

Prof dr. Patrick Van de Voorde,
MD, PhD, FERC

Consultant Paediatrics, Emergency medicine,
Intensive Care, UH Ghent;
Docent Paediatric EM, Ghent University,
Belgium

Disclaimer:

- financial: none
- academic: ERC - EUSEM

but the opinions given are my own
and not necessarily represent ...



CPR controversies

The year is 2015....

FIGURE 1-16 An attempt at resuscitating an apparently drowned person using the modified Dutch method. One resuscitator is assisting respiration by massaging the chest. The fumigator is instilling tobacco smoke through the rectum. (*From Morch, 1985, with permission.*)

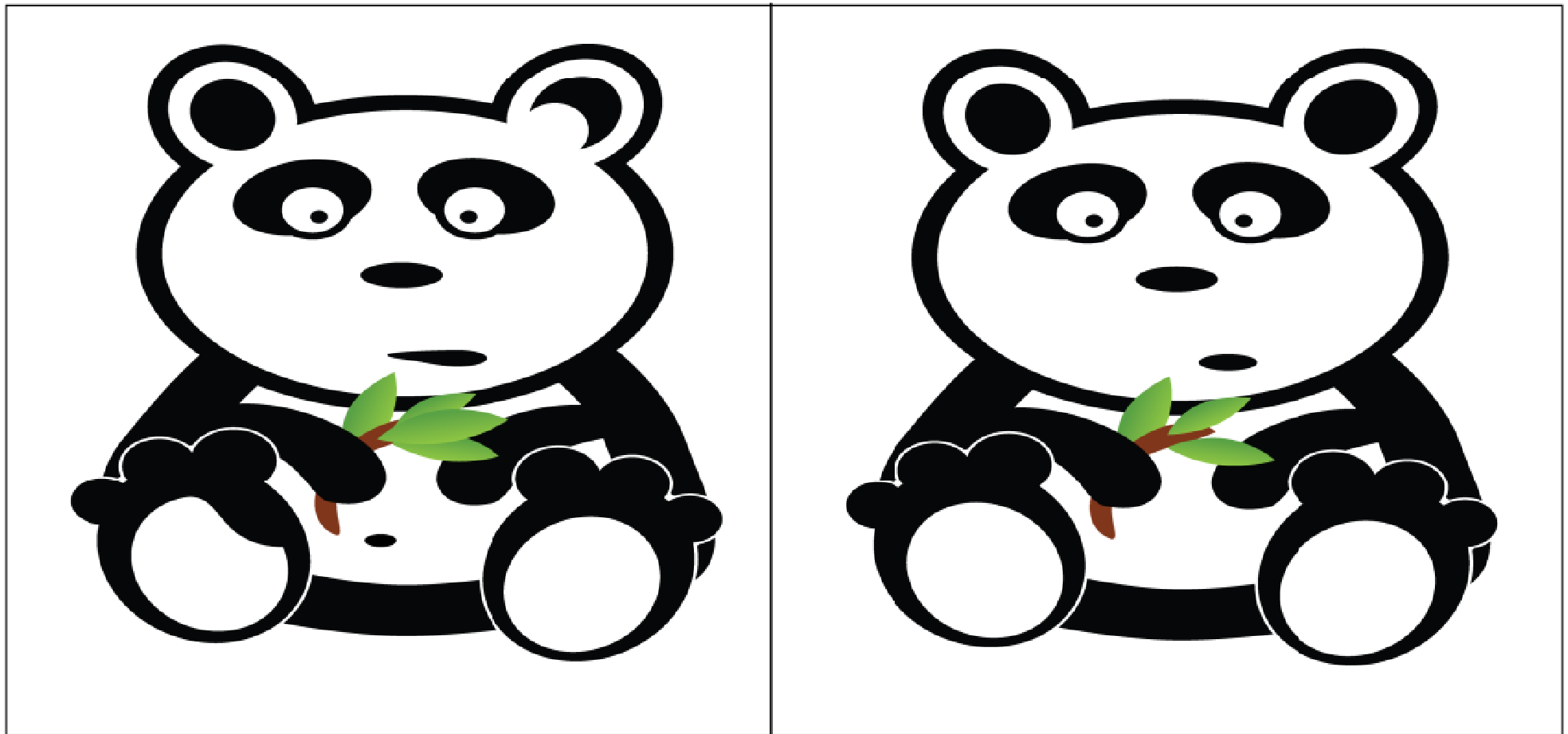




WHO DIES?

