# The 2015 BLS & ACLS Guideline Updates… What Does the Future Hold?

**Greater Kansas City Chapter Of AACN**
**2016 Visions Critical Care Conference**

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## Objectives

1. Discuss the 2015 BLS & ACLS Guidelines
2. Describe the literature supporting the guidelines
3. Discuss the 3 ongoing studies that are not included in the guidelines

## 2015 ACLS/BLS Guidelines:

**https://eccguidelines.heart.org/index.php/american-heart-association/**

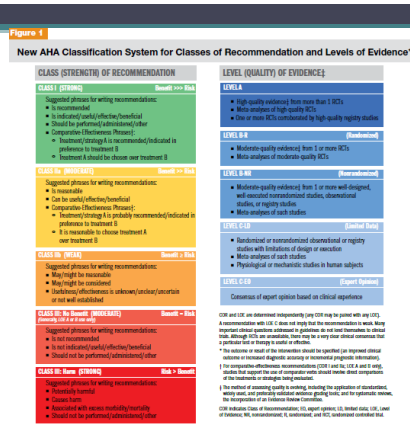


Figure 1

New AHA Classification System for Classes of Recommendation and Levels of Evidence*

CLASS (STRENGTH) OF RECOMMENDATION

CLASS I (STRONG) — Benefit >>> Risk
- Suggested phrases for writing recommendations:
- Is recommended
- Is indicated/useful/effective/beneficial
- Should be performed/administered/other
- Comparative-Effectiveness Phrases†:
- Treatment/strategy A is recommended/indicated in preference to treatment B
- Treatment A should be chosen over treatment B

CLASS IIa (MODERATE) — Benefit >> Risk
- Suggested phrases for writing recommendations:
- Is reasonable
- Can be useful/effective/beneficial
- Comparative-Effectiveness Phrases†:
- Treatment/strategy A is probably recommended/indicated in preference to treatment B
- It is reasonable to choose treatment A over treatment B

CLASS IIb (WEAK) — Benefit ≥ Risk
- Suggested phrases for writing recommendations:
- May/might be reasonable
- May/might be considered
- Usefulness/effectiveness is unknown/unclear/uncertain or not well established

CLASS III: No Benefit (MODERATE) — Benefit = Risk
(Generally, LOE A or B only)
- Suggested phrases for writing recommendations:
- Is not recommended
- Is not indicated/useful/effective/beneficial
- Should not be performed/administered/other

CLASS III: Harm (STRONG) — Risk > Benefit
- Suggested phrases for writing recommendations:
- Potentially harmful
- Causes harm
- Associated with excess morbidity/mortality
- Should not be performed/administered/other

LEVEL (QUALITY) OF EVIDENCE‡

LEVEL A
- High-quality evidence‡ from more than 1 RCTs
- Meta-analyses of high-quality RCTs
- One or more RCTs corroborated by high-quality registry studies

LEVEL B-R (Randomized)
- Moderate-quality evidence‡ from 1 or more RCTs
- Meta-analyses of moderate-quality RCTs

LEVEL B-NR (Nonrandomized)
- Moderate-quality evidence‡ from 1 or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies
- Meta-analyses of such studies

LEVEL C-LD (Limited Data)
- Randomized or nonrandomized observational or registry studies with limitations of design or execution
- Meta-analyses of such studies
- Physiological or mechanistic studies in human subjects

LEVEL C-EO (Expert Opinion)
- Consensus of expert opinion based on clinical experience

COR and LOE are determined independently (any COR may be paired with any LOE).

A recommendation with LOE C does not imply that the recommendation is weak. Many important clinical questions addressed in guidelines do not lend themselves to clinical trials. Although RCTs are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

* The outcome or result of the intervention should be specified (an improved clinical outcome or increased diagnostic accuracy or incremental prognostic information).

† For comparative-effectiveness recommendations (COR I and IIa; LOE A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.

‡ The method of assessing quality is evolving, including the application of standardized, widely used, and preferably validated evidence grading tools; and for systematic reviews, the incorporation of an Evidence Review Committee.

COR indicates Class of Recommendation; EO, expert opinion; LD, limited data; LOE, Level of Evidence; NR, nonrandomized; R, randomized; and RCT, randomized controlled trial.

## According to the GWTG database, the survival rate from in-hospital cardiac arrest is:

A. 5%
B. 18% ☻
C. 30%
D. 50%

## What is the most common type of in-hospital cardiac arrest?

A. PEA and Asystole ☻
B. Vfib and PEA
C. Vtach and Vfib
D. Asystole and Vfib

**Asystole and PEA make up 67% of all adult in-hospital cardiac arrests**

Circulation (2013); Morrison, et al.

