al; on behalf of the Advanced Life Support Head of Staff. Part 4: Extended Life Support: 2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations.Circulation. 2015; 132 (Supple 1): S84-S145. doi: 10.1161/CIR.0000000000000273LinkGoogle Scholar26. Callaham M,Madsen CD, Barton CW, Saunders CE, Pointer J. Randomized Clinical Trial of High Dose Epinephrine and Norepinephrine vs. Standard Dose of Epinephrine in Pregosbytal Cardiac Cardiac Arrest. Jama. 1992; 268:2667-2672.CrossrefMedlineGoogle Scholar27. Gueugniaud PY, Mols P, Goldstein P, Pham E, Dubien PY, Deweerdt C, Vergnion M, Petit P, Carly. Comparison of repeated high doses and repeated standard doses of epinephrine for cardiac arrest outside the hospital. European Epinephrine Study Group. N Engl J Med. 1998; 339:1595–1601. doi: 10.1056/NEJM199811263392204CrossrefMedlineGoogle Scholar28. Stell IG, Hebert PC, Weitzman BN, Wells GA, Roman S, Stark RM, Higginson LA, Ahuja J, Dickinson GE. High-dose epinephrine in cardiac arrest in adults. N Engl J Med. 1992; 327:1045–1050. doi: 10.1056/NEJM199210083271502CrossrefMedlineGoogle Scholar29. Brown CG, Martin DR, Pepe PE, Styuven H, Cummins RO, Gonzalez E, Jastremski M. Comparison of standard dose and high-dose epinephrine in cardiac arrest outside the hospital: Multicenter High-Dose Epinephrine Study Group.N Engl J Med. 1992; 327:1051–1055. doi: 10.1056/NEJM199210083271503CrossrefMedlineGoogle Scholar30. Sherman BW, Munger MA, Foulke GE, Rutherford WF, Panacek EA. A high dose compared to the standard dose of epinephrine treatment for cardiac arrest after failure of standard therapy. Pharmacotherapy. 1997; 17:242-247.MedlineGoogle Scholar31. Choux C, Gueugniaud PY, Barbieux A, Pham E, Lae C, Dubien PY, Petit P. Standard doses compared to repeated high doses of epinephrine in cardiac arrest outside the hospital. Resuscitation. 1995; 29:3-9.CrossrefMedlineGoogle Scholar32. Lindner KH, Dirks B, HU, Пренгель AW, AW, IM, Lurie KG. Randomized comparison of epinephrine and vasopressin in patients with extra-home ventricular fibrillation. Lancet. 1997; 349:535–537. doi: 10.1016/S0140-6736(97)80087-6CrossrefMedlineGoogle Scholar33. Wenzel V, Crisper AC, Arnz HR, Sitter H, Stadlbauer KH, Lindner KH; The European Council of Resuscitation Vasopressor during cardiopulmonary resuscitation of the group. Comparison of vasopressin and epinephrine for extra-breast cardiopulmonary resuscitation. N Engl J Med. 2004; 350:105–113. doi: 10.1056/NEJMoa025431CrossrefMedlineGoogle Scholar34. Mukoyama T., Kinoshita K, Nagao K, Tanjo K. Reduced the effectiveness of vasopressin in repeated doses for patients undergoing long-term cardiopulmonary resuscitation. Resuscitation. 2009; 80:755–761. doi: 10.1016/j.resuscitation.2009.04.005CrossrefMedlineGoogle Scholar35. Ong ME, Tia L, Leong BS, Tang EU, Ong VY, Tan EA, Poh BY, Peck PP, Chen Y. Randomized, Double Blind, Multicenter Study, comparing vasopressin and adrenaline in patients with cardiac arrest, presenting or in the emergency room. Resuscitation. 