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Abstract O-14

Chest compression depth is related to short time survival in out-of-hospital cardiac arrest.

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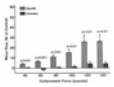
Background

- Recent studies of CPR quality during out-of-hospital cardiac arrest revealed shallow compressions and ~50% no-flow-time. Wik, Kramer-Johansen *et al.* JAMA (293) 2005
- Addition of automated feedback improved chest compression quality, and there was a tendency for improved survival. Kramer-Johansen *et al.* Resuscitation, submitted



- In animal experiments there is a relationship between compression force/ compression depth and improved hemodynamics and short time survival.
  e.g. Bellamy *et al.* Circulation (69) 1984 or Ditchey *et al.* Circualtion (66) 1982
- This has not been studied in humans!

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Method

- Modified defibrillators
  - Compression depth, rate, duty cycle, pauses
  - Ventilation rate
- "Utstein" data:
  - Response time, initial rhythm, # of defibrillations, medications, outcome

- Data collected Mar.2002 – Sept.2004.
  - From Oct.2003 with automated feedback.
- 284 episodes of out-of-hospital cardiac arrest with CPR quality data.

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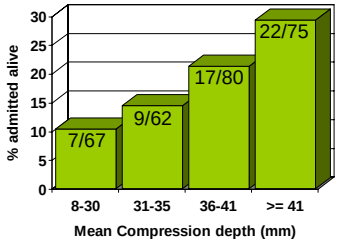
Depth and survival



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Logistic regression

- Dependent factor:
  short time survival = admitted alive to ICU or ward
  - Excludes effect of in-hospital treatment
- Covariates:
  - Quality measures
  - Other prognostic factors
- Covariates chosen based on unadjusted Odds Ratios and forced entry of known predictors of survival after out-of-hospital cardiac arrest.

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Unadjusted Odds Ratios

	Number of observations	OR for admittance (Exp(β))	95 % CI for Exp (β)	P value
Witnessed arrest (yes/no)	284 (208/76)	4.6	1.7, 12.0	0.002
Average compression depth (per 1 mm increase)	284	1.05	1.01, 1.09	0.009
Initial rhythm (VF/nonVF)	284 (111/173)	2.0	1.1, 3.6	0.022
Gender (female/male)	282 (76/206)	1.7	0.93, 3.3	0.082
Adrenalin given (yes/no)	272 (233/39)	0.6	0.27, 1.2	0.161
Feedback (yes/no)	284 (108/176)	1.5	0.81, 2.7	0.208
Response time (per 1 min increase)	284	1.04	0.96, 1.1	0.314
Average number of ventilations 6-16 min^{-1} (yes/no)	261 (216/45)	0.7	0.33, 1.5	0.363
Average compression rate 90-120 min^{-1} (yes/no)	284 (167/117)	1.1	0.58, 1.9	0.841
Age (years)	279	1.0	0.98, 1.02	0.956

- OR > 1 indicates improved survival compared to the reference group (*i.e.* absence of feature or next lower value of continuous values)

Adjusted Odds Ratios

- The final model included only these covariates:

	Adj. OR for admittance (Exp(β))	95 % CI for Exp (β)	P value
Witnessed arrest (yes/no)	4.3	1.6 - 11.3	0.003
Average compression depth (per 1 mm increase)	1.05	1.01 - 1.09	0.011
Gender (female/male)	1.6	0.84 - 3.1	0.153

Discussion / Limitations

- Other factors came out insignificant:
  - Strong interdependence of witnessed arrest, response time, and initial rhythm
  - Ventilation and compression rate were coded as: within/out of target range.
  - No-flow-time is calculated as a ratio of time without compression divided by time without spontaneous circulation.
    - Episodes with early ROSC may have a high ratio, although usually considered to have the best prognosis
  - Too small sample size (type II error)?
- Retrospective analysis of data.

Conclusion

- Average compression depth was associated with short time survival.
- Unethical to do a randomized, prospective study with different compression depths.
  - We have no indications of improved survival with increased compression depth (i.e. >52 mm).
  - Besides; we would need mechanical chest compressions to be sure of adherence to protocol!
- We need large cohorts of CPR episodes with quality measurements.