## CPR Quality


## Optimal Rate?

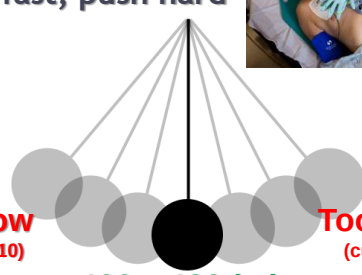
- ROC PRIMED Study
- Prospective observational study
- OHCA
- After adjusting for
  - chest compression fraction &
  - depth

highest survival to discharge was found when the rate was…

**100 – 119 per minute!**

Idris, Guffey, Pepe et al (2015) Critical Care Medicine

## Compression rate "Push fast, push hard"



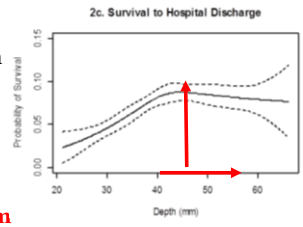
**Too Slow** (Before 2010)

**Too Fast** (current)

**100 – 120 /min**

## Optimal chest compression depth? ROC PRIMED Trial

- OHCA
- Current depth rec 50 mm
- 2005 rec. 38 – 50 mm
- No upper limit
- Highest survival depth interval of **40.3 mm – 55.3 mm**
- **Peak survival 45.6 mm (~1.8 inches)**

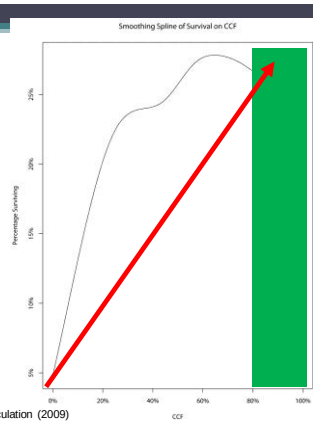



Steill, Brown, Nichol et al (2014) Circulation

## Compression Fraction

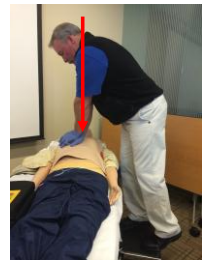
- The amount of time spent providing compressions
- May also be called "compression ratio"
- Goal: At least 80%!

**Is it acceptable to be off the chest for 20% of an arrest?**




Christenson et al. Circulation (2009)

## Positioning



**Leaning & recoil**

## CCC Trial

- ROC Study group
- OHCA, survival to discharge

- Continuous 2 minutes of compressions without pauses in compressions for breathing

vs.

- Chest compressions with pauses for breathing

- Enrolled over 23,000 patients in 8 regions across the US & Canada

## Which is better?

**30 compressions : 2 ventilations?**

**OR**

**2 minutes continuous compressions with ventilations every 6 seconds?**

## 2015 ACLS/BLS Guideline Update Recommendations:

- Compress 100 – 120 bpm
  - Class IIa, LOE C-LD
- Depth 5 - 6 cm (2 to 2.4 inches)
  - Class I, LOE C-LD
- Avoid chest wall leaning, allow for full recoil
- Chest compression fraction should be as high as possible, with a minimum of 60% (with an unprotected airway)
  - Class IIb, LOE C-LD

## 2015 ACLS/BLS Guideline Update Recommendations:

- Reasonable to use audiovisual feedback devices during CPR for real time optimization of CPR performance
  - Class IIb, LOE B-R
- Insufficient evidence to recommend artifact-filtering algorithms for analysis of ECG rhythm during CPR
  - Class IIb, LOE C-EO

## 2015 ACLS/BLS Guideline Update Recommendations:

- The routine use of an Impedance Threshold Devices (ITD) in addition to conventional CPR is not recommended.
  - Class III

## 2015 ACLS/BLS Guideline Update Recommendations:

- The use of **mechanical compression devices** may be a reasonable for use by properly trained personnel.
- The use of mechanical compression devices may be considered in specific settings where the delivery of high quality manual compressions may be challenging or dangerous to the provider.
  - **Examples: Prolonged CPR, in the back of a moving ambulance, in the angiography suite**
    - **Class IIB, LOE C-EO**

## 2015 ACLS/BLS Guideline Update Recommendations:

- Continuous waveform capnography for confirming placement of an endotracheal tube
  - Class I
- Low PETCO2 (< 10 mmHg) after 20 minutes in intubated patients is strongly associated with failure of resuscitation
  - Class IIb, LOE C-LD
- Should not be used in isolation or in non-intubated patients
  - Class III

## 2015 ACLS/BLS Guideline Update Recommendations:

- Ventilation rate 10 breaths per minute with an advanced airway
  - Class IIb, LOE C-LD

## AVOID Over-ventilation!!!

- If patient does not have an advanced airway:

30:2

Do you stop compressions for ventilations? **YES**

- If the patient has an advanced airway:

10 breaths / min

(1 breath every 6 seconds)

