Is Education Driving Outcomes
Or
Are Outcomes Driving Education

Kostas Alibertis, NR-P
Ryan Shercliffe, RN

ECCU2017
Emergency Cardiovascular Care Update

CITIZEN CPR
FOUNDATION
Helping citizens and communities save lives

What's really between you and Bourbon St
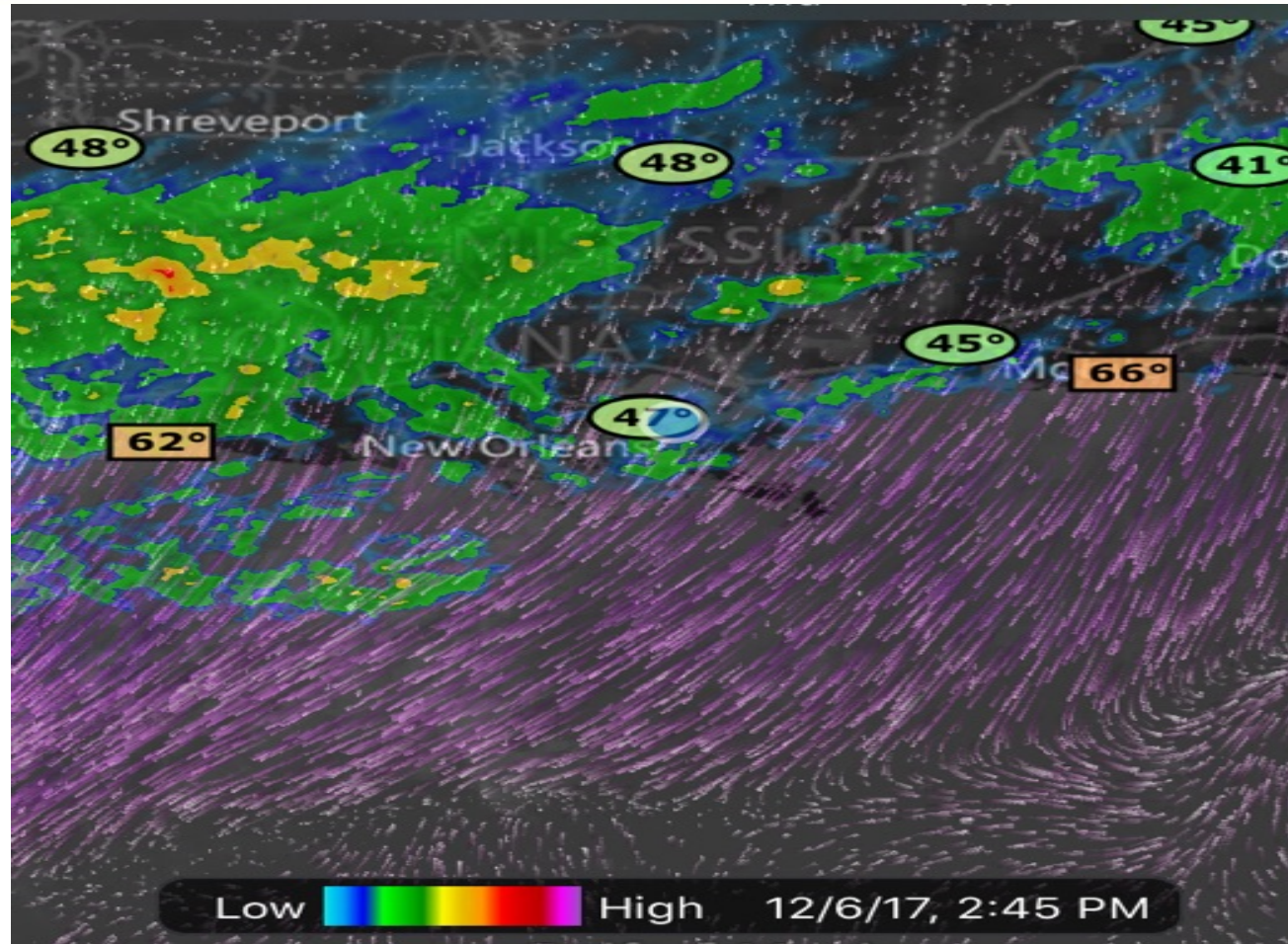
COI Disclosure

Kostas Alibertis, NR-P

Is Education Driving Outcomes or are Outcomes Driving Education

FINANCIAL DISCLOSURE:
- None

UNLABELED/UNAPPROVED USES DISCLOSURE:
- None

COI Disclosure

Ryan Shercliffe, RN

Is Education Driving Outcomes or are Outcomes Driving Education

FINANCIAL DISCLOSURE:
* None

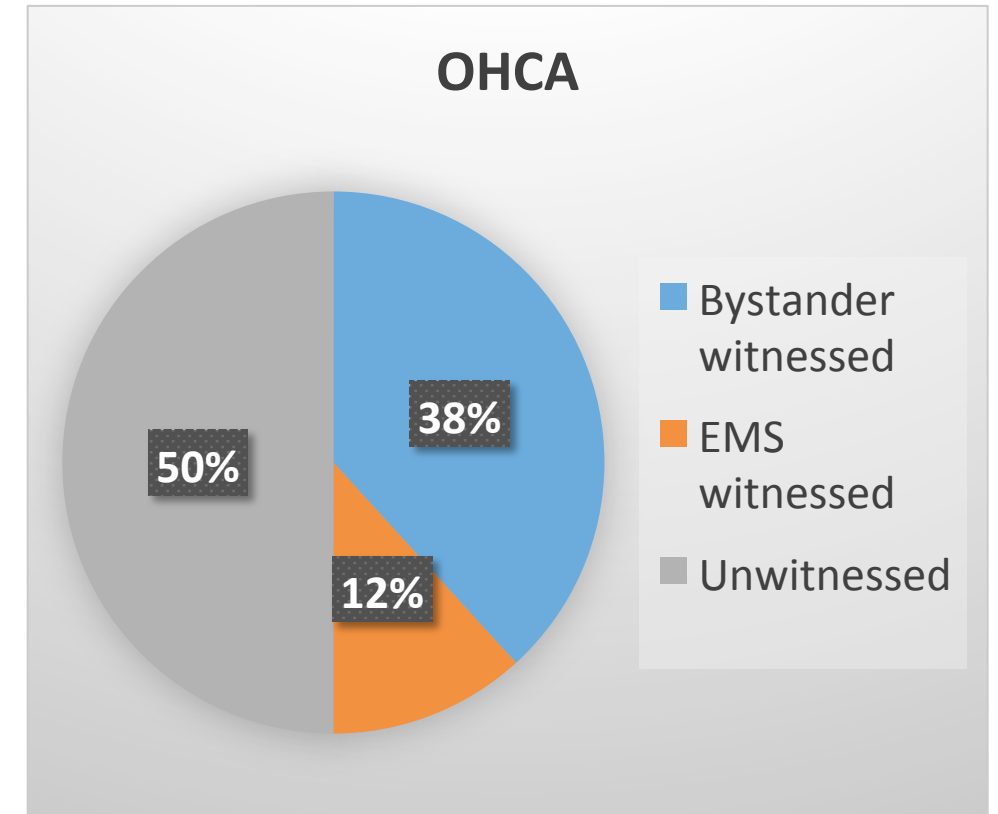**UNLABELED/UNAPPROVED USES DISCLOSURE:**
* None

