

**”Just push on the chest while I do the important stuff”
– time to change focus to good quality chest compressions.**

What is really the important stuff?

Jo Kramer-Johansen
Anaesthesiologist/Researcher
Institute for Experimental Medical Research
Ullevål University Hospital

e-mail: jo.kramer-johansen@medisin.uio.no



UNIVERSITY
OF OSLO








What is most important?

- Case:

- Male, 70, collapses at the dinner table.
- What do you do?

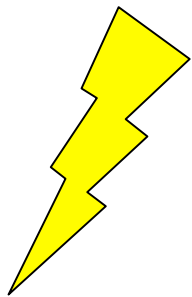
- Select:

-  A hard thump between the shoulders
-  Start compressions
-  Open airway and start mouth-to-mouth
-  Call for help
-  I don't know

What is the purpose of CPR?

CPR is what we do in sudden cardiac arrest:

- to delay permanent death!
- to administer causal treatment and avoid death!



Electrical defibrillation to end arrhythmias

Treat the potentially reversible causes:

Reversible causes

Hypoxia	Tension Pneumothorax
Hypovolemia	Tamponade, cardiac
Hypo/hyperkalaemia/Metabolic	Toxins
Hypothermia	Thrombosis (coronary or pulmonary)

How can we delay death?

- People die, and then their heart stops!
 - Sometimes the heart stops before the rest of the body – sudden cardiac death.
 - When circulation ceases →
 - Tissue hypoxia → cell death
- This is a process – it is NOT inevitable**
- Tolerance for hypoxia varies between organs!
 - ... unfortunately the brain is the most vulnerable!






Turning the Oxygen back on!

Delays the cells' transition from alive to dead

Oxygen is toxic – reperfusion triggers detrimental cascades!

Is ventilation necessary during CPR?

- In sudden cardiac arrest the circulation stops abruptly and the lungs are still filled with air.
 - Residual volume in a grown man is 2-4 l
 - Oxygen content in room air is 21%; in the lungs ~17%
 - → 2-4 minutes at rest.

- Select:
 -  Yes
 -  No
 -  I don't know

What is the evidence?

- Retrospective clinical trials
 - Lancet 2007:

Cardiopulmonary resuscitation by bystanders with chest compression only (SOS-KANTO): an observational study

SOS-KANTO study group

Summary

Lancet 2007; 369: 920-26

See [Comment](#) page 882

*Members listed at end of paper

Background Mouth-to-mouth ventilation is a barrier to bystanders doing cardiopulmonary resuscitation (CPR), but few clinical studies have investigated the efficacy of bystander resuscitation by chest compressions without mouth-to-mouth ventilation (cardiac-only resuscitation).

- 27/439 (6%) with only chest compressions and 30/712 (4%) with standard CPR survived (OR 1.5(0.9,2.5))

Prospective clinical trials:

- Randomized instructions from dispatch central:

The New England
Journal of Medicine

© Copyright, 2000, by the Massachusetts Medical Society

VOLUME 342

MAY 25, 2000

NUMBER 21



CARDIOPULMONARY RESUSCITATION BY CHEST COMPRESSION ALONE
OR WITH MOUTH-TO-MOUTH VENTILATION

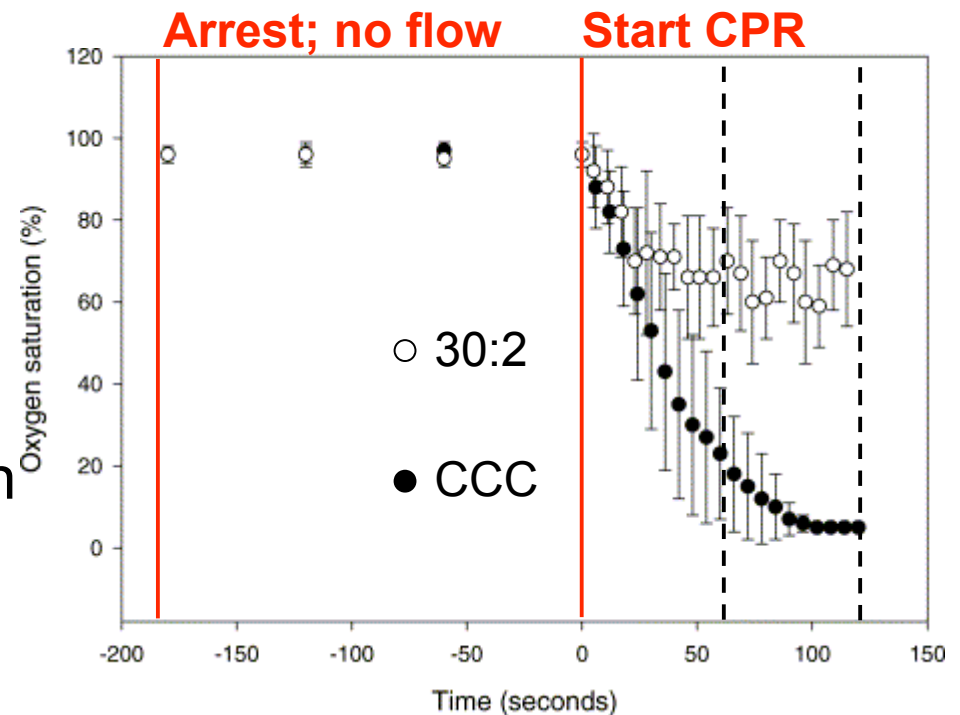
ALFRED HALLSTROM, PH.D., LEONARD COBB, M.D., ELISE JOHNSON, B.A., AND MICHAEL COPASS, M.D.