2012; 83:953–960. doi: 10.1016/j.resuscitation.2012.02.005CrossrefMedgleGugle Scholar36. Callaway CW, Hostler D, Doshi AA, Pinchalk M, Roth RN, Lubin J, Newman DH, Kelly LJ. The usefulness of vasopressin, injected with epinephrine during off-the-uba cardiac arrest. Am J Cardiol. 2006; 98:1316–1321. doi: 10.1016/j.amjcard.2006.06.022CrossrefMedlineGoogle Scholar37. Gueugniaud PY, David JS, Chanzy E, Hubert H, Dubien PY, Mauriaucourt P, Braganja C, Biller X, Clotto-Lambert MP, Fuster P, et al. Vasopressin and Epinephrine vs. Epinephrine only in cardiopulmonary resuscitation. N Engl J Med. 2008; 359:21–30. doi: 10.1056/NEJMoa0706873CrossrefMedlineGoogle Scholar38. Ducros L, Vicaut E, Soleil C, Le Guen M, Gueye P, Poussant T, Mebazaa A, Payen D, Plaisance P. Effect of adding vasopressin or vasopressin plus nitroglycerin for epinephrine on blood pressure during cardiopulmonary resuscitation in humans. J Emerg Med. 2011; 41:453–459. doi: 10.1016/j.jemermed.2010.02.030CrossrefMedlineGoogle Scholar39. Tanaka H, Takyu H, Sagisaka R, Ueta H, Shirakawa T, Kinoshi T, Takahashi H, Nakagawa T, Shimazaki S, Ong Eng Hok M. Favorable neurological outcomes of early epinephrine administration within 19 minutes of EMS FOR out-of-hospital cardiac arrest patients. Am J Emerg Med. 2016; 34:2284–2290. doi: 10.1016/j.ajem.2016.08.026CrossrefMedlineGoogle Scholar40. Hayashi Y, Iwami T, Kitamura T, Nishiuchi T, Kajino K, Sakai T, Nishiyama C, Nitta M, Hiraid A, Kai T. Effect of early intravenous epinephrine on results after an out-of-hospital cardiac arrest. Circ J. 2012; 76:1639-1645.CrossrefMedlineGoogle Scholar41. Cantrell CL, Hubble MW, Richards ME. The effect of delay and infrequent administration of vasopressors on the return of spontaneous during an out-of-hospital cardiac arrest. Prehosp Emerg Care. 2013; 17:15–22. doi: 10.3109/10903127.2012.702193CrossrefMedlineGoogle Scholar42. Hansen M, Schmicker RH, Newgard CD, Grunau B, Scheuermeyer F, Cheskes S, Vithalani V, Alnaji F, Rea T, Idris AH, etc.; on behalf of the resuscitation results of the consortium of investigators. Time for epinephrine administration and survival from unshockable out-of-hospital cardiac arrest among children and adults. Circulation. 2018; 137:2032–2040. doi: 10.1161/CIRCULATIONAHA.117.033067LinkGoogle Scholar43. Koscik C, Pinawin A, McGovern H, Allen D, Media DE, Ferguson T, Hopkins W, Sawyer KN, Bura J, Swor R. Fast Epinephrine Administration improves early results of out-of-hospital cardiac arrest. Resuscitation. 2013; 84:915–920. doi: 10.1016/j.resuscitation.2013.03.023CrossrefMedlineGoogle Scholar44. Nakahara S, Tomio J, Nishida M, Morimura N, Ichikawa M, Sakamoto T. Association between the timing of epinephrine administration and intact neurological survival after an out-of-hospital cardiac arrest in Japan: population-promising observational studies. Acad Emerg Med. 2012; 19:782–792. doi: 10.1111/j.1553-2712.2012.01387.xCrossrefMedlineGoogle Scholar45. Patel KK, Spertus JA, Hariton Y, Tan Y, Curtis LH, Chan PS; on behalf of the American Heart Association get with the guidelines of resuscitation investigators. The link between surgical defibrillation and epinephrine treatment with long-term survival after cardiac arrest in hospital. Circulation. 