Introduction

Why are we doing what we are doing?

Is it making a difference?

Out of Hospital Cardiac Arrest Incidence

- US population 321,716,000 (Sept 2015)
- Extrapolation of the incidence of EMS assessed OHCA (ROC Investigators):
  - Each year, 110.8 individuals per 100,000 or 356,500 people of any age
  - 347,000 adults
- Estimated approximately 60% of OHCAs were treated by EMS
- Estimated total = 594,166

OHCA

Bystander witnessed — 38%

EMS witnessed — 12%

Unwitnessed — 50%

ECCU2017
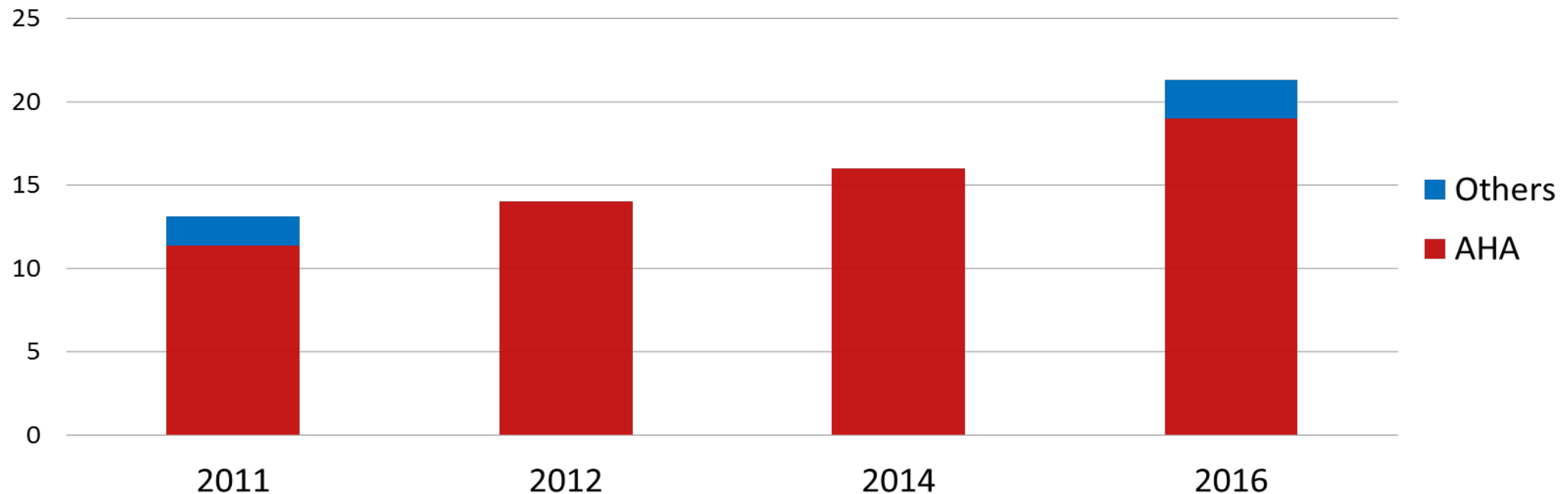
CITIZEN CPR FOUNDATION

Where Are We?

We are on track to train more than ever!

Outcomes: Have they been significantly been impacted?

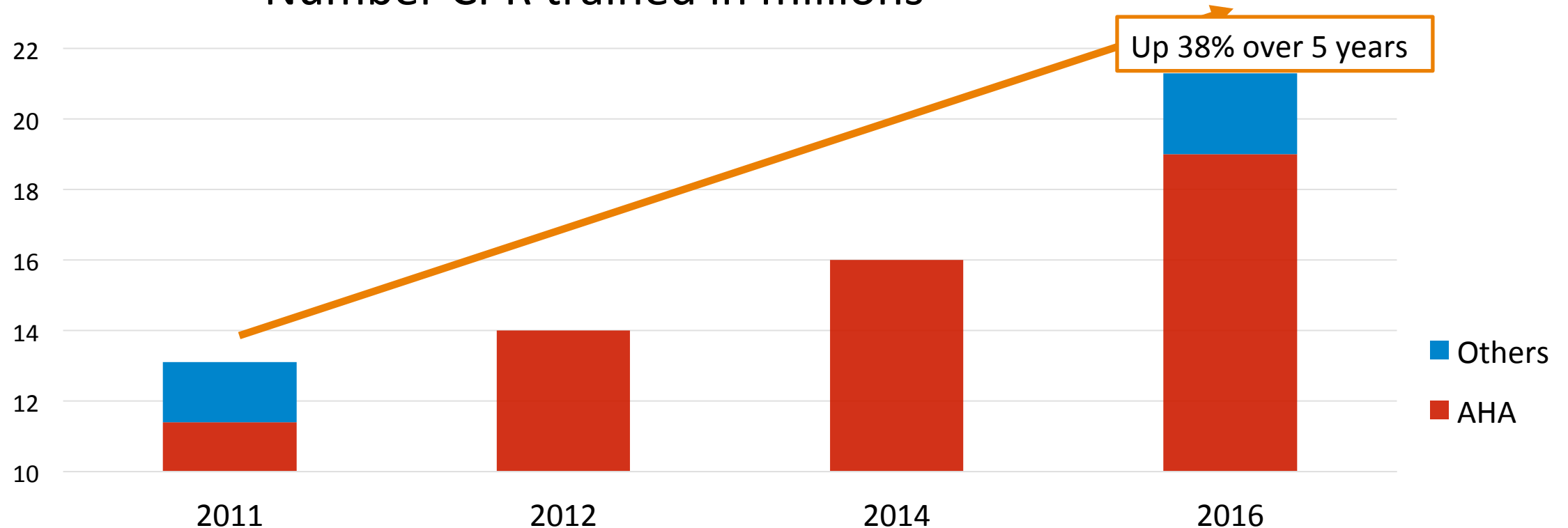Where is the "science" to support what we do?