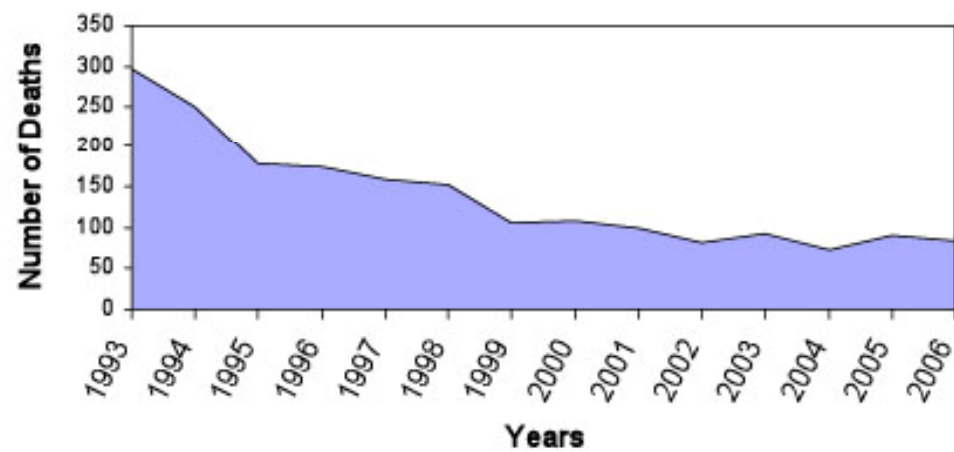
WHO CAN/SHOULD be SAVED?

SPOT THE FIVE DIFFERENCES





SIDS Deaths (1993 - 2006)