Do you stop compressions for ventilations? **NO**

-2015 BLS/ACLS Guidelines

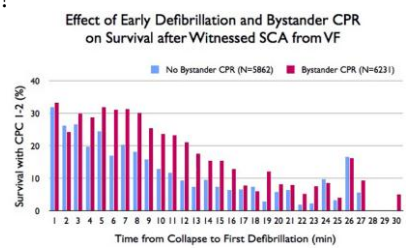
## AHA Identified Knowledge Gaps:

- The optimal method for ensuring adequate depth of chest compressions during manual CPR
- The optimal chest compression fraction
- Optimal use of CPR feedback devices to increase patient survival
- Are mechanical devices superior to manual compressions in special situations? (moving ambulance, prolonged CPR, angiography suite, etc.)

# Defibrillation

## Ventricular fibrillation

- Most successful treatment for v-fib is defibrillation!
- For every minute delay, survival decreases by 10%!!!




Metoba et al (2010) Circulation

N = 13, 053

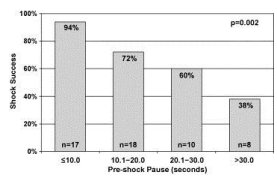
Resuscitation (2006) 71, 137–145
ELSEVIER
CLINICAL PAPER
RESUSCITATION
www.elsevier.com/locate/resuscitation

**Effects of compression depth and pre-shock pauses predict defibrillation failure during cardiac arrest**☆

Dana P. Edelson[a], Benjamin S. Abella[b,*], Jo Kramer-Johansen[c,d], Lars Wik[c,d,e,f], Helge Myklebust[g], Anne M. Barry[b], Raina M. Merchant[b], Terry L. Vanden Hoek[h], Petter A. Steen[c,d,f,h], Lance B. Becker[i]

The 2nd most cited paper in *Resuscitation* in the 5-year period after it was published!

Conclusion:
Pause duration does affect VF termination rate.



## Minimize Pre & Post Shock pauses

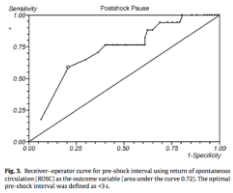



Fig. 3. Receiver–operator curve for pre-shock interval using return of spontaneous circulation (ROSC) as the outcome variable (area under the curve 0.72). The optimal pre-shock interval was defined as <3 s.

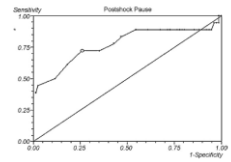



Fig. 4. Receiver–operator curve for post-shock interval using return of spontaneous circulation (ROSC) as the outcome variable (area under the curve 0.77). The optimal post-shock interval was defined as <6 s.

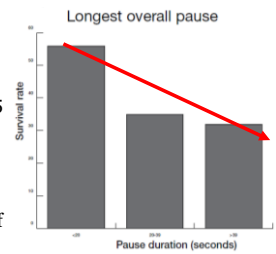
**Pre-Shock pause < 3 seconds**

**Post-Shock pause < 6 seconds**

Sell et al 2010 Resuscitation

## Pauses are bad. Very bad.

- OHCA, observational study
- Evaluated pauses in all rhythms including PEA & asystole
- Survival decreased 11% per 5 second increase in duration of longest overall pause
- Individual long pauses may be more harmful than multiple short pauses even if the overall CCF is similar




Brouwer, Walker, Chapman, Koster (2015) Circulation 132:1030-37.


## 2015 ACLS/BLS Guideline Update Recommendations:

- Suggest an initial period of CPR for 30-60 seconds while the defibrillator is being applied
- For manual defibrillators, we suggest that pre & post shock pauses are as short as possible.
  - Class I, LOE C-LD

# Drugs

Which of the following medications has been shown to increase survival to discharge from cardiac arrest?

A. Epinephrine
B. Vasopressin
C. Bicarb
D. Amiodarone
E. None of the above

## Emergency medications - V-fib

- **Epinephrine** 1 mg every 3-5 min **or**
- **Vasopressin** 40 units instead of the 1st or 2nd Epi **(Removed from Cardiac Arrest Algorithm!)**
- **Amiodorone**
  - 300 mg IV pulseless
  - 150 mg pulse

Circulation 2015, AHA ACLS Guidelines

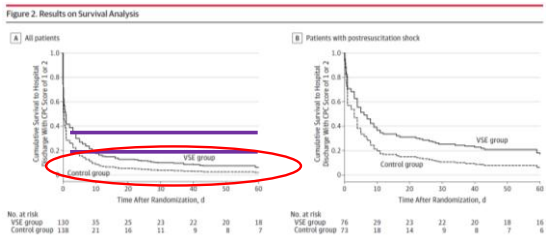
## Studies questioning the use, timing, efficacy of Epinephrine