Training

Number CPR trained in millions

1. Rates of Cardiopulmonary Resuscitation Training in the United States. Monique L. Anderson et.al. JAMA Intern Med. 2014;174(2):194-201. oi:10.1001/jamainternmed.2013.11320
2. American Heart association Annual Reports 2012, 2014. 2016. http://www.heart.org/HEARTORG/
3. American Red Cross http://www.redcross.org/news/article/CPRAED-Training-Saves-Lives

Training

Number CPR trained in millions

Up 38% over 5 years

Legend:
- Others (blue)
- AHA (red)

1. Rates of Cardiopulmonary Resuscitation Training in the United States. Monique L. Anderson et.al. JAMA Intern Med. 2014;174(2):194-201. oi: 10.1001/jamainternmed.2013.11320
2. American Heart association Annual Reports 2012, 2014. 2016. http://www.heart.org/HEARTORG/
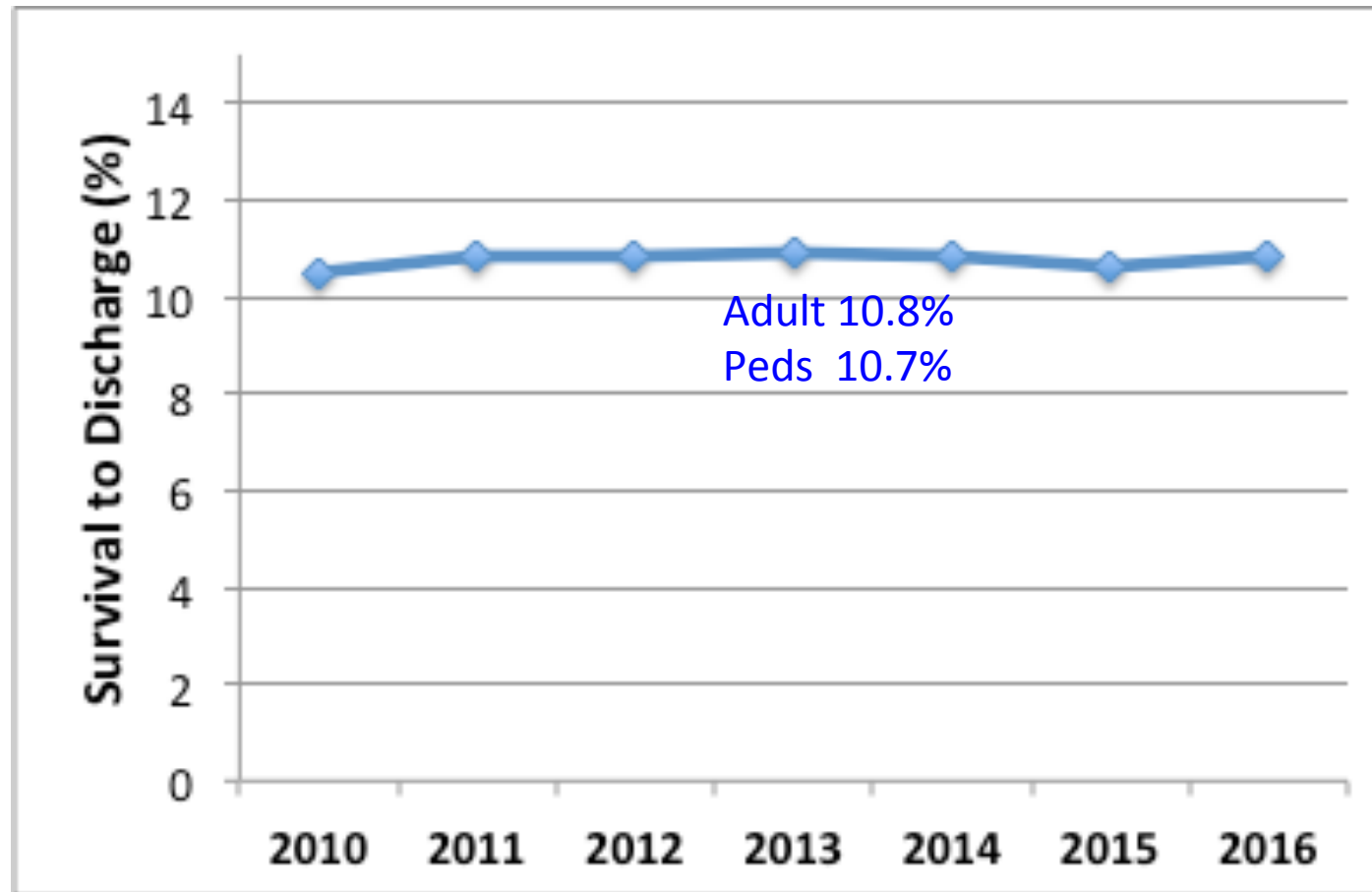3. American Red Cross http://www.redcross.org/news/article/CPRAED-Training-Saves-Lives

ECCU2017

CITIZEN CPR FOUNDATION

Analysis

Trends in Bystander Response and OHCA Outcomes between 2006 and 2015 in the ROC Epistry

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Bystander CPR, %	36.5	37.9	37.4	39.1	38.6	38.6	42.8	43.0	44.5	43.6
Lay use of AED, %	3.2	3.3	3.9	4.5	4.0	3.9	5.1	6.0	6.6	6.7
Survival EMS treated, %	10.2	10.1	11.9	10.3	11.1	11.3	12.4	11.9	12.7	12.4

ECCU2017

CITIZEN CPR FOUNDATION

OHCA Survival from CARES

Adult 10.8%
Peds 10.7%

IHCA Survival: Get with the Guidelines Resuscitation

Survival to Discharge by Event Year
All Pulseless IHCA Events From 2000 Through 2015

