

Hartmassage: is dieper beter?

Prof. Dr. Koen Monsieurs
Urgentiegeneeskunde
Universitair Ziekenhuis Gent

Voorzitter, Belgische Reanimatieraad
Rea 2009, 23 oktober 2009

Verklaring belangenconflict

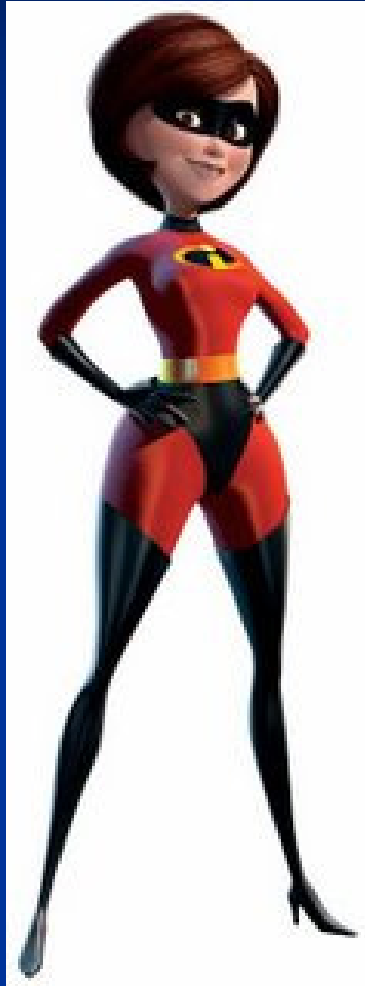
Onderzoeksprojecten met Laerdal en Zoll

Diepte van hartmassage



Richtlijnen compressiediepte (ERC 2005)