- Dumas et al (2014) J Amer College of Card*
- Olasveengen et al (2012) Resuscitation*
- Hagihara et al (2012) JAMA*
- Jacobs et al (2011) Resuscitation*
- Olasveengen et al (2009) JAMA*
- Ong et al (2007) Ann Emerg Med*
- Gueugniaud et al (1998) NEJM
- Herlitz et al (1995) Resuscitation*
- Paradis et al (1991) JAMA

*Epi associated with worse outcomes

## VSE Study Mentzelopoulos (2013) JAMA

- RCT
- **V**asopressin 20 IU + **E**pi 1mg q 3 min x 5 cycles + 40 mg **S**teroid - methylprednisolone (1st cycle)




## Is Epinephrine beneficial or does it cause harm?

- Current recommendation: 1 mg Q 3 – 5 min

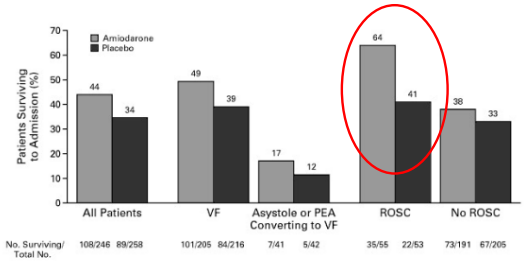
- RCT Epi vs. Placebo
- Warwick University
- UK & Wales
- Enrollment started Sept 2014
- 8,000 subjects
- Out-of-Hospital Cardiac Arrest


- Paramedic2 Trial

http://www2.warwick.ac.uk/fac/med/research/hscience/ctu/trials/critical/paramedic2/caa/

## Amiodorone vs. Placebo

(after 3 successive shocks in OHCA)




N = 504

Kudenchuk et al (1999) NEJM

## ALP Trial

- **A**miodorone vs.
- **L**idocaine vs.
- **P**lacebo
- Out of hospital v-fib arrest
- Goal is drug administration < 10 minutes after arrival on scene
- Resuscitation Outcome Consortium (ROC) study group
- Multi-city EMS trial
- Enrolled last patient 10/24/15
- Goal: 3,000 patients

## 2015 ACLS/BLS Guideline Update Recommendations:

- Vasopressin in combination with Epinephrine shows no advantage as a substitute for standard Epinephrine.
- Vasopressin has been removed from the Adult Cardiac Arrest Algorithm.
- In non-shockable rhythms, administer Epinephrine as soon as possible.
- There is inadequate evidence to support the use of Lidocaine after cardiac arrest.

## 2015 ACLS/BLS Guideline Update Recommendations:

- For IHCA we suggest that the combination of methylprednisolone, vasopressin & epinephrine may be considered as an alternative to epinephrine alone during CPR
  - Class IIb, LOE C-LD
- Suggest the use of Amiodarone in adult patients who suffer OHCA with refractory VF/pVT to improve rates of ROSC

www.ilcor.org

# Post Cardiac Arrest: Targeted Temperature Management

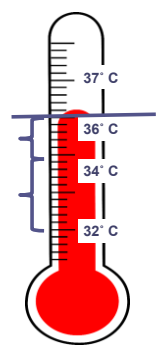
## Post-Arrest Optimal Temperature?

# 33˚C vs. 36˚C

Nielsen et al (2013) NEJM

## Clinical assessment:

- Does mild hypothermia (32 - 34˚C) reduce mortality & improve neurologic outcomes post cardiac arrest?
- **YES!!!!**
- Does 36˚ C have the same benefit?
- **YES!!!**
- Does "normothermia" have the same benefit?
- **We don't know!!!**
- Is fever bad post-cardiac arrest?
- **YES!!!**



## 2015 ACLS/BLS Guideline Update Recommendations:

- Recommend against routine pre-hospital cooling of patients with ROSC with rapid infusion of cold IV fluids
  - Class III, LOE A
- Comatose adult patients with ROSC after CA should have Targeted Temperature Management.
  - Class I, LOE B-R for Vfib/pVT OHCA
  - Class I, LOE C-EO for non Vfib/pVT & IHCA

## 2015 ACLS/BLS Guideline Update Recommendations:

- Maintain temperature 32 - 36˚ C
  - Class I, LOE B-R
- TTM for a minimum of 24 hours after achieving ROSC
  - Class IIa, LOE C-EO
- It may be reasonable to actively prevent fever in comatose patients after TTM
  - Class IIb, LOE C-LD

## System of Care





## In conclusion,

- Resuscitation involves a system of care, all being inter-dependent on improving outcomes
- We need to focus on **high quality CPR** & early defibrillation
- Capnography & CPR feedback devices should be considered to monitor quality
- Temperature should be managed to 32 - 36˚ C in patients resuscitated from cardiac arrest