High Quality CPR: Demonstration and Analysis

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Conflict of Interest (COI)

- **Ankur Doshi, MD, Emergency Medicine, University of Pittsburgh - None**
- **Mark Pinchalk, MS, EMT-P, Patient Care Coordinator, Pittsburgh EMS - None**
- **Robin Roberts, Sr. Account Manager, Emergency Cardiovascular Care Programs - None**

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Objectives

- Know current cardiac arrest survival statistics and American Heart Association 2020 goals
- Understand the importance and efficacy of High Quality CPR in patient outcomes
- Increase awareness of resources, such as the Resuscitation Quality Improvement (RQI) program
- Successfully perform High Quality CPR on a feedback manikin

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Mission of the AHA

To build healthier lives, free of cardiovascular diseases and stroke.

2020 Impact Goal

By 2020, to improve the cardiovascular health of all Americans by 20% while reducing deaths from cardiovascular diseases and stroke by 20%.

ECC 2020 Impact Goal

Increase survival from cardiac arrest by doubling In-Hospital and Out of Hospital survival rates

In-Hospital Adult	19% to 38%
In-Hospital Children	35% to 50%
Out of Hospital	8% to 16%

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ORIGINAL RESEARCH

Hospital Variation in Survival After In-hospital Cardiac Arrest

Raina M. Merchant, MD, MSHP; Robert A. Berg, MD; Lin Yang, MS; Lance B. Becker, MD; Peter W. Groeneveld, MD, MS; Paul S. Chan, MD; for the American Heart Association's Get With the Guidelines-Resuscitation Investigators

- **Significant variation** across hospitals despite adjusting for patient level factors.
- **135,896** IHCA events at **468** hospitals using the AHA's **GWTG®-Resuscitation** quality registry.
- After adjusting for 36 predictors of survival, bottom and top deciles were **12.4% - 22.7%**.
- Median odds ratio for risk-adjusted survival was 1.42 suggesting a substantial **42% difference in the odds of survival for patients at similar hospitals, with a similar case-mix**. (95% CI: 1.37 to 1.46)

Merchant RM, Berg RA, Yang L, et al. Hospital Variation in Survival After In-hospital Cardiac Arrest. Journal of the American Heart Association: Cardiovascular and Cerebrovascular Disease. 2014;3

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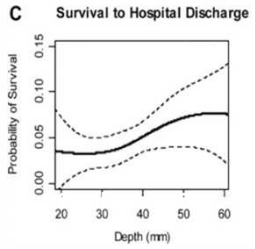
High-Quality CPR Saves Lives

- High-quality CPR (HQCPR) is the primary component in influencing survival from cardiac arrest.
  - When rescuers compress at a depth of <38 mm, survival-to-discharge rates after out-of-hospital arrest are reduced by 30%
  - When rescuers compress too slowly, return of spontaneous circulation (ROSC) after IHCA falls from 72% to 42%



Click Here to View AHA Consensus on CPR Quality

Metrics of HQCPR to include compressions, ventilations, rates, and chest compression fraction are primary influencers in survival rates

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Gaps in the Perception and Reality of CPR Performance

- 2009 Survey of 1,023 healthcare providers
- 75% believe they perform high quality CPR
- <50% receive training beyond the minimum required
- Almost all stated they were quite familiar with AHA Guidelines on CPR and ECC
- Only 26% self-report they are compliant to AHA Guidelines in their CPR performance in rate, depth, and ratios.

Nearly two-thirds (64 percent) of American drivers rate themselves as "excellent" or "very good" drivers

2011 Financial Dynamics survey for Allstate Insurance

Ipsos: Attitudes Among Health-Care Professionals Concerning CPR. Online survey. 2009

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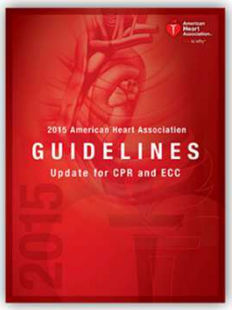
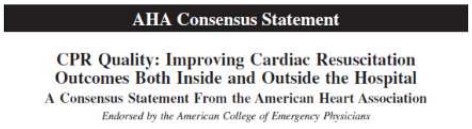
The AHA recognizes that there must be a CHANGE



"Two-year retraining cycles are not optimal. More frequent training in basic life support (BLS), and retraining in advanced life support (ALS) may be helpful for providers who are likely to encounter a cardiac arrest." - **2015 AHA Guidelines Update for CPR and ECC**

"Poor-quality CPR should be considered a preventable harm."