Survival to Discharge by Event Year and Rhythm
All Pulseless IHCA Events From 2000 Through 2015
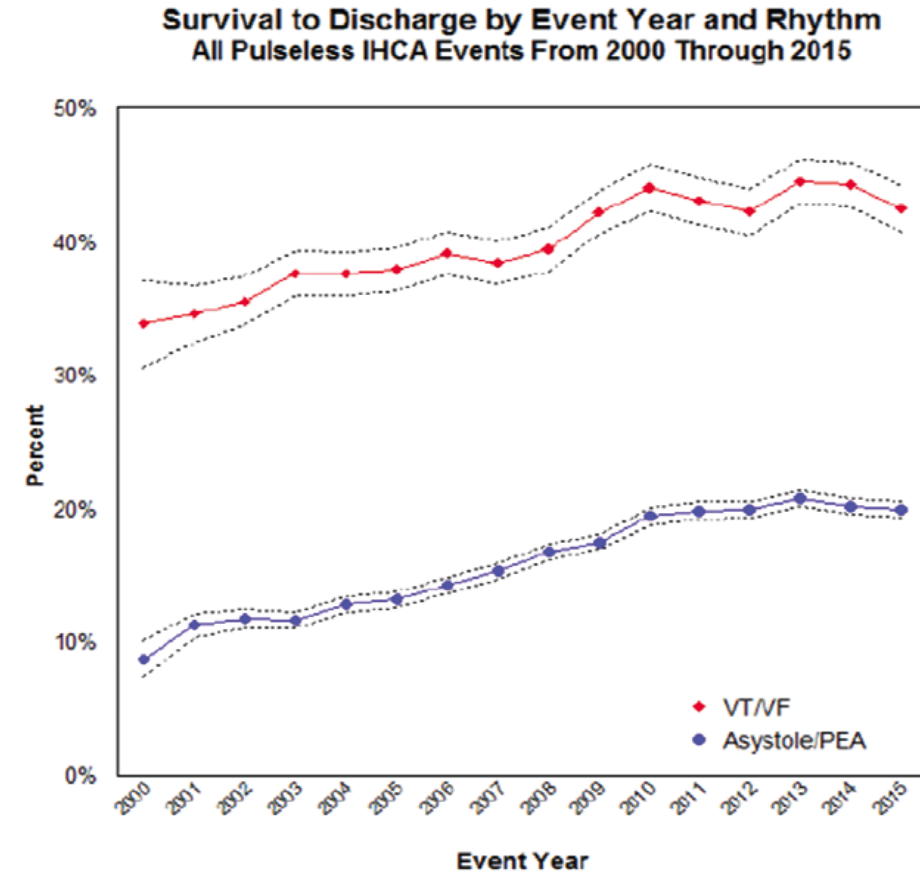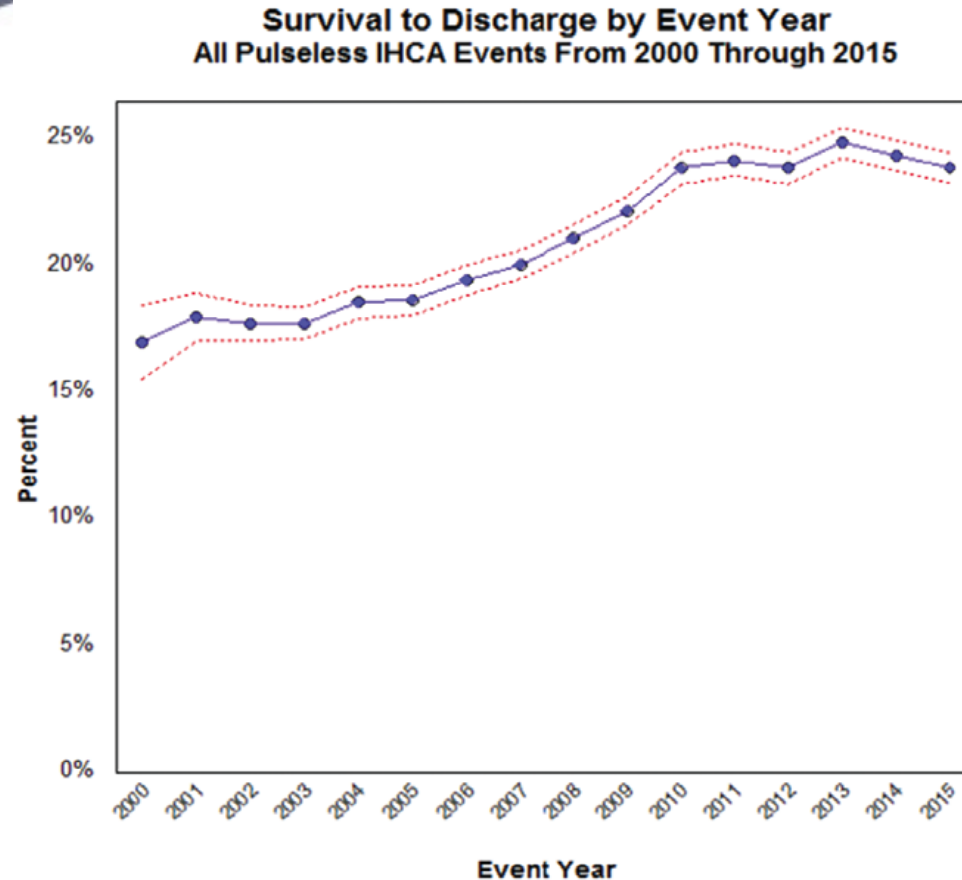
Heart Disease and Stroke Statistics—2017 Update: A Report From the American Heart Association. Emelia J. B et. al; Circulation. 2017;CIR.0000000000000485, originally published January 25, 2017. https://doi.org/10.1161/CIR.0000000000000485
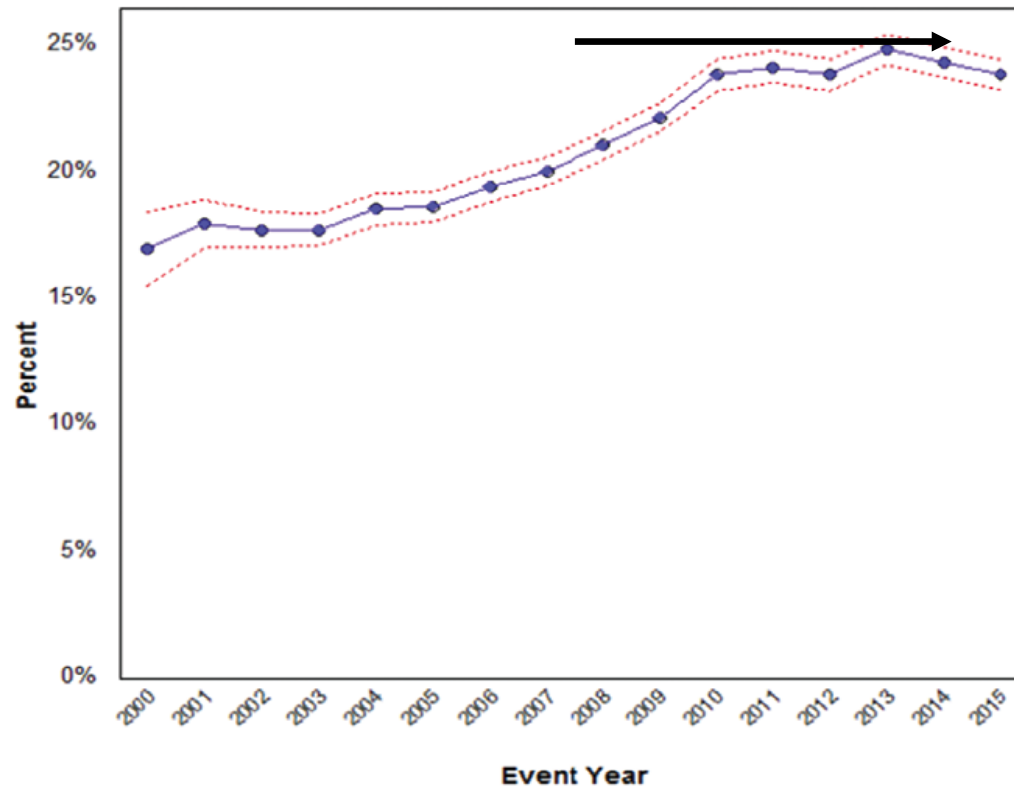
IHCA Survival: Get with the Guidelines Resuscitation