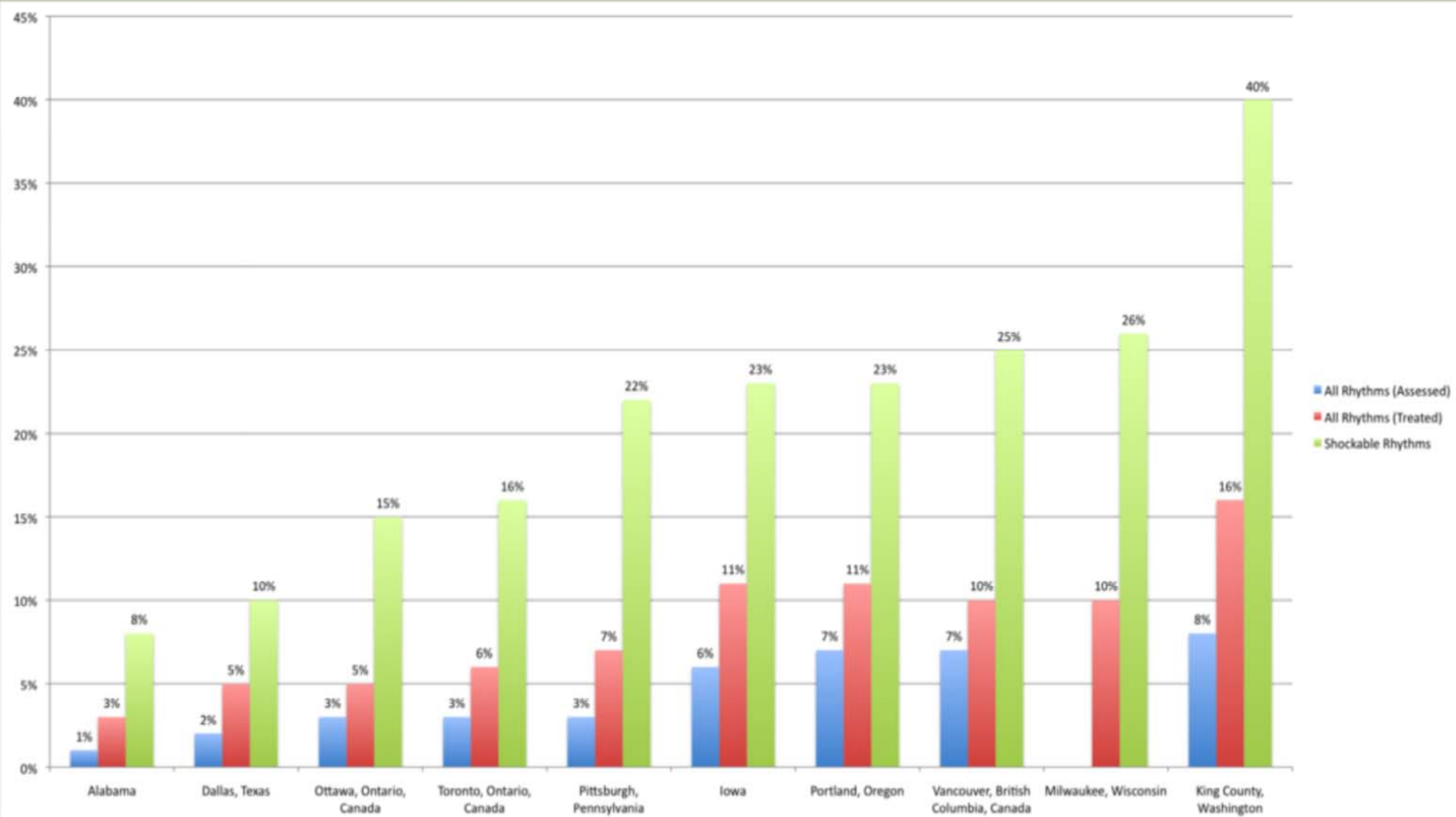


OHCA 'outcome'

- Young, 2004 – Atkins, 2006 – Kitamura, Lancet 2010:
 - Survival 2-10% **NOT MUCH IMPROVEMENT**
 - ? DESPITE bystander CPR 30-60%
- Kitamura, Circulation 2012 – Meyer, Circulation 2012:
 - better survival for older children
 - Meyer sudden collapse 3-13y: **70%** survival
- Akahane, CCM 2012: 1780 OHCA <20y:
 - 39.5% bystander CPR;
 - 28.4% dispatcher assisted = 13.4% survival (OR 6 chest compressions, OR 3.1 rescue breaths);