2013 AHA Consensus Statement on CPR Quality


AHA Consensus Statement

CPR Quality: Improving Cardiac Resuscitation Outcomes Both Inside and Outside the Hospital
A Consensus Statement From the American Heart Association
Endorsed by the American College of Emergency Physicians

Farhan Bhanji, et al. Part 14: Education: 2015 American Heart Association Guidelines Update for CPR and ECC. Circulation. 2015;132:18 S561-S573

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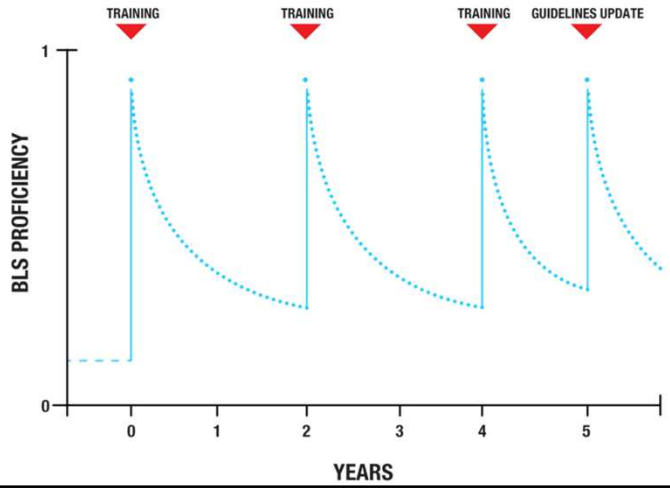
Biennial Training Does Not Prevent Skills Decay

"Studies have demonstrated the deterioration of BLS skills in as little as 3 months after initial training." – **2015 AHA Guidelines Update on CPR and ECC**



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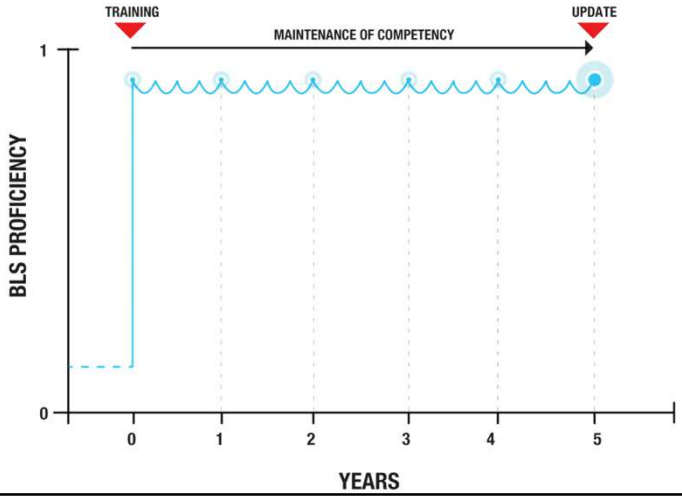
AHA Guidelines Support More Frequent Training

"Recent literature in resuscitation education demonstrates improved learning from "frequent, low-dose" versus "comprehensive, all-at-once" instruction..." – **2015 AHA Guidelines Update on CPR and ECC**



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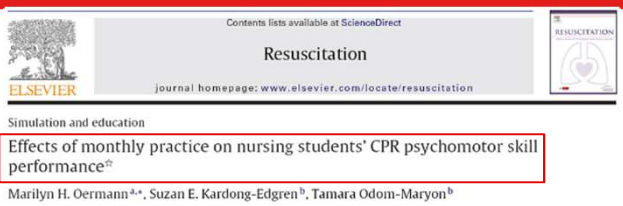
Psychomotor CPR Skills Rapidly Decay


Contents lists available at ScienceDirect

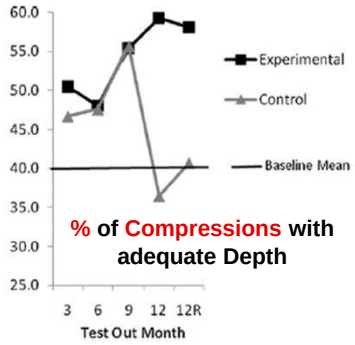
Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

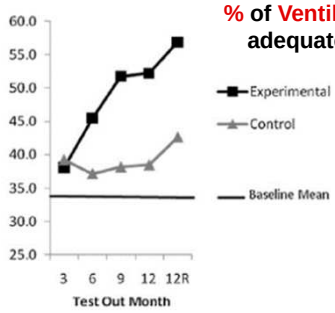
Simulation and education

Effects of monthly practice on nursing students' CPR psychomotor skill performance☆