Survival to Discharge by Event Year
All Pulseless IHCA Events From 2000 Through 2015

Survival to Discharge by Event Year and Rhythm
All Pulseless IHCA Events From 2000 Through 2015

Today…

- Currently basic and advanced courses are heavily weighted in video presentations because of instructor variability.

- How have we assessed needs?!

- Is the current design based on needs or desired outcomes?

Discussion Points

- Pre-Conceived Knowledge
- Knowledge Acquisition
- Methodologies: Today and Tomorrow

Pre-conceived Knowledge - Point

- Current materials assume general understanding and are the same for all
- Program policies designed to facilitate learning (book availability)
- Required pretest allows students to gauge their knowledge
- Multiple opportunities to "learn" before class (specialized add on courses)

Pre-conceived Knowledge - Counterpoint

- Healthcare continues to evolve into "specialized" services
- Students have "niche" knowledge
- Pretest lacks variability and robustness, not adaptable
- Participants are lazy; want all-in-one experience

Benefits of Pre-course work

- Improved attitudes = yes
- Improved outcomes and skills = not so much
- Micro-sim computer based pre-course preparation for ALS
  - 80% students believed improved understanding of ALS theory and skills
  - Despite candidates perceived value, micro-sim produced no significant improvement in learning outcomes[1]
- CD-Rom BLS program (compared to standard training)
  - Improved users attitudes and assessment skills
  - Was inferior for the acquisition of the psychomotor skills[2]

1. G.D. Perkins et al. The effect of pre-course e-learning prior to advanced life support training: A randomised controlled trial. Resuscitation 81 (2010) 877–881
2. Monsieurs KG, et al. Learning effect of a novel interactive basic life support CD: the JUST system. Resuscitation 2004;62:159–65.

ECCU2017

CITIZEN CPR FOUNDATION

Predictive Performance Equation (PPE)

In PPE, three factors impact the acquisition and retention of knowledge
1. Amount of practice (frequency effect)
2. Elapsed time since practice occurred (recency effect)
3. The distribution of practice over time (spacing effect)

US Air Force developed; measures individual characteristics of the learner (i.e. decay rate, susceptibility to spacing, and retrieval variability) then predicts future performance.

Personalizing Training to Acquire and Sustain Competence Through Use of a Cognitive Model TS Jastrzembski et al. International Conference on Augmented Cognition, 148-161

Predictive Performance Optimization

- Prescribe tailored, individualized regimens to help trainees acquire and sustain competency
- Partnering Laerdal and AHA, utilizing RQI equipment and parameters
- Compressions and ventilations performed for 1 minute in assessment cycle (e.g., pre-test, training with feedback, and post-test)

- More training required upfront to attain proficiency
- Then refreshers spaced farther as knowledge and skills become more and more stable
- Compared to tradition 2 year CPR training cycle
- Estimated 12 years to achieve maintained proficiency
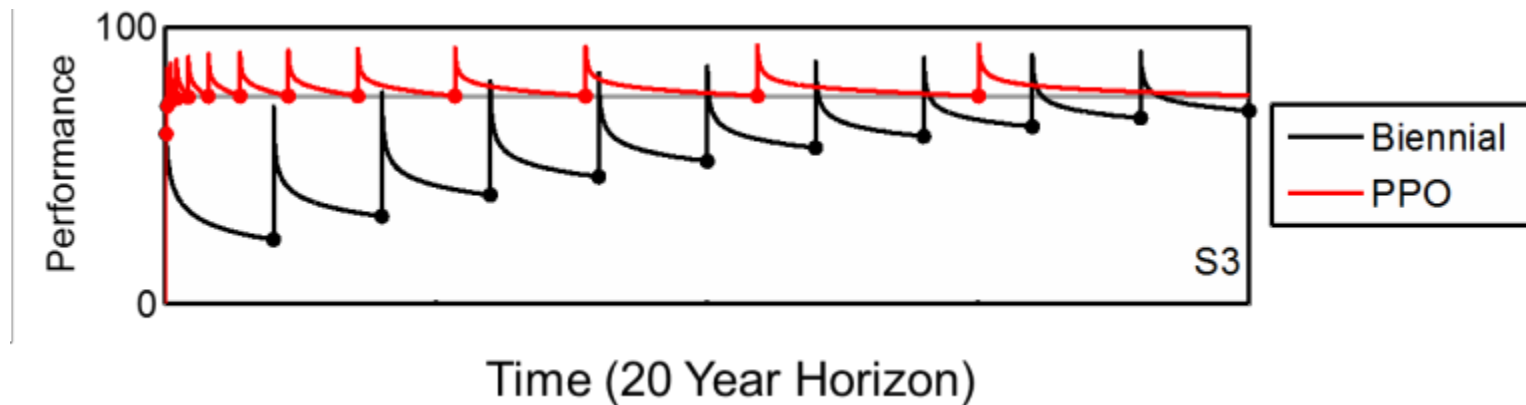
Personalizing Training to Acquire and Sustain Competence Through Use of a Cognitive Model TS Jastrzembski et al. International Conference on Augmented Cognition, 148-161