2018; 137:2041–2051. doi: 10.1161/CIRCULATIONAHA.117.030488LinkGoogle Scholar46. Sagisaka R, Tanaka H, Taqyu H, Ueta H, Tanaka S. Effects of re-administering epinephrine and manage deadlines to witness out-of-hospital cardiac patients. Am J Emerg Med. 2017; 35:1462–1468. doi: 10.1016/j.ajem.2017.04.052CrossrefMedlineGoogle Scholar47. Ueta H, Tanaka H, Tanaka S, Sagisaka R, Takyu H. Rapid epinephrine administration causes favorable neurological outcomes in out-of-hospital cardiac patients. Am J Emerg Med. 2017; 35:676–680. doi: 10.1016/j.ajem.2016.12.066CrossrefMedlineGoogle Scholar48. Ewy GA, Bobrow BJ, Chikani V, Sanders AB, Otto CW, Spaite DW, Kern KB. Time depends on the association of adrenaline administration and survival from out-of-hospital cardiac arrest. Resuscitation. 2015; 96:180–185. doi: 10.1016/j.resuscitation.2015.08.011CrossrefMedlineGoogle Scholar49. Homma Y, Shiga T, Funakoshi H, Miyazaki D, Sakurai A, Tahara Y, Nagao K, Yonemoto N, Yaguchi A, Morimura N; SOS-KANTO study group. Association of time for the first introduction of epinephrine and results outside cardiac hospital: SOS-KANTO 2012 study. Am J Emerg Med. 2019; 37:241–248. doi: 10.1016/j.ajem.2018.05.037CrossrefMedlineGoogle Scholar50. Hubble MW, Johnson C, Blackwelder J, Collopy K, Houston S, Martin M, Wilkes D, Wiser J. Probability return circulation as a function of the time of vasopressor administration in an off-the-uba cardiac arrest. Prehosp Emerg Care. 2015; 19:457–463. doi: 10.3109/10903127.2015.1005262CrossrefMedlineGoogle Scholar51. Hubble MW, Tyson C. Effect of early vasopressor administration on neurological outcomes after prolonged out-of-hospital cardiac arrest. Prehosp Disaster Med. 2017; 32:297–304. doi: 10.1017/S1049023X17000115CrossrefMedlineGoogle Scholar52. Brooks SC, Anderson ML, Bruder E, Daya MR, Gaffney A, Otto CW, Singer AJ, Thiagarajan RR, Travers AH. Part 6: Alternative Methods and Assistive Devices for Cardiopulmonary Resuscitation: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2015; 132:S436-S443. doi: 10.1161/CIR.0000000000000260LinkGoogle Scholar53. Sesana F, Avali L, Garatti L, Coppo A, Righetti S, CalcherA I, Scanziani E, Cozzolino P, Malafronte C, Mauro A, et al. Effect of extracorporeal cardiopulmonary resuscitation on neurological and cardiac outcome after a ishable fire-resistant cardiac arrest. Eur Heart J Acute Cardiovascular Care. 2018; 7:432–441. doi: 10.1177/2048872617737041CrossrefMedlineGoogle Scholar54. Choi DH, Kim YJ, Ryoo SM, Sohn CH, Ahn S, Seo DW, Lim JY, Kim WY. Extracorporeal cardiopulmonary resuscitation among patients with non-combat cardiac arrest. Clin Exp Emerg Med. 2016; 3:132–138. doi: 10.15441/ceem.16.145CrossrefMedlineGoogle Scholar55. Maekawa K, Tanno K, Hase M, Mori K, Asai Y. Extracorporeal cardiopulmonary resuscitation for patients with out-of-patient cardiac arrest: propensity-consistent research and predictive analysis. Crit Care Med. 2013; 41:1186–1196. doi: 10.1097/CCM.0b013e31827ca4c8CrossrefMedlineGoogle Scholar56. Schober A, Sterz F, Herkner H, Wallmueller C, Weiser C, Hubner