Marilyn H. Oermann[a,*], Suzan E. Kardong-Edgren[b], Tamara Odom-Maryon[b]



% of Compressions with adequate Depth



% of Ventilations with adequate Volume

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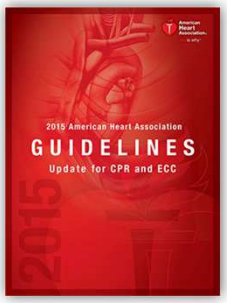
Oermann, Marilyn H, et al. (2014). "Effects of Practice on Competency In Single-Rescuer Cardiopulmonary Resuscitation". MEDSURG Nursing, 23(1), 22-28.

Mastery Learning is the Key to Skill Retention

"There is substantial evidence to suggest that mastery learning is the key to skill retention and the prevention of rapid decay in skills and knowledge after simulation-based learning.

The goal of mastery learning is to have learners achieve the highest standards for all educational outcomes instead of simply meeting the minimum standard." - **2015 AHA Guidelines Update on CPR and ECC**



American Heart Association® | RQI RESUSCITATION QUALITY IMPROVEMENT

Farhan Bhanji, et al. Part 14: Education: 2015 American Heart Association Guidelines Update for CPR and ECC. Circulation. 2015;132:18 S561-S573

The RQI Platform is the Solution for Mastery Learning

History of High Quality CPR

- 2010 Guidelines
- July 23, 2013 - *CPR Quality: Improving Cardiac Resuscitation Outcomes Both Inside and Outside the Hospital, A Consensus Statement From the American Heart Association*
- 2015 Guidelines

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2015 Summary of Key Issues and Changes

- Recommendations allow flexibility for activation of the emergency response system to better match the HCP's clinical setting
- Trained rescuers are encouraged to simultaneously perform some steps (i.e. checking for breathing and pulse at the same time), in an effort to reduce the time to first chest compression
- Integrated teams of highly trained rescuers may use a choreographed approach that accomplishes multiple steps and assessments simultaneously rather than the sequential manner used by individual rescuers (i.e. Pit Crew CPR)
- Increased emphasis has been placed on high-quality CPR using performance targets

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High Quality CPR Performance Targets

- **Compression rate is modified to a rage of 100 to 120/min**
- **Compression depth for adults is modified to at least 2 inches (5 cm) but should not exceed 2.4 inches (6cm)**
- **To allow full chest wall recoil after each compression, rescuers must avoid leaning on the chest between compressions**
- **Criteria for minimizing interruptions is clarified with a goal of chest compression fraction as high as possible, with a target of at least 60%**
- **Where EMS systems have adopted bundles of care involving continuous chest compressions, the use of passive ventilation techniques may be considered as part of that bundle for victims of OHCA.**
- **For patients with ongoing CPR and an advanced airway in place, a simplified ventilation rate of 1 breath every 6 seconds (10 breaths per minute)**

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Dos and Don'ts of High Quality CPR

Rescuers Should	Rescuers Should NOT
Perform chest compressions at a rate of 100 to 120 / min	Compress at a rate slower than 100/min or faster than 120/min
Compress to a depth of at least 2 inches (5 cm)	Compress to a depth of less than 2 inches (5 cm) or greater than 2.4 inches (6 cm)
Allow full recoil after each compression	Lean on the chest between compressions
Minimize pauses in compressions	Interrupt compressions for greater than 10 seconds
Ventilate adequately (2 breaths after 30 compressions, each breath delivered over 1 second, each causing chest rise)	Provide excessive ventilation (too many breaths or breaths with excessive force)

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As stated in the *2015 AHA Guidelines for CPR and ECC*,
"Unfortunately, inadequate performance of CPR is common yet challenging for providers and instructors to detect, thereby making it difficult to appropriately focus feedback and improve future performance. Technology could theoretically help address this problem by assessing CPR performance and providing feedback."

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Feedback Devices Required…

- By January 31, 2019, the AHA will require the use of an instrumented directive feedback device or manikin in all AHA courses that teach the skills of adult CPR.
- Specifically, an instrumented directive feedback device or manikin is one that, at a minimum, provides audio or visual (or both) feedback on the rate and depth of compressions during CPR training.
- This requirement will impact AHA Basic Life Support (BLS), Advanced Cardiovascular Life Support (ACLS), ACLS for Experienced Providers, and Heartsaver® Courses taught in the US and internationally.
- In the future, as more devices become available for child and infant CPR, the AHA will also require the use of feedback devices in courses that teach the skills of child and infant CPR.