ECCU2017

CITIZEN CPR FOUNDATION

Knowledge Delivery - Point

- Extensive process to delivery high quality video instruction
- Utilizing "programmed scenarios"
- Evaluation of both cognitive and psychomotor domains

ECCU2017

CITIZEN CPR
FOUNDATION

Knowledge Delivery - Counterpoint

- Video quality and accuracy can be suspect
- Video cost is great
- Can learners multi-task
- Are they retaining or mimicking

Can learners multi-task?

Cognitive load theory (CLT)

- Working memory can hold no more than 5 to 9 information elements
- Can actively process no more than 2 to 4 elements simultaneously
- Almost all information is lost after about 20 seconds unless it is refreshed by rehearsal

Type of load

- Intrinsic = the information or task itself
- Extrinsic = instructional procedures e.g. auditory, visual, psychomotor
- Germane = learners related knowledge, experience, attitudes and confidence

ECCU2017

CITIZEN CPR
FOUNDATION

Can learners multi-task?

- Intrinsic and Extrinsic loads are additive
- Goal = manage or balance intrinsic and extrinsic loads (i.e. for complex tasks which have high intrinsic load … decrease extrinsic load
- Strategies to manage extrinsic load:
  - Worked examples: Show examples that are correct, provide a full solution
  - Split attention: Replace multiple sources of information with one integrated source
  - Modality: Replace all visual (printed text + images) with multimodal (spoken words and visual images)

Can learners multi-task

- Strategies to manage intrinsic load
  - Simple to complex: first present only isolated elements then work up to the tasks in their full complexity
  - Low- to high-fidelity: first perform task in low-fidelity environment then increasingly higher-fidelity environments (alone, then groups, then team roles)
- Strategies to optimize germane load
  - Variability: perform the task in a variety of similar scenarios
  - Contextualize: present information and situate tasks in a manner that relates to the learner

Cognitive load: Expertise reversal effect

- Principles that work well for novice learners may not work well or may even have negative effects for more experienced learners
- Strategies suited to experienced learners:
  - Present a portion of task that learner completes
  - Provide less step-by step instruction
  - *Provide more complex (less common or uniform) information and scenarios

Knowledge Acquisition - Point

- Video provides uniform information
- Practice while watching enforces psychomotor cognition
- Presumed retention

Knowledge Acquisition - Counterpoint

- Instructors have varying degrees of competence
- Information presented may lack "depth"
- Evaluation process is incomplete (1 scenario)
- eLearning programs may miss team dynamics and debriefing emphasis

Course Design ➡️

Course Design - Point

- Course design is based on uniformity (Big Mac)
- It includes core information
- Presented without modifications
- Material is available in both print and electronic versions
- Prepared scenarios

Course Design - Counterpoint

- Rarely are the materials delivered uniformly
- How is core information defined
- Are real life applications parallel with actual scenarios
- Resuscitation science changes rapidly
- Adaptability to specialized audiences (Coca-Cola)

How is core information defined - incorporated into courses

- There are things that have equal or better class recommendations in guidelines that we never practice in courses.
  - Examples: 2010 Stable VT: Procainimide Class IIa v Amiodarone IIb
- How might this guideline recommendation be addressed?
  - *Because panic can significantly impair a bystander's ability to perform in an emergency, it may be reasonable for CPR training to address the possibility of panic and encourage learners to consider how they will overcome it. (Class IIb LOE C)*

Course Design - Point

- Fewer data points to focus learning
- Robust delivery of eLearning micro-simulations
- Ancillary topics deleted from material or optional
- Incorporation of directive feedback

Course Design - Counterpoint

- Are the educational objectives on target
- Micro-simulations have a "gaming" curve
- Great deal of fluctuation in what we should be evaluating and how
- Where are we offering "specialized" training for unique patient populations
- Directive feedback technology is evolving and some refuse to utilize

Directive feedback technology in training

- Several studies and learners who used devices that provided corrective feedback during CPR training had improved compression rate, depth, and recoil compared with learners performing CPR without feedback

- Guidelines recommendation (2010): Use of feedback devices can be effective in improving CPR performance during training. (Class IIa, LOE A)

Directive feedback technology in training

New requirements for American Heart Association adult CPR courses

Real-time feedback devices improve quality and provide consistency in CPR training

August 15, 2017 | Categories: Program News

DALLAS, August 15, 2017 — The American Heart Association – the world's leading voluntary health organization devoted to fighting cardiovascular disease – will now require the use of an instrumented directive feedback device in all courses that teach adult CPR skills, effective January 31, 2019. The *devices* provide, real-time, audiovisual and corrective evaluation and instruction on chest compression rate, depth, chest recoil and proper hand placement during CPR training.