 - **difficult to recognize CA**

Bystander CPR relates to outcome only in Kitamura, 2010





OHCA 'compressions only'

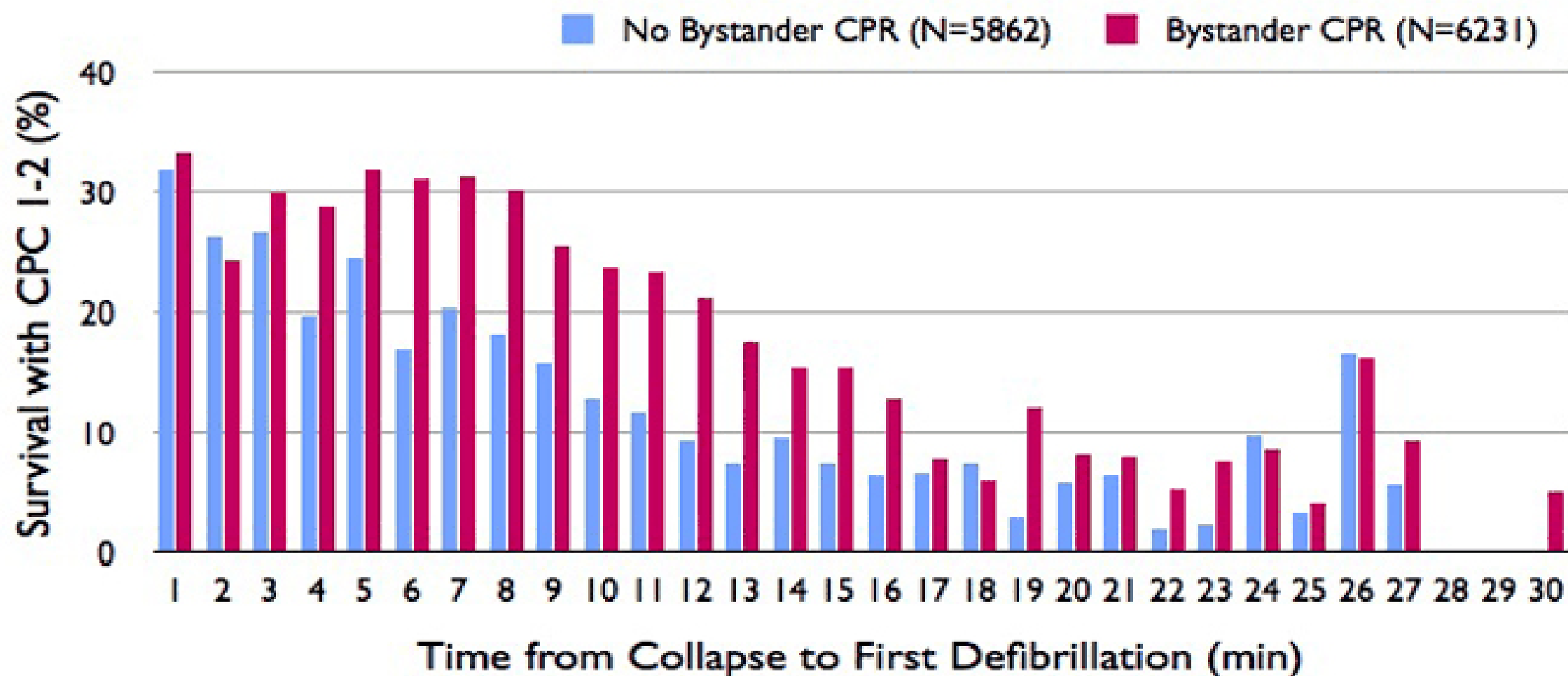
- Iwami, Circulation 2012: 2005-2009 adult prosp. observ.
 - Compressions only OR good outcome 1.3 (1.03-1.7)
- Kitamura, Lancet 2010: 5170 <18y (1495 presumed cardiac)
 - Bystander CPR: OR 2.6
 - >1y non cardiac: CONVENTIONAL CPR OR 5.5
 - >1y cardiac: no diff. conventional or compressions only