P, Testori C. Emergency Extracorporeal Life support and ongoing resuscitation: retrospective comparison of fireproof outside cardiac hospital. Emerg Med J. 2017; 34:277–281. doi: 10.1136/emermed-2015-205232CrossrefMedlineGoogle Scholar57. Siao FY, Chiu CC, Chiu CW, Chen YC, Chen YL, Hsieh YK, Lee CH, Wu CT, Chou CC, Yeh HH. Control of cardiac arrest with fire-resistant ventricular fibrillation in the emergency department: conventional cardiopulmonary resuscitation against extracorporeal cardiopulmonary resuscitation. Resuscitation. 2015; 92:70–76. doi: 10.1016/j.resuscitation.2015.04.016CrossrefMedlegleGugl Scholar58. Hase M, Tsuthihashi K, Fujii N, Nizisato K, Kokubu N, Nara S, Kurimoto Y, Hashimoto A, Uno K, Miura T, etc. Early defibrillation and circulatory support can provide the best long-term results due to favorable neurological recovery in patients with out-of-bed cardiac arrest. Circ J. 2005; 69:1302-1307.CrossrefMedlineGoogle Scholar59. Kagawa E, Inoue I, Kawagoe T, Ishihara M, Shimatani Y, Kurisu S, Nakama Y, Dai K, Takayuki O, Ikenaga H, et al. Assessment of outcomes and differences between in- and out-of-hospital cardiac arrest patients treated with cardiopulmonary resuscitation using extracorporeal life support. Resuscitation. 2010; 81:968–973. doi: 10.1016/j.resuscitation.2010.03.037CrossrefMedlineGoogle Scholar60. Tanno K, Itoh Y, Takeyama Y, Nara S, Mori K, Asai Y. Utstein style study of cardiopulmonary bypass after cardiac arrest. Am J Emerg Med. 2008; 26:649–654. doi: 10.1016/j.ajem.2007.09.019CrossrefMedlineGoogle Scholar61. Yiannopoulos D, Bartos JA, Martin C, Raveendran G, Miss E, Conterato M, Frascone RJ, Tremblay A, Sipprell K, John R, et al Minnesota Resuscitation Consortium advanced perfusion and reperfusion cardiac life support strategies for out-of-hospital fire-resistant ventricular fibrillation. J Am Heart Assoc. 2016; 5doi: 10.1161/JAHA.116.003732LinkGoogle Scholar62. Yiannopoulos D, Bartos JA, Raveendran G, Conterato M, Frascone RJ, Tremblay A, John R, Connett J, Benditt DG, Lurie KG, et al. ischemic heart disease in patients with out-of-hospital ventricular retardant fibrillation. J Am Coll Cardiol. 2017; 70:1109–1117. doi: 10.1016/j.jacc.2017.06.059CrossrefMedlineGoogle Scholar63. Kim SJ, Jung JS, Park JH, Park JS, Hong YS, Lee SW. The optimal time to move to extracorporeal cardiopulmonary resuscitation to predict a good neurological outcome in patients with an out-of-hospital cardiac arrest: propensity-consistent study. Crete Care. 2014; 18:535. doi: 10.1186/s13054-014-0535-8CrossrefMedlineGoogle Scholar64. Poppe M, Weiser S, Holzer M, Sulzgruber,, Detler., Keferbeck M, Seiner S, Lobmeir E, van Tulder R, Siegler A. et al. Incidence load go outside the hospital cardiac arrest candidates for emergency room extracorporeal life support: one year of review. Resuscitation. 