

AEDs: Where Do They Belong?

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Sudden Cardiac Death

- #1 killer of adults in USA
 - American Heart Association – 2001 “The Power to Save” → 220,000 deaths / year
 - “...quicker emergency care... could save up to 50,000 lives a year.”
 - >60% OOH-CA shockable rhythm
 - ~70% OOH-CA occurs at home
 - 16% SCA in public places
 - OSHA – 15% workplace deaths due to SCA
- Majority in private businesses

Chain of Survival

- Early EMS activation (911 or similar)
- Early CPR
- Early **defibrillation**
- Early ACLS
- Survival from out-of-hospital cardiac arrest ~5 – 20%
- Theory: BLS + AED + rapid ACLS = increased survival
- CPR started within 4 minutes + ACLS started within 8 minutes = ~40% survival
- Traditional: Each minute defibrillation is delayed, survival decreases by 2 to 10%

Logistical regression:

SURVIVAL = 67% at collapse
minus 2.3% / minute to CPR
minus 1.1% / minute to defib
minus 2.1% / minute to ACLS

0.67 minus

0.023 x 3 minutes to CPR (0.069) minus

0.011 x 5 minutes to AED (0.055) minus

0.021 x 8 minutes to ACLS (0.168) = 0.378

“AEDs are recommended for public sites with a high probability of at least one use every five years...”

Select sites for AED deployment that are within a 5 minute radius of the majority of expected arrests but outside a 5 minute radius of the closest EMS units.”

Class 1b Recommendation

Let's Look at the Evidence

- Nomenclature: automated
- Some special situation defibrillators are automatic
- Lithium batteries: 5 year
- Self-checking: unit will tell you if something's wrong
- Portable: some <2 kg

- Microprocessors analyze wave frequency and amplitude, compare to preset values
- Visual and verbal prompts: “shock advised” vs. “no shock advised”
- >90% sensitive: recognizes shockable rhythm
- >95% specific: not recommend shock if not indicated
- Studies dating to 1987 show ‘civilians’ can operate AEDs

Patient unresponsive and not breathing, ADVISES shock for...

...monomorphic and polymorphic ventricular tachycardia

...supraventricular tachycardia

...ventricular-fibrillation

Effective? YES!! “Effectiveness” not the same as “efficacy”

The AED Bandwagon

121 wire service / local news stories*

- “How an AED saved my life”
- Businesses getting AEDs
- State shield law enacted to promote AED use
- Fire/EMS lobbying for money to purchase AEDs
- “Even small children can use an AED”

Not one story was negative...

- It’s UNPATRIOTIC to not want AEDs everywhere!!

“Is it time for over-the-counter defibrillators?”

- Home arrests ~75%
- Witnessed ~60%
- Most are v-fib
- Therefore: put ‘em at home!!

Shocking Truth About AEDs

- Same issue JAMA as Eisenberg
- Different conclusions
- “Let’s look at the evidence”

Memphis, Tennessee

- Firefighter first responders
- On scene 2½ minutes before paramedics
- AEDs → survival to discharge same as firefighter CPR

Charlotte, North Carolina

- Duplicated the Memphis experience
- First-responder AED use did not improve survival to hospital discharge rate

New York City

- PHASE study (Pre-Hospital Arrest Survival Study)
- No increased survival with AEDs

OPALS
Ontario Prehospital ALS

- System optimized – 90% of cardiac arrest victims reached in <8 minutes
- >1600 cardiac arrests
- Survival rate increased from 3.9% to 5.3%
- Benefit: patients in PEA!
- Survival rates in patients found in v-tach or v-fib: 11.9% post-intervention vs. 10% pre-intervention (P = .17)

Indiana – middle USA

- Rural communities
- Police had half of county's defibrillators
- First on scene 6.7% of time (1 of every 16 calls)
- "Uncomfortable" as resuscitator

What's Best-case?

Rate of cardiac arrest:

1 / thousand adults / year

X 60% witnessed

X 50% in "shockable" rhythm

X 45% survivors per year

Best estimate: 13.5% survival

What's Best-case?

City of 100,000

100 arrests annually

60 witnessed

30 "shockable"

~13 survivors

Where Do We Put Them?

O'Hare in Chicago 49 AEDs → 10 months → 14 uses → 9 saves!!

Nashville Cats

- Federal Aviation Administration (FAA)
- Unfunded mandate: 215 airports must purchase and maintain AEDs
- Any airport with 275 travelers daily
One death / week on US planes
60% arrests observed (!!)
25 months trial
191 AED applications
14 in fibrillation
6 with neurologic survival!!

Casinos

- High-risk group
- Surveillance cameras see all
- Time to CPR <3 minutes
- Time to AED ~4.5 minutes
- Survival to discharge: 59%!

Dialysis centers (??)

- Seattle experience: 3 cardiac arrests every 4 years / site (0.746 arrests / site / year)
- (What is the usual rhythm found in a dialysis arrest?)

US AED Mania...

- House Regulation 2498: CASA (Cardiac Arrest Survival Act of 2000)
- AEDs in federal buildings
- “Good Samaritan” laws protect users
- ‘Training’ deferred to states
- Berger S et al. Sudden cardiac death in infants, children, and adolescents.
- Claim 5000 to 7000 sudden cardiac deaths in children *every year* not including SIDS (!!!)

“So simple even a child can use it...”

6th graders had several hours training and demonstrated they could properly use AEDs

- What’s driving the decisions where they should go?

Krys vs. Lufthansa

- \$2,700,000 judgment for NOT having cardiac resuscitation capabilities onboard

US AED Mania...

13 year-old died after riding roller coaster

Busch Gardens paid for no resuscitation equipment

US AED Mania...

Chai vs. Sports & Fitness Clubs of America

~\$2,000,000 for gym not having AED

What’s the Big Deal?

The Outrage Factor

$RISK = HAZARD + OUTRAGE$

Outrage → “You should have done something...”

Outrage costs big

It’s Only Money

Money spent on AEDs

is money NOT spent on

training, equipment,

research, vehicle maintenance,

medications, supplies, etc.

It’s Only Money

“The core fiction of American health care...is that insurance should cover every useful medical procedure no matter how small the result or prohibitive the cost.”

Some Silly Arguments

“It’s like having a smoke detector...”

Consumer Products Safety Commission estimates smoke alarms in 16,000,000 US homes don’t work, mostly due to dead or missing battery.

“Foolproof and safe...”

Lithium batteries can ‘rupture’ (that is, explode)

Two firefighters ended up in hospital

NIOSH website has details

<http://www.cdc.gov/niosh/face9939.html>

\$3000 for Peace of Mind...

Initial cost for AED - \$2500 to \$3500, depending on “bells and whistles”

Technological Imperative

If your only tool is a hammer...

...everything looks like a nail.

Technological Imperative

Will universal AEDs cause people to skip the basics

A – airway

B – breathing

C – circulation

and go straight to

D – defibrillator

We See Dead People

- In hospital setting, we expect dead people to stay dead
- Referral bias?? Most DOA
- AED implication → everybody lives!!!

Summary

- Out of Hospital Cardiac Arrest is a significant cause of death
- Existing methods of treatment are inadequate

Comments?

Questions?

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