- Volwassenen: 4 à 5 cm
- Kinderen: $\frac{1}{3}$ diameter borstkas



40 Kg

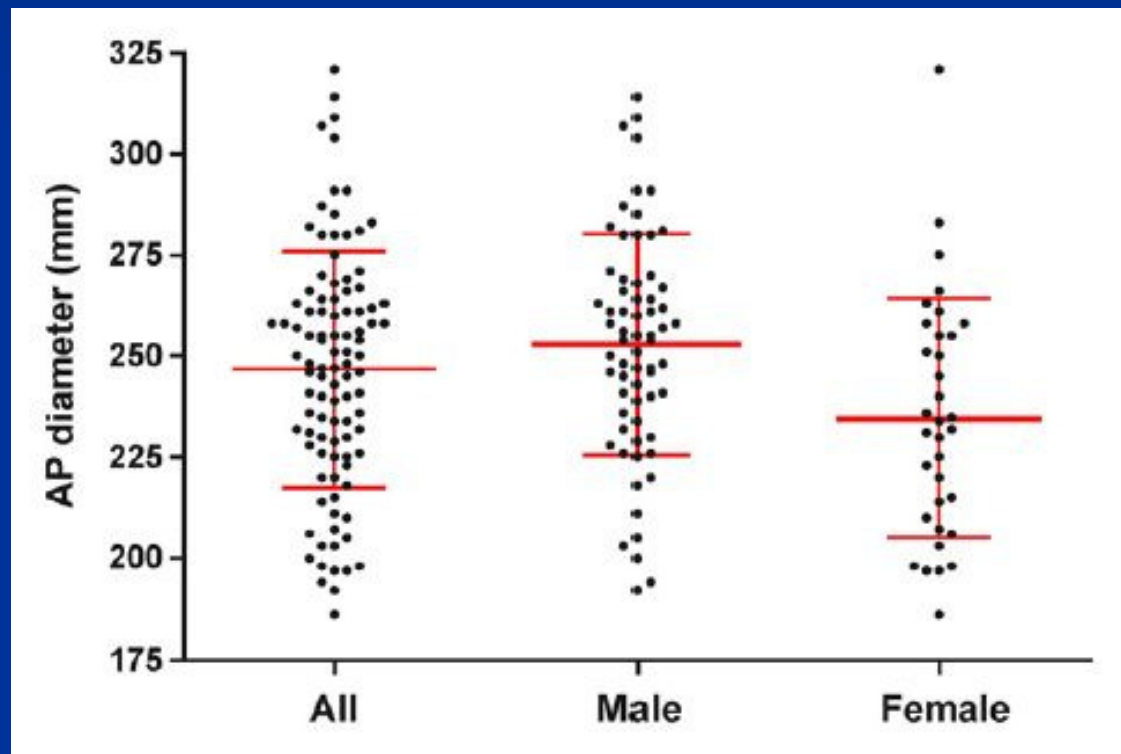


140 Kg

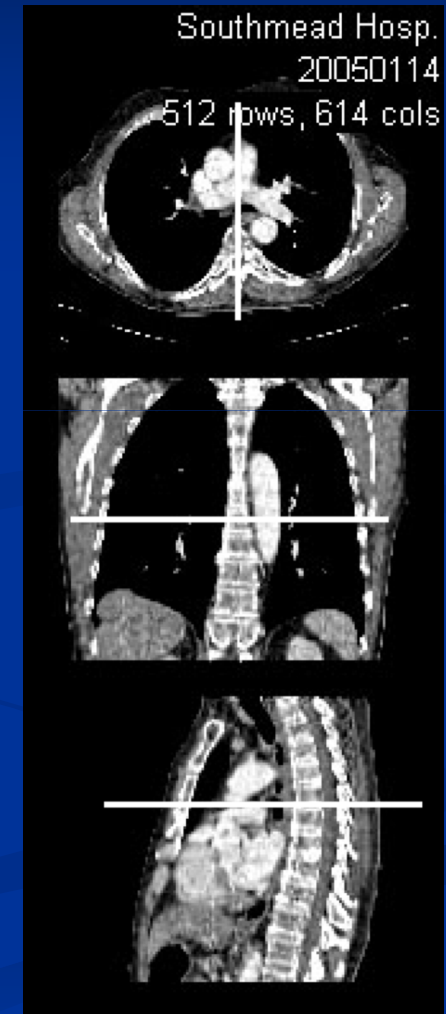


Dezelfde compressiediepte

4-5 cm = 20% AP diameter



Pickard, 2006, Resuscitation



Mechanische compressie



Lucas



Autopulse

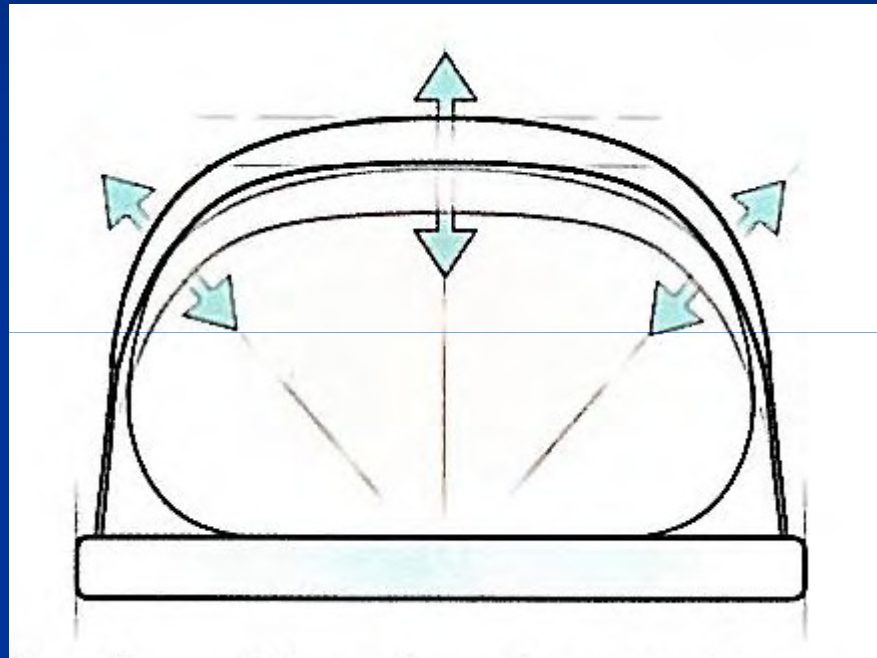
Lucas en Autopulse



“Diepte 4-5 cm”