ECCU2017

CITIZEN CPR FOUNDATION

What are we accomplishing

- Participant roles - vary greatly
- Participant scope of practice - not relevant to many
- What is the target? Outcomes?
- Have they improved?
- Are we trying to drive a square peg into a round hole and losing something in the process

Retention of BLS skills

- Significant decline skills at 3 months
- Unexpected non-linear decay of skill over time
  - 9-month group had less experience, refreshers and confidence
- Positive predictors retention
  - More years of service
  - Periodic refreshment skills
  - Higher confidence in abilities
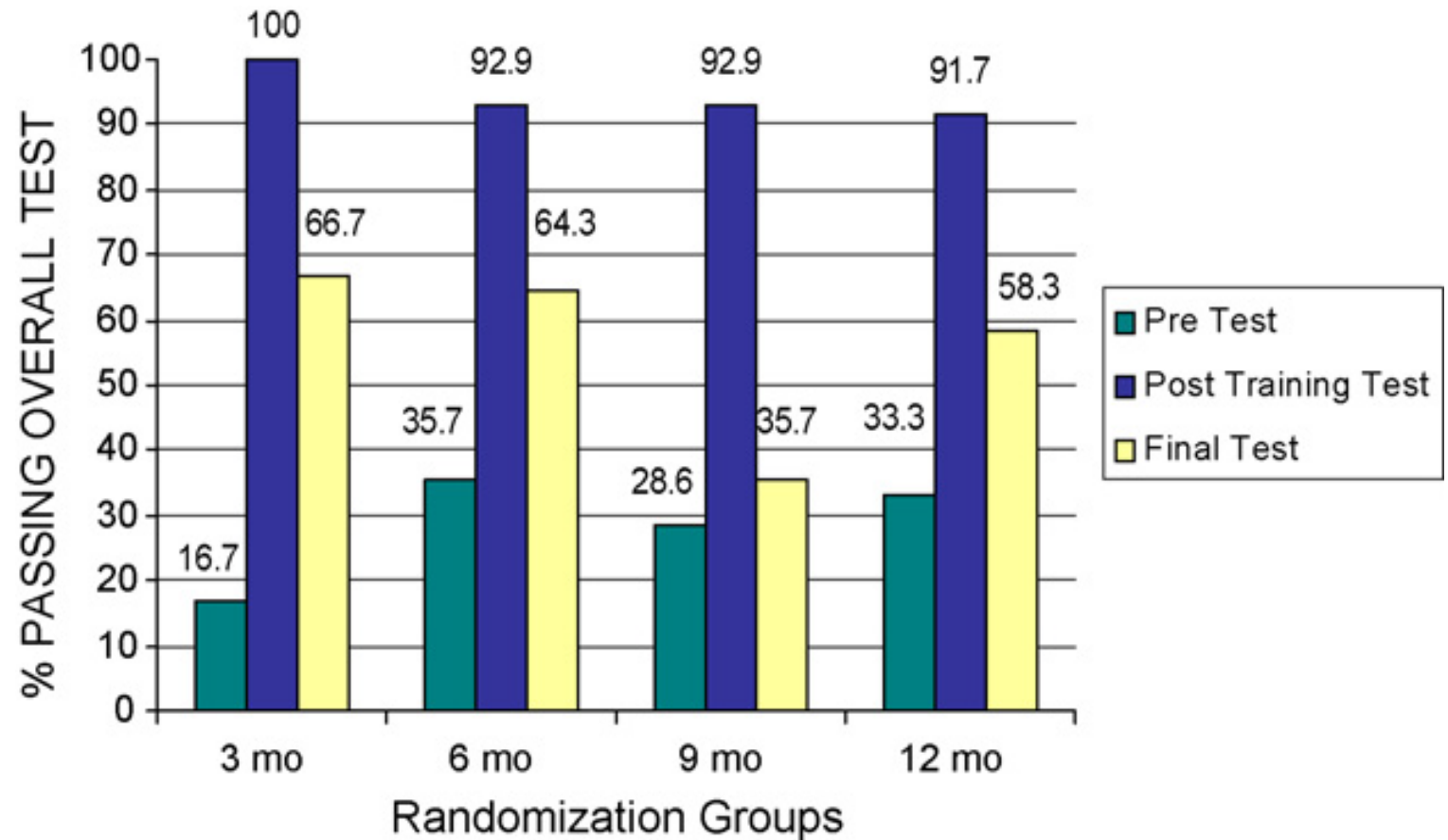
Evaluation of staff's retention of ACLS and BLS skills; Kimberly K. Smith. Resuscitation (2008) 78, 59-65.

Instructors assessment of chest compression quality

- Instructors least accurate assessing rate
  - When rate within 100-120: majority assessed as inadequate
  - When rate above 120 majority assessed as adequate
- Overall trend: rate, depth, and fraction was toward false positives
  - Inadequate chest compressions being assessed as adequate
  - Participants who do not meet requirements are passed and not given corrective feedback
- One potential explanation: Need to simultaneously assess multiple variables
  - CPR quality
  - Application of ACLS algorithms
  - Team dynamics & communication
  - Overall scenario management
- High level of instructor cognitive load in ALS scenarios = suboptimal assessments

ECCU2017

CITIZEN CPR FOUNDATION
Helping citizens and communities save lives

BLS Report Card

- Illustration of proposed resuscitation "report cards."
- Routine use of a brief tool to document resuscitation quality
- Would assist debriefing efforts and quality improvement efforts
- Perhaps incorporating such a tool in training courses would increase real world adoption?

A Report Card: general checklist

Event number / date _VO131 3-9-12_	No / Intermediate / Yes
Was the team leader clearly identified?	🟥 🟨 ✅🟩
Was the scene orderly and quiet?	🟥 🟨 ✅🟩
Was the defibrillator applied quickly?	🟥 🟨 ✅🟩
Was CPR started promptly?	🟥 ✅🟨 🟩
Were pauses in CPR delivery minimized?	🟥 ✅🟨 🟩
Was CPR of subjectively high quality?	🟥 🟨 ✅🟩
Were peri-shock pauses minimized?	🟥 ✅🟨 🟩
Was an airway secured efficiently?	🟥 🟨 ✅🟩

Comments ____ _Great team leadership, good effort by all, but remember to MINIMIZE pauses in CPR, esp. before/after shocks_ ____

B Report Card: CPR quality analysis

Event number / date _VO131 3-9-12_		
Compression fraction	92%	🟥🟨🟩
Mean compression rate	102	🟥🟨🟩
Mean compression depth (mm)	49	🟥🟨🟩
Compressions without leaning	75%	🟥🟨🟩
Mean ventilation rate	9	🟥🟨🟩

Comments ____ _Great rate and hands on time; remember to keep Pre-shock and post-shock pauses short to improve shock success_

Peter A. Meaney et al. Circulation. 2013;128:417-435

Where are we with this topic?