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Let's Perform High Quality CPR!

- Introduce Scenario
- Equipment available
- Instructions
- Debriefing

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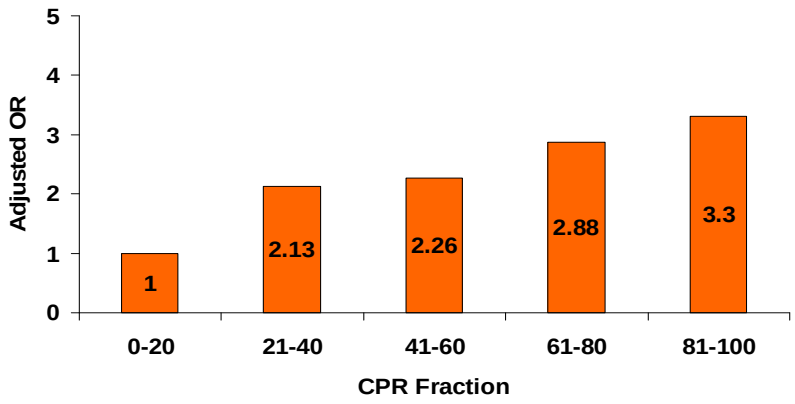

Adjusted for: bystander CPR, age, gender, time from 911 call to arrive at scene, chest compression rate, public location

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375E5- 2 Rescuer Scenario

Problem	Mitigation
Delay in initiating CCC	ABC assessment and initiation of CCC; one rescuer CCC while monitor placed
Pauses of CCC for rhythm analysis and defibrillation	Brief pause for rhythm analysis; continue CPR until ready for shock, clear and then resume CCC immediately
Pauses of CCC for advanced airway placement	Defer until later in the arrest unless clinically indicated to do earlier or placement with interruption of CCC

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375E5 - 2 Rescuer Scenario

Problem	Mitigation
Delay in initiating IV	**One rescuer CPR while second rescuer starts IV; Defer advanced airway**
Delay in administering epinephrine	**One rescuer CPR while second rescuer administer epinephrine**
Number of 1 mg epinephrine administered	**Ensure Epinephrine is administered q3-5 minutes**

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Training Results: 2 rescuer scenario

Parameter	Pretest	Posttest	P value
CPR fraction	62.71%	71.33%	< 0.001
Start CCC	26.54 sec	10.42 sec	< 0.001
Defib pause time	21.39 sec	5.75 sec	< 0.001
Time to IV	207.33 sec	116.06 sec	< 0.001
Time to 1st EPI	245.83 sec	144.39 sec	< 0.001
Number epi given	0.29	2.13	< 0.001