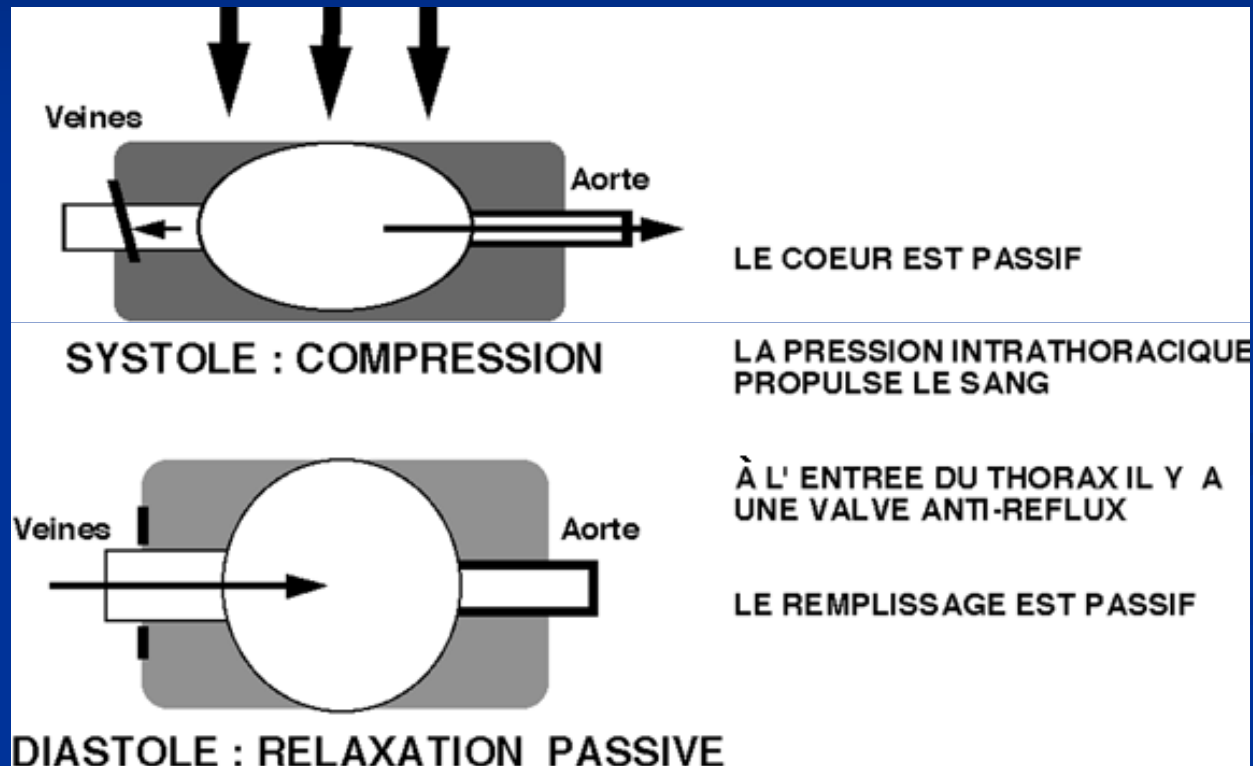


“20% afname diepte”