Is Education Driving Outcomes

or

Are Outcomes Driving Education

Methodologies and learner styles

- Scenario based delivery
- Practice While Watching
- Cognitive testing
- Psychomotor testing
- Debriefing
- Interactive videos

Visual(see'rs)

Aural(hear'ers)

Kinesthetic (Do'ers)

Generations

- Traditionalists - structured
- Baby Boomers - personalized
- Generation X - independent
- Millennials - combination

PWW - Point

- Meets everybody's needs
- Compromise for all learner types
- Less reliance on instructor
- Psychomotor reinforcement essential to learning

PWW - Counter point

- Not uniform in all programs
- Limited instructor ability to offer "true" feedback and correction
- Information overload or indigestible for some learner types (can't do 2 things at the same time)

Cognitive and Psychomotor Testing - Point

- Uniform evaluation of skills via skills check sheets
- Critical concepts skills sheets for scenarios
- All learner types should be able to perform
- Cognitive reinforcement

Cognitive and Psychomotor Testing - Counterpoint

- Learners overrate ability
- Learners self triage needs
- Failure to capture feedback from instructor (what's it take to change behavior)
- Performance fatigue vs critical concept understanding

Cognitive and Psychomotor Testing - Point

- Emphasis on debriefing scenarios which improve outcomes
- Scripted scenarios
- Open resource testing offers a learning continuum

Cognitive and Psychomotor Testing - Counterpoint

- Are we extending learning with testing, are the tests validated?

- Have instructors embraced the importance of debriefing?

- Do we allow students to utilize actual equipment? Is it more than just "high quality" CPR?

- Are we extending these behaviors to the bedside?

- Time allowance for scenarios inadequate.

Have instructors embraced the importance of debriefing?

- Guidelines: *During debriefing, learners reflect on their performance during the simulation, performance gaps are identified and corrected, and "take-home" messages are generalized to maximize learning. Without this step, learners are unlikely to improve non-technical skills, decision-making abilities, situational awareness, and team coordination.*

Methodologies and learner types - moving forward

- Curriculum design/delivery could use some latitude
- Retention of knowledge not optimized
- Expanded instructor development
- Program evaluation
- Maintenance of Competency(MOC)

ECCU2017

CITIZEN CPR FOUNDATION

Program Evaluation

- Consistent with established methodologies for program evaluation, the effectiveness of resuscitation courses should be evaluated. (Class I, LOE C)

- This is an integral component of resuscitation education with the appraisal of resuscitation courses including learner, individual instructor, course and program performance. Training organizations should use this information to drive the continuous quality improvement process.

Program Evaluation

Kirkpatrick's Training Evaluation Model

RESULTS — LEVEL 4: To what degree the targeted outcome occurs, as a result of the learning event(s) and subsequent reinforcement.

BEHAVIOR — LEVEL 3: To what degree participants apply what they learned during the training when they are back on the job.

LEARNING — LEVEL 2: To what degree participants acquire the indented knowledge, skills and attitudes based on their participation in the learning event.

REACTION — LEVEL 1: To what degree participants react favorably to the learning event.

Program Evaluation: Reaction (Level 1)

- New student survey rolling out (myCards)
- Plan to standardize survey participants in all leaning platforms
  - Same or similar questions for ILT, CBT (HeartCode) and RQI
- Data aggregated nationally
- Will be able to compare results across centers and platforms
- Benchmarking and sharing best practices

2015 Guidelines recommendations supporting Maintenance of Competency (MOC) programs

- *CPR self-instruction through video- and/or computer-based modules paired with hands-on practice may be a reasonable alternative to instructor-led courses. (Class IIb, LOE C-LD)*
- *Given the rapidity with which BLS skills decay after training, coupled with the observed improvement in skill and confidence among students who train more frequently, it may be reasonable for BLS retraining to be completed more often by individuals who are likely to encounter cardiac arrest. (Class IIb, LOE C-LD)*
- *Given the potential educational benefits of short, frequent retraining sessions coupled with the potential for cost savings from reduced training time and removal of staff from the clinical environment for standard refresher training, it is reasonable that individuals who are likely to encounter a cardiac arrest victim perform more frequent manikin-based retraining. (Class IIa, LOE C-LD)*

RQI Findings: Learning (level 2)

- Some individuals have high initial and lasting competency in certain areas
  - e.g. "human metronome" for compression rate
- AHA investigating genetic prediction of future performance based on past performance.
  - Worked with the USAF 711th Human Performance Wing and the AFRL to develop a predictive performance model (for future use)
- Going forward MOC programs will likely adjust to individual participant abilities

Learning (level 2)

High miss skill = BVM ventilation

More difficult to achieve and maintain mastery than chest compressions

Average 2-3 attempts required to achieve passing score

RQI Findings: Behavior (level 3)

- Self-directed over-training
  - Many participants end the training session once they achieve a passing score
  - However a significant number repeatedly re-test
  - Logs contain >10 attempts (scoring 88, 90, 93…)
  - Need to explore the extrinsic and intrinsic motivators that drive some participants to the 90th percentile
  - AHA analyzing if the over-training results in improved retention

RQI Findings: Behavior (Level 3)

- Participants demonstrate increased CPR confidence
  - Recognize sub-optimal performance (in real world codes) and replace these rescuers
  - Prohibit students and other non-RQI trained personnel from performing CPR
  - Forming lines: waiting for turn/opportunity to demonstrate skills in a code

RQI Findings: Outcomes (level 4)

Very early review of data begins to link RQI with improved patient outcomes. However many variables not accounted for …..in process.

Is Education Driving Outcomes – YES!

- More trained in CPR year over year

- Higher rates of bystander CPR and AED use

- Evidence based Guidelines recommendations incorporated into training program

Is Education Driving Outcomes – YES!

- As science advances materials and techniques updated

- Generic, standardized instructional design delivers some degree of acceptable competency to learners

- Refresher courses with higher cognitive load and compressed agendas suited to experienced learners

Are Outcomes Driving Education – YES!

- Directive feedback improves skills acquisition training and likely real-world performance

- Predictive performance training evolving concept of individual "prescription" for frequency, timing and spacing

- Debriefing (training and practice) serves to improve non-technical skills, decision-making abilities, situational awareness, and team coordination

Are Outcomes Driving Education – YES!

- MOC - RQI program shows increased retention and that over time performance improves past minimal competency

- RQI fosters over-training and quicker progression to mastery learning

- RQI participants now eager to demonstrate skills and empowered to recognize/correct poor real world CPR performance

Questions?

Courses designed for the masses…….
educate one learner at a time!

Thank you!

"We don't know it all …but we all know a know-it-all"

ECCU2017 CITIZEN CPR FOUNDATION