

**If correct and timely CPR is so important,
how do we make sure lay people and health personnel
learn it, remember it, and use it?**

Teaching and performing quality CPR



**UNIVERSITY
OF OSLO**






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

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



Lay-people vs. professionals

- Which skills should be performed by lay-people?
- Again:
What is most important?
- How about in-hospital?

- Select:
 -  Chest compressions
 -  Mouth-to-mouth ventilation
 -  Defibrillation
 -  All of the above
 -  I don't know

How to learn correct CPR?

- Motor memory

- Time with hands on experience
 - 25 min self instruction video equivalent to 4 h course

Lynch et al Resuscitation 2005

Einsbruch et al Resuscitation 2007 in press

- Automatic feedback manikins

- Immediately improves quality

Milander et al Acad Emerg Med 1995

Wik et al Resuscitation 2001, 2002, 2005

Handley and Handley Resuscitation 2003

Sutton et al Resuscitation 2007 in press







- Knowledge

- Understanding the physiology and rationale

What is the most important feature of good quality chest compressions?

- “...perform chest compressions for adults at a rate of at least 100 compressions min⁻¹ and to compress the sternum by at least 4-5 cm. Rescuers should allow complete recoil of the chest after each compression. [...] It is reasonable to use a duty cycle [...] of 50%.”

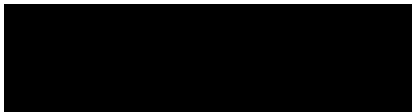
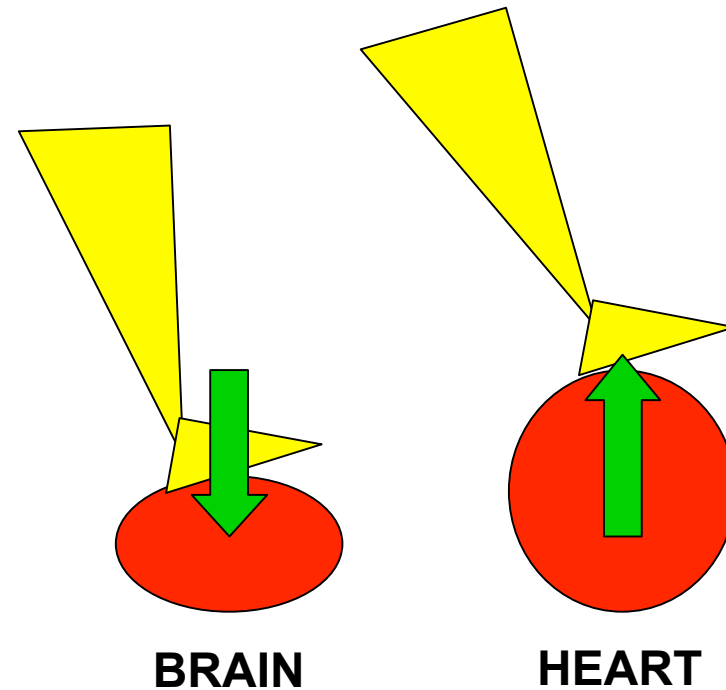
2005 COSTR document

- Select:
 -  Rate
 -  Depth
 -  Complete release
 -  Duty Cycle
 -  Continuity
 -  I don't know

All features must be within the range!

- In animal studies the impact of the different features can be studied in isolation.
- In human studies –

We don't know



How to remember CPR?

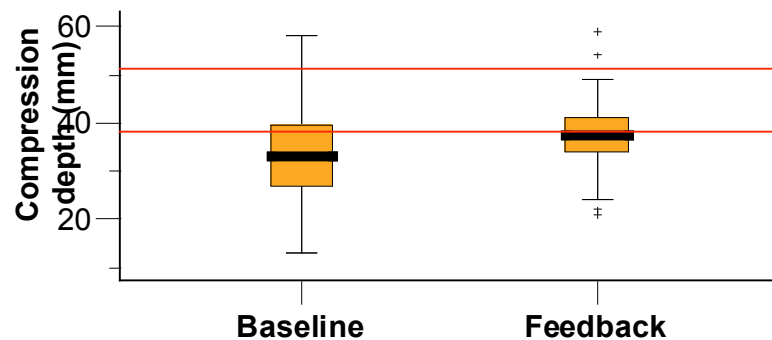
- Retention
 - Overtraining
- Refresher courses

- Knowledge
 - Understanding the physiology and rationale

- Memory is associated with emotions!

How to use it?

- Refreshing skills on-the-go
 - Automatic feedback from the defibrillator improved chest compression depth and rate:

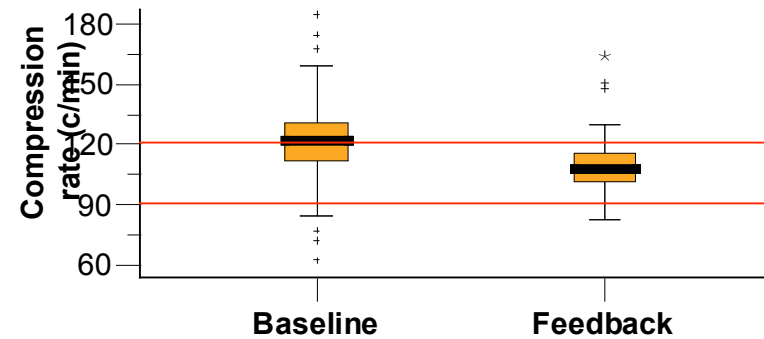


34 ± 9 mm



38 ± 6 mm

P<0.001



121 ± 18 min⁻¹



109 ± 12 min⁻¹

P=0.001

- And reduced variability in the measured aspects of quality.