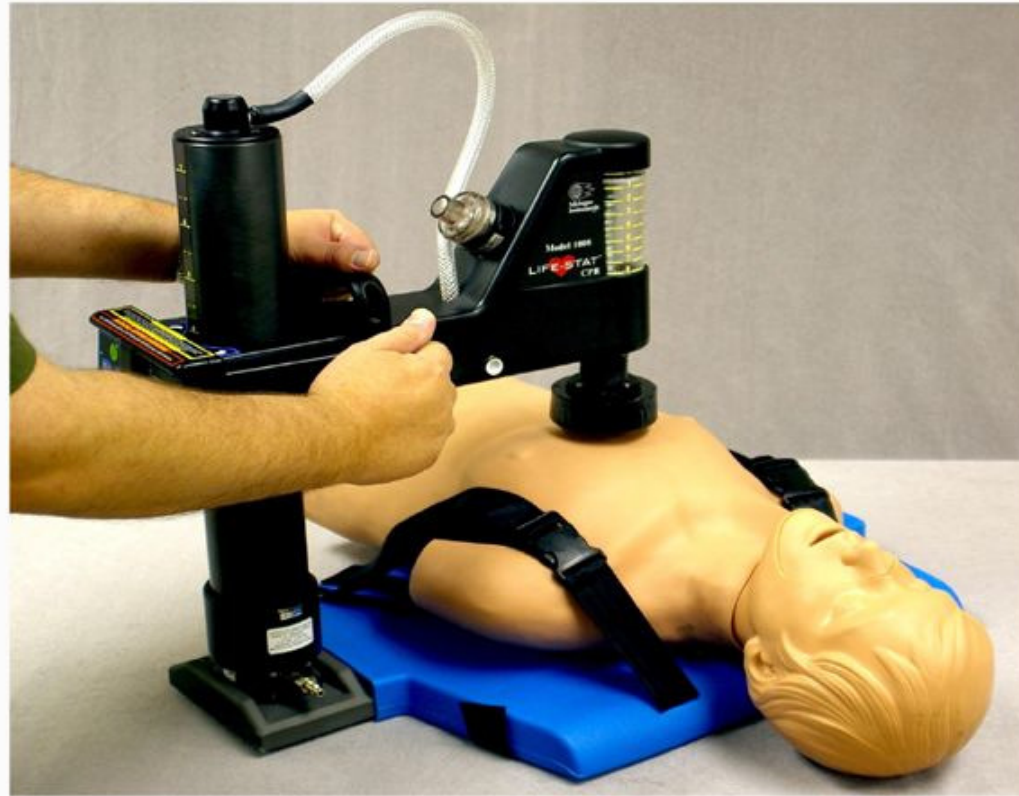


20% afname van voorachterwaartse
diepte van de borstkas

Thoraxpomp vs cardiale pomp theorie

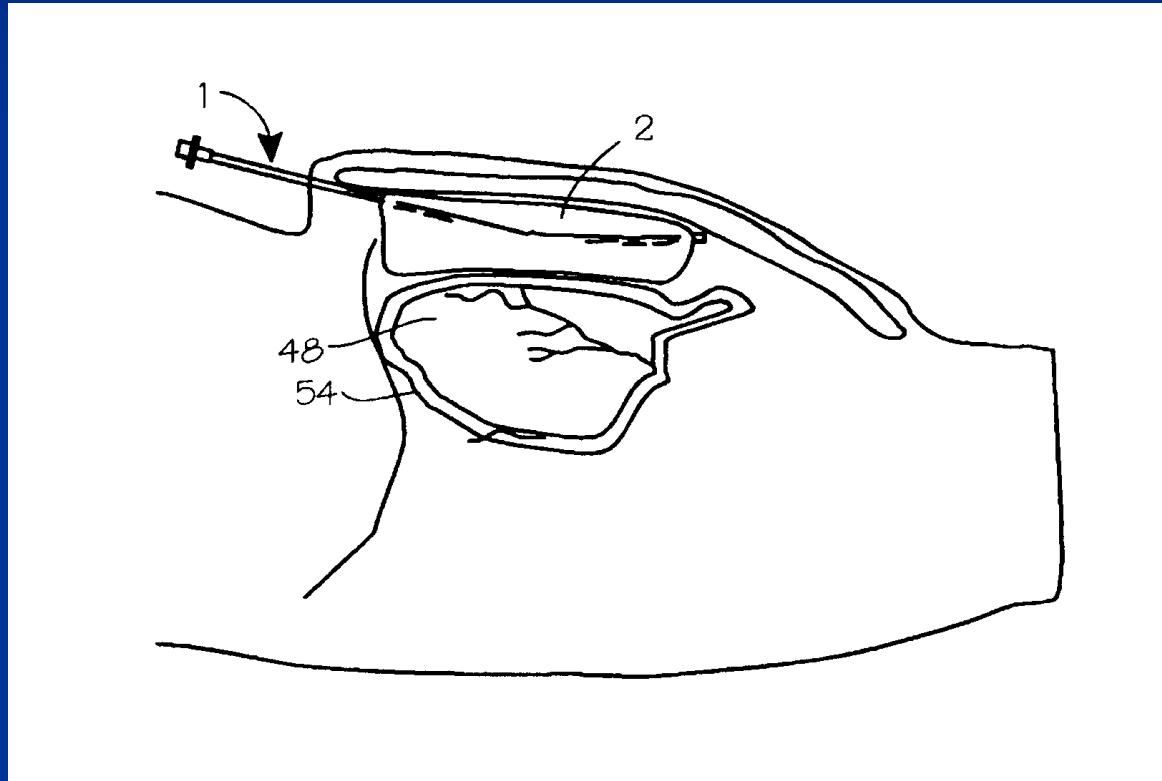


Lifestat



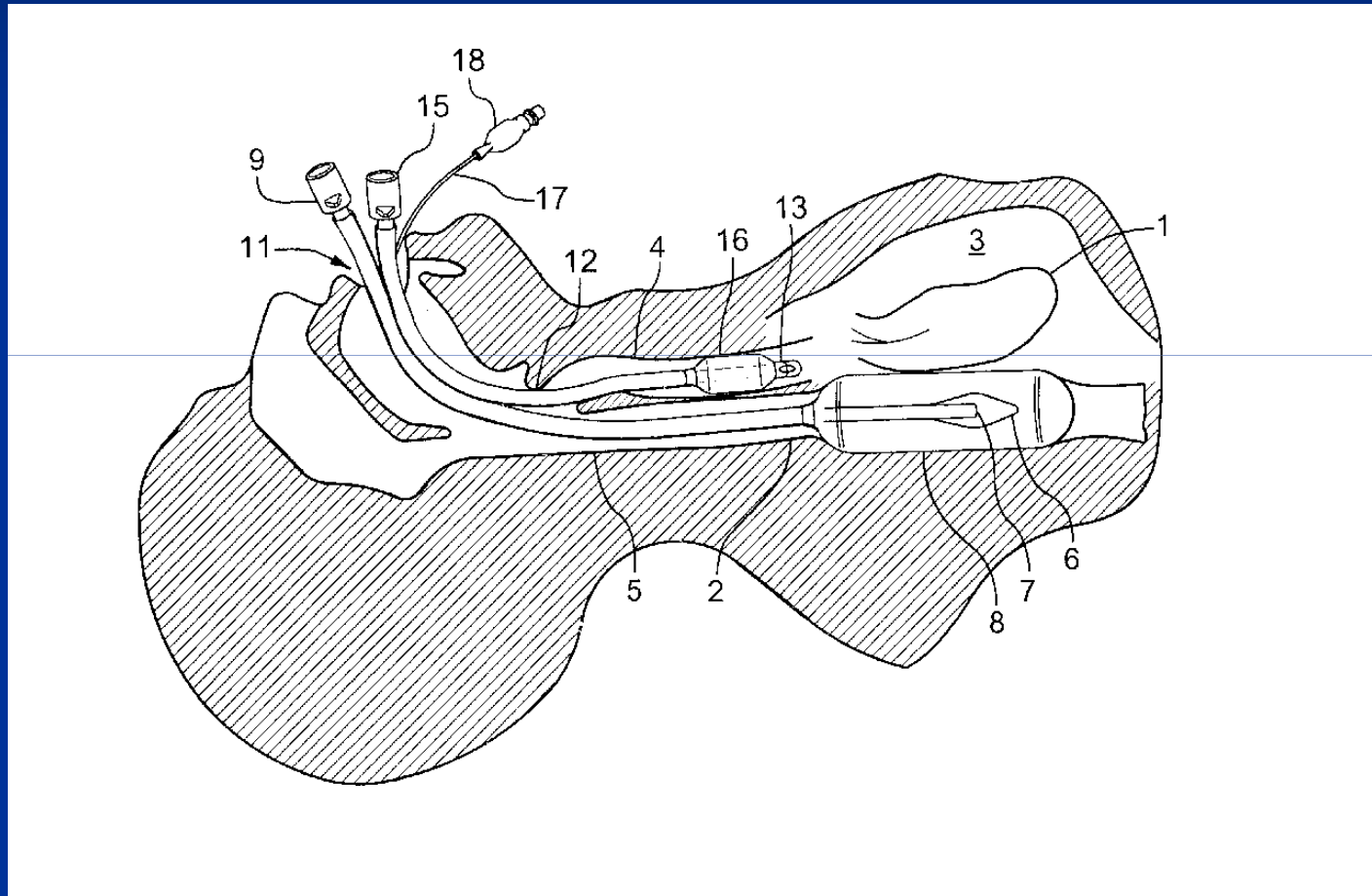
Diepte 0-7.5 cm

Cardiale pomp (voor het hart)



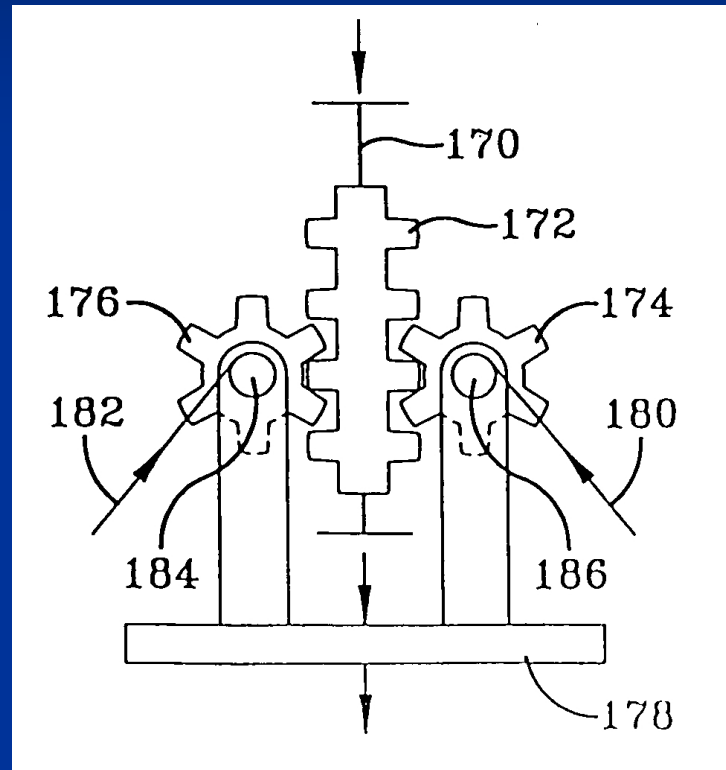
United States Patent 6503265 (filed 2000)

Cardiale pomp (achter het hart)



US patent 6374827B1 (filed 2002)

Thorax- en cardiale pomp



United States Patent 7186225 (filed 2003)

We doen het niet goed met onze handen



Diepte

Quality of Cardiopulmonary Resuscitation During Out-of-Hospital Cardiac Arrest

Lars Wik, MD, PhD

Jo Kramer-Johansen, MD

Helge Myklebust, BEng

Hallstein Sorebo, MD

Leif Swenson, MD

Bob Fellows, MD

Petter Andreas Steen, MD, PhD

SINCE THE FIRST STANDARDS AND guidelines for cardiopulmonary resuscitation (CPR) were published 30 years ago¹ (with the latest update in 2000^{2,3}) health care professionals in and out of the hospital have been trained accordingly around the world. The importance of CPR, defined as chest compressions and ventilation, for survival of cardiac arrest patients has been demonstrated,⁴ and there are indications that the quality of CPR performance influences the outcome.⁵⁻⁷

When tested on mannequins, CPR quality performed by lay rescuers and health care professionals tends to deteriorate significantly within a few months after training,⁸⁻¹⁰ but little is known about

Contact: Cardiopulmonary resuscitation (CPR) guidelines recommend target values for compressions, ventilations, and CPR-free intervals allowed for rhythm analysis and defibrillation. There is little information on adherence to these guidelines during advanced cardiac life support in the field.