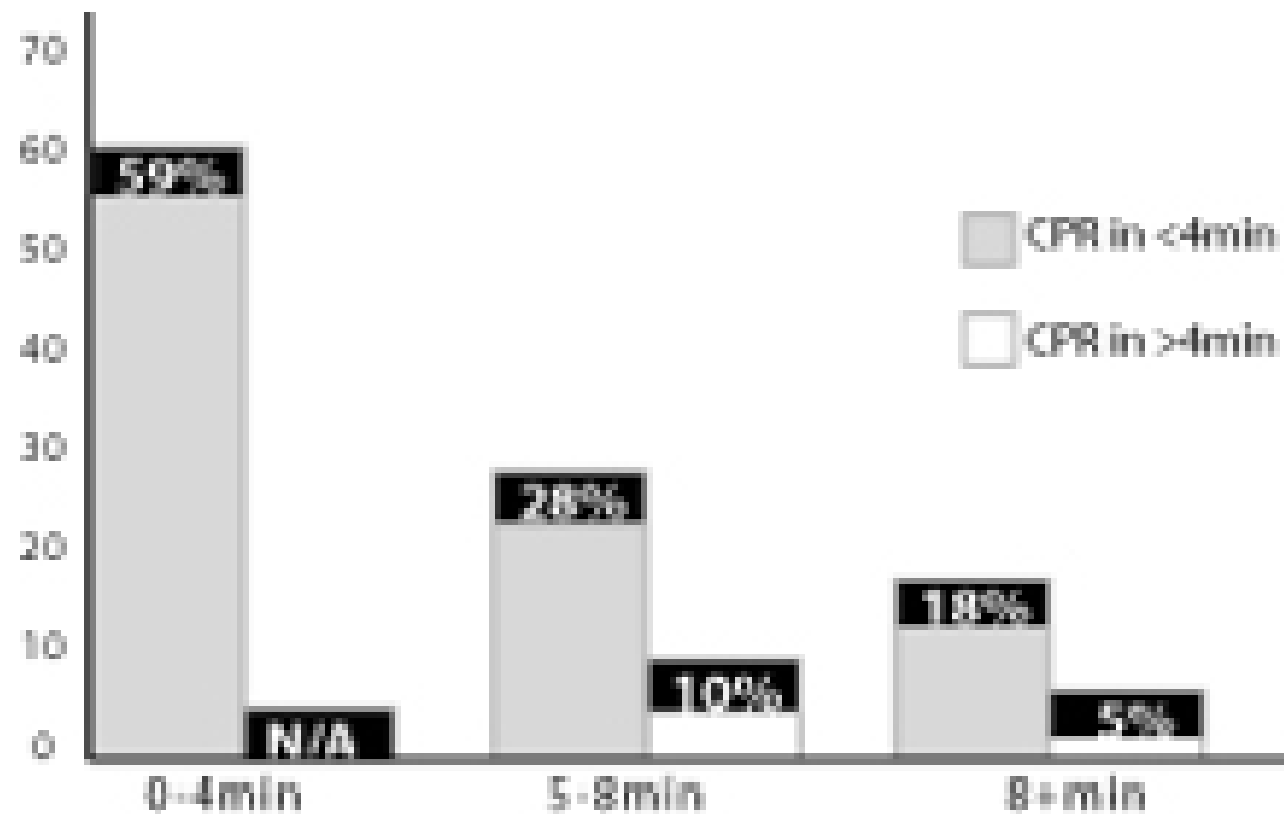


OHCA 'shockable'

- Gerrein, Acad. Em. Med. 2006:
 - 34% witnessed; 37% trauma – 20% SIDS – 12% resp.;
 - init. shockable 4%
 - 2% survival
- Meyer, Circulation 2012: sudden collapse 3-13y: 70% survival
- Bennett, CCM 2013 (PECARN):
 - Outcome related to location, initial rhythm but not oxygenation-ventilation...
- Enright, Ped Em Care 2013:
 - 9 children with sudden witnessed: 6 good outcome: all CPR <5' – defib <10' (only 1 adr.)

Effect of Early Defibrillation and Bystander CPR on Survival after Witnessed SCA from VF





Percent surviving cardiac arrest by time to CPR and time to defibrillation, King County

OHCA 'adrenaline'

- Hagihara, JAMA 2013
 - OHCA Observ. Propensity: ADRE OR ROSC 2.5 – OR 1M survival 0.56 – OPC 1-2 0.23
- Jacobs, Resusc 2011:
 - RCT double-blind, but underpowered
 - ADRE ROSC 23.3% vs 8.4% - 95% CI for OR [2-5.6]
 - ADRE survival discharge 4% vs 1.9% - 95% CI for OR [0.7-6.3] (even lower if CPC 1-2)



IHCA

- Berg, 2013 – Sugminem, 2000 - Reis, 2002 – Matos, 2013 – Lopez-Herce, 2014:
 - Improving survival with good outcome (up to 30% survival - 2/3 OPC 1-2)
 - Arrest more than 95% on ICU
 - Duration of CPR >30' survival down to 7% and 2/3 impaired (so what?)
- Matos, Circulation 2013 (GWTG-R): 3419 children (9y)
 - Survival to hospital discharge 27.9% - favourable outcome 19%
 - Odds decrease 2.1% per '
 - CPR >35' adjusted survival probability 12% with 60% good PCPC

IHCA

- Lopez-Herce, Crit Care 2014: 502 (1m-18y) observational:
 - 69.5% ROSC
 - 39.2% surv discharge (89% good outcome)

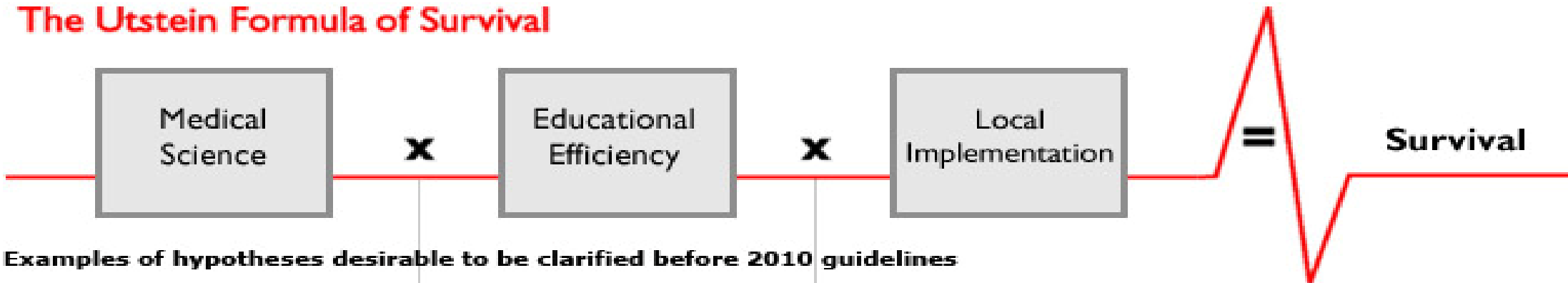
Spain in 10y surv discharge 25% > almost 40%