2015; 91:131–136. doi: 10.1016/j.resuscitation.2015.03.003CrossrefMedlineGoogle Scholar65. Agostinucci JM, Ruscev M, Galinsky M, Gravelo S, Petrovich T, Carmo C, Haouache H, Russin F, Adnet F, Lapostolle F. Out-hospital use of an automated chest compression device: facilitating access to extracorporeal life support or non-heart-beating organ purchases. Am J Emerg Med. 2011; 29:1169–1172. doi: 10.1016/j.ajem.2010.06.029CrossrefMedlineGoogle Scholar66. Lee SH, Jung JS, Lee KH, Kim HJ, Son HS, Sun K. Comparison of extracorporeal cardiopulmonary resuscitation with conventional cardiopulmonary resuscitation: is extracorporeal cardiopulmonary resuscitation useful? Korean J Thorac Cardiovasc Surg. 2015; 48:318–327. doi: 10.5090/kjtcs.2015.48.5.318CrossrefMedlineGoogle Scholar67. Venturini JM, Retzer E, Estrada JR, Friant J, Beiser D, Edelson D, Paul J, Blair J, Nathan S, Shah AP. Mechanical chest compressions improve the rate of spontaneous return and allow for a start percutaneous blood circulation support during cardiac arrest in the cardiac catheterization laboratory. Resuscitation. 2017; 115:56–60. doi: 10.1016/j.resuscitation.2017.03.037CrossrefMedgleGugle Scholar68. Lin JW, Wang MJ, Yu HY, Wang CH, Chang WT, Jerng JS, Huang SC, Chou NK, Chi NH, Ko WJ et al. Comparison of survival between extracorporeal rescue and routine resuscitation in adults with cardiac arrest in the hospital: analysis of the propensity of three-year data. Resuscitation. 2010; 81:796–803. doi: 10.1016/j.resuscitation.2010.03.002CrossrefMedlineGoogle Scholar69. Chen YS, Lin JW, Yu HY, Co WJ, Jerng JS, Chang WT, Chen WJ, Huang SC, Chi NH, Wang CH, et al. Cardiopulmonary resuscitation with extracorporeal life support compared to conventional cardiopulmonary resuscitation in adults with cardiac arrest in the hospital: about observational study and analysis of propensity. Lancet. 2008; 372:554–561. doi: 10.1016/S0140-6736(08)60958-7CrossrefMedlineGoogle Scholar70. Shin TG, Choi JH, Joe IJ, Sim MS, Sun HG, Hg YK, Sun YB, Han JY, Choi SH, Gwon HC, et al. Extracorporeal Cardiopulmonary Resuscitation in patients with inhospitable cardiac arrest: comparison with conventional cardiopulmonary resuscitation. Crete Care Med. 2011; 39:1–7. doi: 10.1097/CCM.0b013e3181feb339CrossrefMedlineGoogle Scholar71. Shin TG, Joe IJ, Sim MS, Song YB, Yang JH, Han JY, Choi SH, Gwon HC, Chon ES, Son K, et al. Two-year survival and neurological outcome of patients with cardiac arrest in hospital, rescued by extracorporeal cardiopulmonary resuscitation. It's J Cardiol. 2013; 168:3424–3430. doi: 10.1016/j.ijcard.2013.04.183CrossrefMedlineGoogle Scholar72. Blumenstein J, Lake J, Liebetrau C, Kempfert J, Gaede L, Grosh S, Circle M, Berkowitsch A, Nef H, Rolf A, et al. Extracorporeal Life Support of Cardiovascular Patients with Observed Fire-Resistant Heart Disease in Hospital is associated with favorable short- and long-term outcomes: analysis of propensity. Eur Heart J Acute Cardiovasc Care. 2016; 5:13–22. doi: 10.1177/2048872615612454CrossrefMedlineGoogle Scholar73. Chow TH, Fang CC, Iena, Li CC, Chen YS, Ko WJ, Wang CH, Wang SS, Chen SC. Observational study of extracorporeal CPR for cardiac arrest in the hospital secondary in relation to myocardial infarction. Emerg Med J. 2014; 31:441–447. doi: 10.1136/emermed-2012-202173CrossrefMedlineGoogle Fellow 2015 aha acls guidelines circulation