Objective: To measure the quality of out-of-hospital CPR performed by ambulance personnel, as measured by adherence to CPR guidelines.

Design and Setting: Case series of 176 adult patients with out-of-hospital cardiac arrest treated by paramedic and nurse anesthetists in Stockholm, Sweden, London, England, and Akershus, Norway, between March 2002 and October 2003. The defibrillators recorded chest compressions via a sternal pad fitted with an accelerometer and ventilations by changes in thoracic impedance between the defibrillator pads, in addition to standard event and electrocardiographic recordings.

Main Outcome Measure: Adherence to international guidelines for CPR.

Results: Chest compressions were not given 48% (95% CI, 45%-51%) of the time without spontaneous circulation; this percentage was 38% (95% CI, 36%-41%) when subtracting the time necessary for electrocardiographic analysis and defibrillation. Combining these data with a mean compression rate of 121/min (95% CI, 118-124/min) when compressions were given resulted in a mean compression rate of 64/min (95% CI, 61-67/min). Mean compression depth was 34 mm (95% CI, 33-35 mm), 23% (95% CI, 24%-32%) of the compressions had a depth of 38 mm to 51 mm (guidelines recommendation), and the compression part of the duty cycle was 42% (95% CI, 41%-42%). A mean of 11 (95% CI, 11-12) ventilations were given per minute. Sixty-one patients (35%) had return of spontaneous circulation, and 5 of 6 patients discharged alive from the hospital had normal neurological outcomes.

Conclusions: In this study of CPR during out-of-hospital cardiac arrest, chest compressions were not delivered half of the time, and most compressions were too shallow. Electrocardiographic analysis and defibrillation accounted for only small parts of intervals without chest compressions.