- 30/240 (15%) discharged alive if instructions of only chest compressions and 29/278 (10%) if standard CPR instructions were provided, $P=0.18$ (NS)

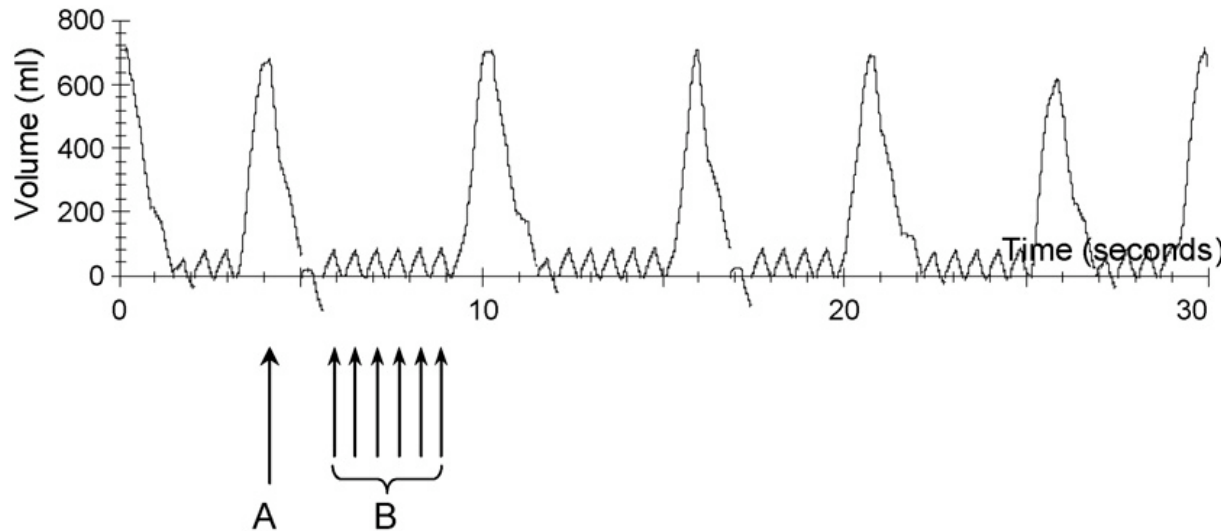
Evidence supporting ventilation:

- Animal experiments

- Dorph et al. Resuscitation 2004
- Complete desaturation after less than 2 min CPR with occluded airways!



Virtually no ventilation with chest compressions only in humans:



- Average tidal ventilation associated with chest compressions (LUCAS) in 17 patients was ~40 ml (<1/3 of deadspace).

Deakin et al Resuscitation 2007 in press

Get the Oxygen to the tissues!

- Good quality chest compressions can generate ~30% of resting cardiac output.
- However, quality of CPR have been found to be poor and variable!
 - Long chest compression pauses.
 - Shallow compressions.
 - Too rapid ventilations.
- What cardiac output does this generate?

Sunde et al Resuscitation 1999

Van Alem et al Ann Emerg Med 2003

Wik et al JAMA 2005

Rea et al Ann Emerg Med 2005

Valenzuela et al Circulation 2005

Kramer-Johansen et al Resuscitation 2006

Aufderheide et al Circulation 2004

Abella et al JAMA 2005

But WE don't do poor CPR –

- ...because we monitor the effects of our CPR:
 - Clinical signs of circulation
 - Palpable pulsations
 - Skin colour
 - Pupils contract
 - Gasping or spontaneous respiration
 - Technical monitoring
 - Excretion of CO₂
 - During CPR end tidal CO₂ is proportional to cardiac output
 - Reliable pulsatile readings of SpO₂

The sad fact!







- No studies have reported CPR quality!
 - If quality of CPR performed out-of-hospital is as bad and variable in the clinical studies, no wonder there is no differences to be found!
- So...

What is really the important stuff?

- Case:

- Male, 70, have collapsed at the dinner table, bystanders are performing CPR when you arrive.
- What do you do?

- Select:

-  Defibrillation
-  Intubation
-  IV medications
-  Chest compressions
-  All of the above
-  None

Conclusion

- Unless we provide good quality chest compressions – nothing else is important.
 - In cardiac arrest with initial VF/VT the time to defibrillation is important...
 - but; why deprive our patients of blood flow to the brain while we prepare for defibrillation?
 - and; if our response time are more than a few minutes, it is probably good idea to “prime the pump” before the defibrillation attempt.