- Rodriguez-Nunez, Resuscitation 2014: same population, 40 shockable events
 - 50% sustained ROSC
 - 32.4% survival discharge
 - Outcome better if presenting shockable (vs. subsequent)
 - No relation with dose of shock...

HOW TO SAVE A LIFE?



The Utstein Formula of Survival



Examples of hypotheses desirable to be clarified before 2010 guidelines

- "Tailored" treatment
- Impedance Threshold Device
- Mechanical chest compressions
- Immediate CPR performance feedback
- Early hypothermia
- ECG waveform analysis shock/no shock

- New strategies for increased public education
- Value of e-learning

- Medical emergency teams
- CPR process monitoring
- Hypertonic IV fluid

Examples of practical research areas relating to implementation of MDG 4 and 5 measures

ILCOR Guidelines

- Evidence based and culturally sensitive training material
- Time-efficient course model

Cascade dissemination model

Low barriers and incentives to attract instructors/facilitators

Intergration with other MDG 4 and 5 programs

Reach into the communities

- plans to scale up the health care work force
- Incentives for health care facilities (resuscitation kits?)
- Incentives for mothers (baby clothing, napkins?)

Government financing of training and equipment

Reporting/QA

CPR QUALITY



CPR QUALITY in BLS and ALS

- Human factors (fear; communication; situational awareness...)
- Regular practice (teams, mock codes..)
- Algorithms (unequivocal):
 - CAB or ABC; C:V ratio
 - Adrenaline
 - Post-resuscitation care (TTM, HD target, oxygen target)

CPR QUALITY: to monitor is to know?

- Monitoring (limited ped evid.)
 - Feedback devices
 - Arterial line; diastolic BP aims?
 - EtCO₂ goals
 - Wave form analysis
 - NIRS
 - Ultrasound



WHEN TO START, WHEN TO STOP

ETHICAL DECISION MAKING IN CPR

WHEN TO START, WHEN TO STOP?

- “We’ve done everything we could....”
- “Enough is enough?”
- Dystanasia when resuscitation is prolonged despite obvious futility
- Self-fulfilling prophecy if everyone of a certain population dies because no one really tries...

E-CPR

- Huang, Resusc 2012
 - IHCA ped
 - 46% survival (21/24 PCPC1-3)
 - Survival <60' CPR (1 >60')
 - Survival rate better in recent cases
- Raymond, PedsCCM, 2010
 - Even survivors with CPR duration of >90'
- Adult data for OHCA but survival still limited and in selected populations (e.g. intox, sudden witnessed collapse..)



When to withhold or withdraw CPR?

- cases of obvious mortal injury or irreversible death
- cases where the safety of the provider can no longer be sufficiently assured
- cases where a valid and relevant patient-approved advanced directive becomes available
- cases where there is other strong evidence that further CPR would be against the patient's values and preferences or is considered 'futile': palliative setting, very low a priori QoL... (but not context of suicide for instance)
- *cases with asystole >20' despite on-going ALS, in the absence of a reversible cause*

When to consider ongoing CPR during transport to hospital?

In the absence of CPR withdrawal criteria:

- Bystander or EMS witnessed arrest and/or
- ROSC at any moment and/or
- Shock given for VT/VF and/or
- Presumed reversible cause (cardiac, toxic, hypothermia..)

Consider early on (after 10 minutes of ALS without ROSC) and in view of the circumstances (e.g. distance, CPR delay and presumed CPR quality) and patient characteristics (e.g. age, presumed QoL).

? Resuscitate for donor??

The Bottom Line



TAILORED CODE, TAILORED CARE

- . CAB or ABC
- . C:V ratio
- . CPR goals
- . Vasopressors
- . eCPR
- . HD target
- . O₂ target
- . TTM
- . Prognostication & futility
- ...

INDIVIDUAL