JAMA. 2005;293:299-304

www.jama.com

- 48% tijd geen compressies
- Gemiddelde diepte slechts 34 mm

Wik et al, JAMA 2005



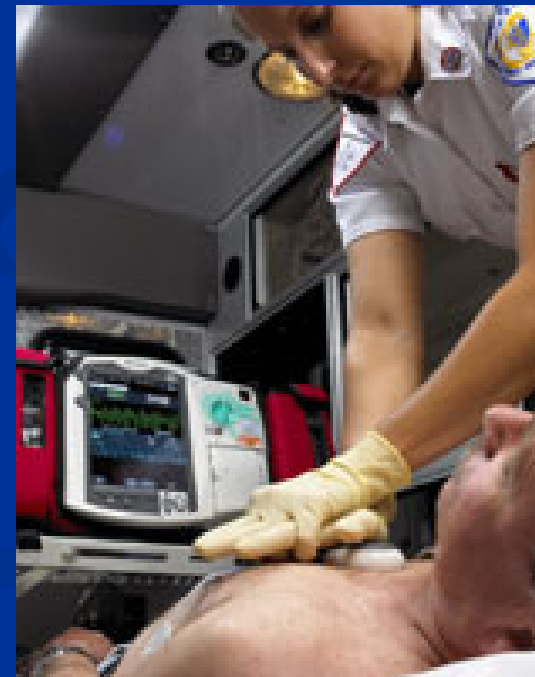
Wii™

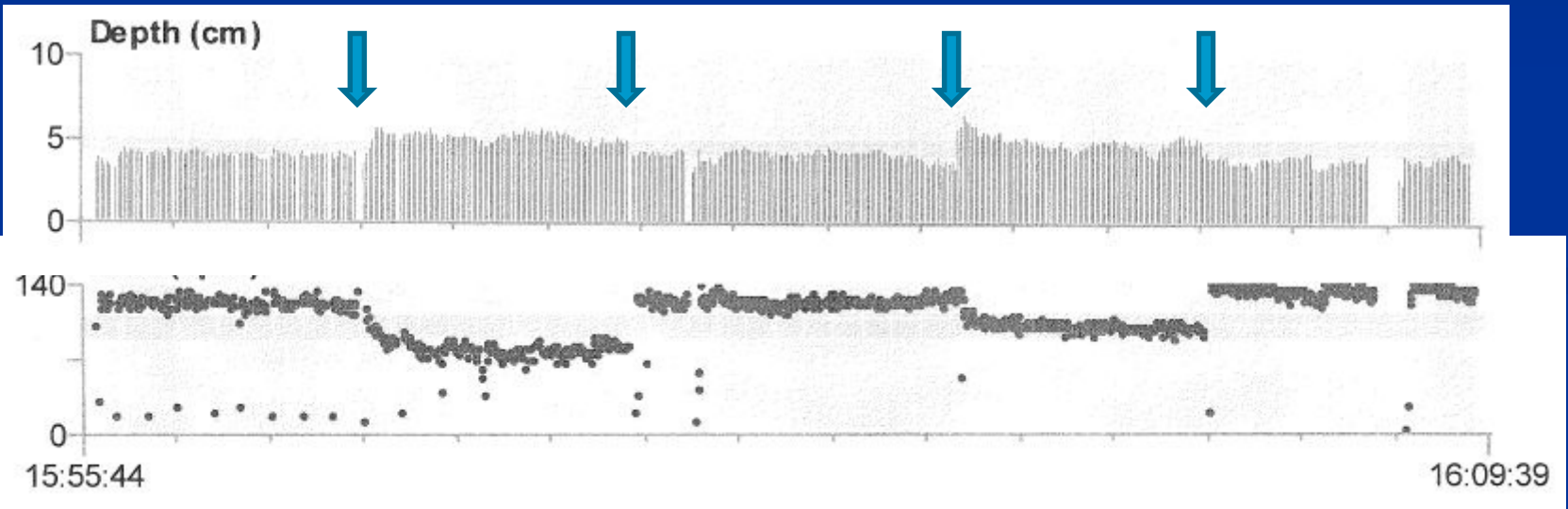


100/min, 4-5 cm