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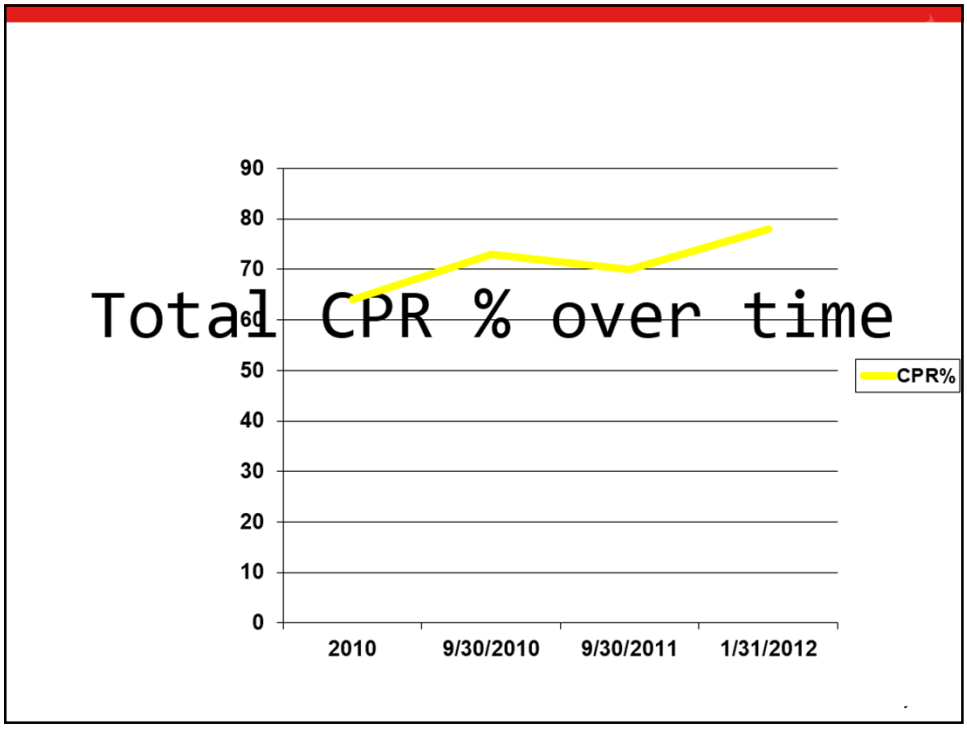
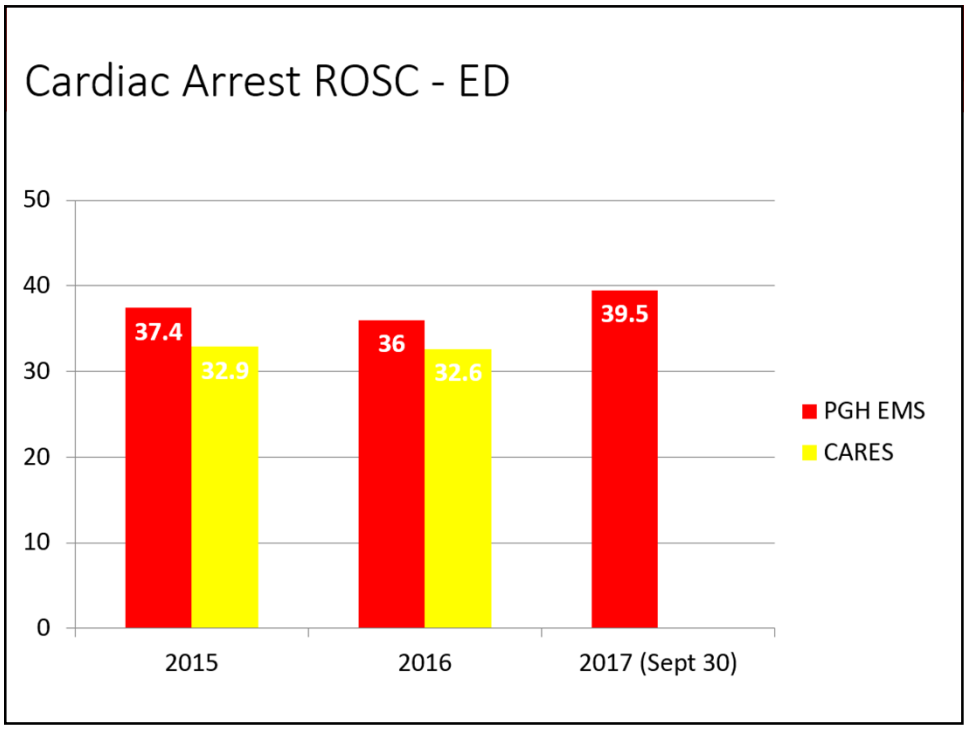

Total CPR % over time
90
80
70
60
50
40
30
20
10
0
2010
9/30/2010
9/30/2011
1/31/2012
CPR%


Cardiac Arrest ROSC - ED
50
40
30
20
10
0
37.4
32.9
36
32.6
39.5
2015
2016
2017 (Sept 30)
PGH EMS
CARES

Case Review

- 25 y/o male c/o dizziness, “heart racing” while bowling, collapses
- Immediate bystander CPR via a nurse on scene, 911 called
- First Responder unit arrives: CPR continued, AED applied with one shock
- Patient remains pulseless

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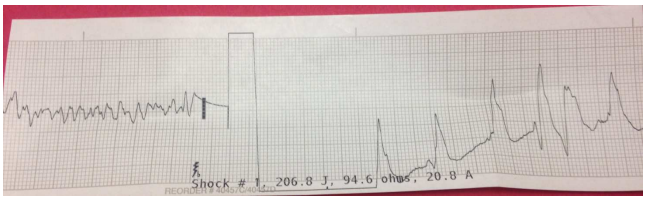
Case Progression

- Paramedics arrive on scene in 5 minutes
- High Quality CPR continued
- Patient found to be in V-Fib
- Defibrillation with recurrent V-Fib/V-Tach
  - **Total 11 defibrillations/cardioversions**



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Case Progression

- IV access
- 300mg Amiodarone, 2 gm Magnesium
- Intubation
- Hemodynamically stable on ED arrival, requires sedation
- Discharged home about 2 weeks later

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Questions?

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