Kramer-Johansen et al Resuscitation 2006

Use the opportunities for learning!

- After each episode:
 - Evaluate
 - Discuss
 - Debrief
 - ALSO when patient survives
- We learn from experience,
 - but only when we reflect

Arrest details:

Start of episode: 2006.10.06 13:45
Time of intubation 13:49 Time of ROSC: 14:04 Duration (min:s): 20:13
Shocks delivered: 4

Chest compressions

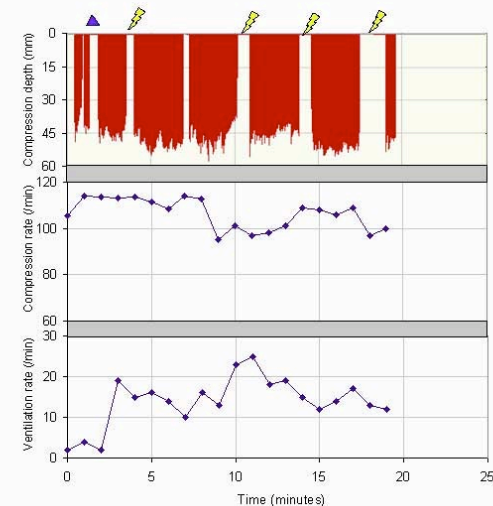
Mean depth (mm):	45 ± 5
Minutes with shallow (<38mm) compressions:	0
% of compressions with incomplete release:	0
Mean compression rate (/min):	106 ± 7
Minutes with inadequate rate (<90 or >120):	0
Compressions delivered per minute:	78 ± 32

Pauses

Total no flow time (min:s):	5:21
No flow fraction:	0.28
Median pre-shock pause (s):	10.6
Median post-shock pause (s):	26.5

Ventilations

Mean pre-intubation ventilation rate:	3 ± 1
Mean post-intubation ventilation rate:	16 ± 4
Minutes with hyperventilation (> 15 /min):	8
Minutes with no ventilation:	0








We must define quality!

- Agree on a common language to describe quality!
 - What is a chest compression pause?
 - What is the definition of chest compression depth?
 - What is incomplete release of compression?

Kramer-Johansen et al Resuscitation 2007

- Combined with the common definitions used for reporting peri-arrest factors and outcome:
 - Utstein guidelines

Why should we measure and monitor quality of CPR?

- Select:
 -  To facilitate learning after each episode
 -  To compare groups in clinical studies
 -  To advance resuscitation research
 -  All of the above
 -  I don't know

3 reasons to report quality of CPR



To learn from each episode and to be used in all EMS' to monitor the effect of training and interventions.



To ensure valid clinical studies of interventions and medications in CPR.



To advance our knowledge about the physiology and mechanisms of human CPR.

What is the use of measuring if you can't improve?

- Almost constant:
 - Duty cycle; ~40%
 - Incomplete release; 0-3%
 - Pause time; ~10-50%
- Improved by feedback:
 - Compression depth
 - Compression rate
 - Ventilation rate

We must improve this!

Results from studies of CPR quality with feedback:
Kramer-Johansen et al Resuscitation 2006
Abella et al Resuscitation 2007
Losert et al Arch Intern Med 2006

How to minimize pauses!

Rational guidelines

- 30:2 is better than 2:15
- 1 shock is better than up to 3 shocks
- No rhythm check immediately after shock is good

Improved technology

- Automatic VF detection during chest compressions
- Mechanic chest compression devices

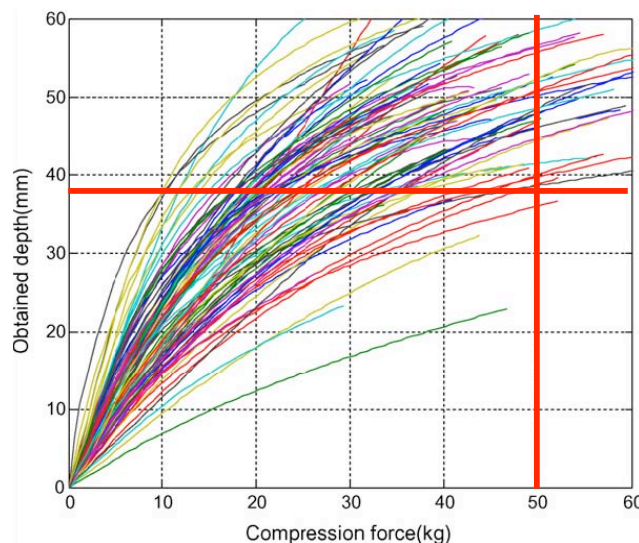
Knowledge and attitudes

- Use defibrillators in manual mode
- Secure airway that allows for continuous compressions
- Attitudes changes only with good implementation

Implementation

- To change behaviour we need to change attitudes – implementation!
 - The personnel have the physical capabilities to compress the stiffest manikins.

Ødegaard et al Resuscitation 2007



- The patients are not impossible to compress.
- 96% of the patients were compressed to 38 mm with less than 50 kg force.

Tomlinson et al Resuscitation 2007

Conclusion

- Unless we learn to provide good quality chest compressions – nothing else is important.
 - We learn and remember motor skills by practising.
 - We learn intellectual skills by reflection.
 - Memory is improved if we feel something!
 - Reflection must be paired with emotions and identification to change attitudes – implementation!