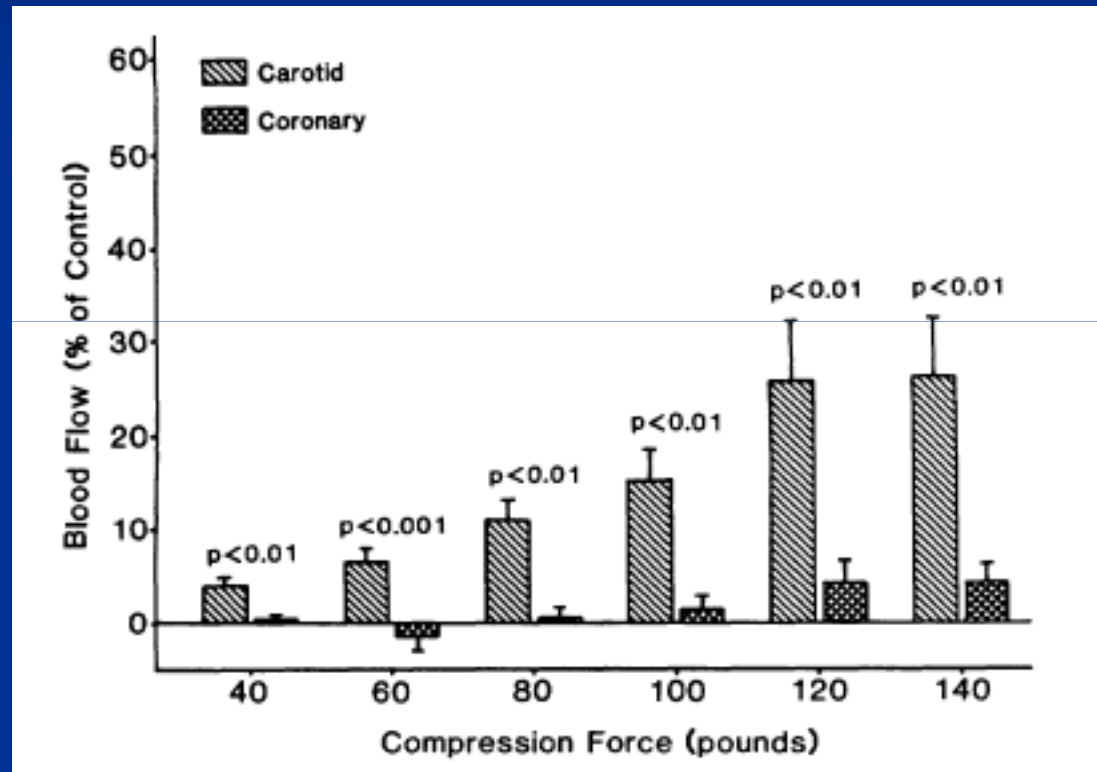


Q-CPR

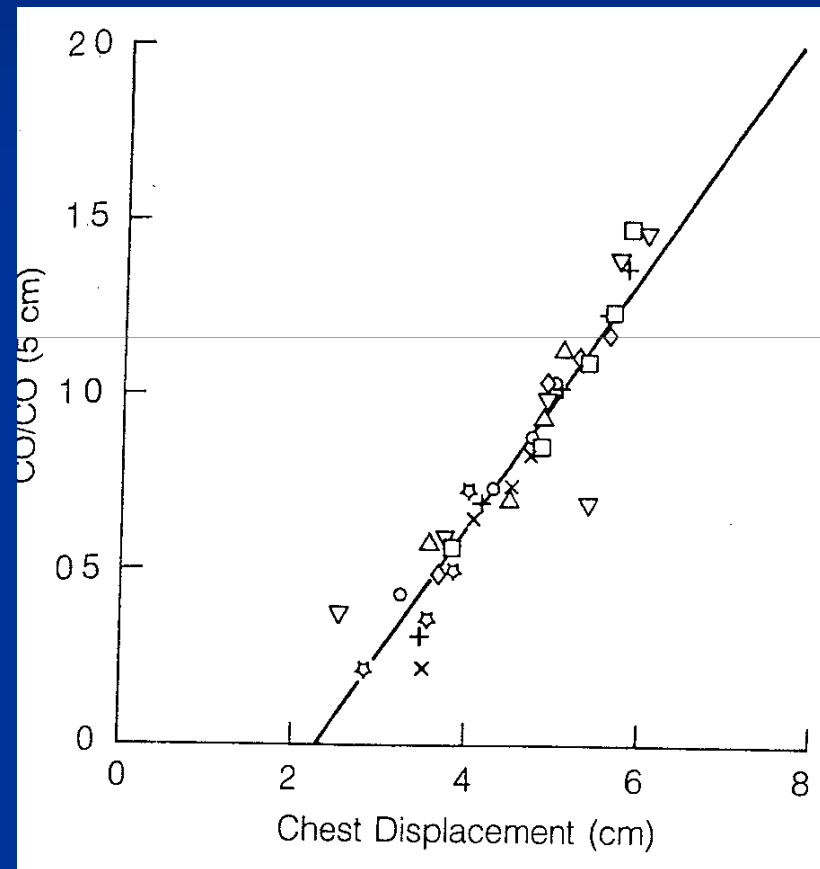




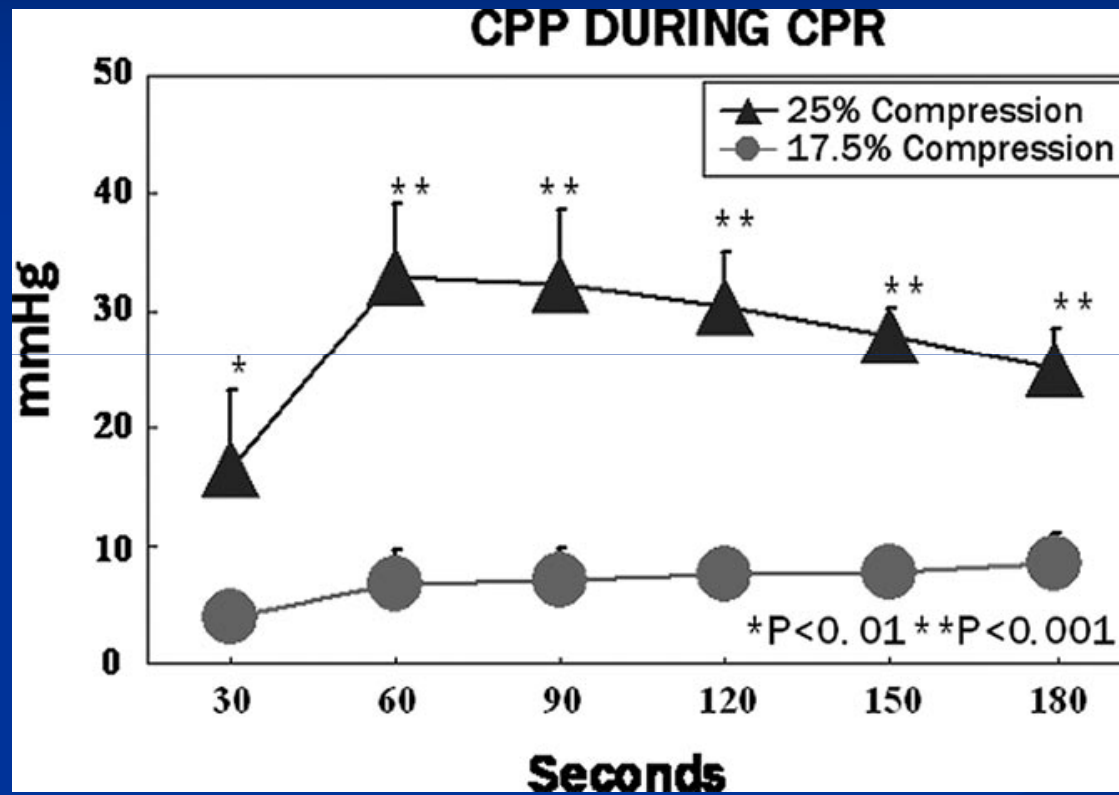
Studies



Ditchey, 1982 (honden)



Babbs, 1983 (honden)



Li, 2008 (varkens)

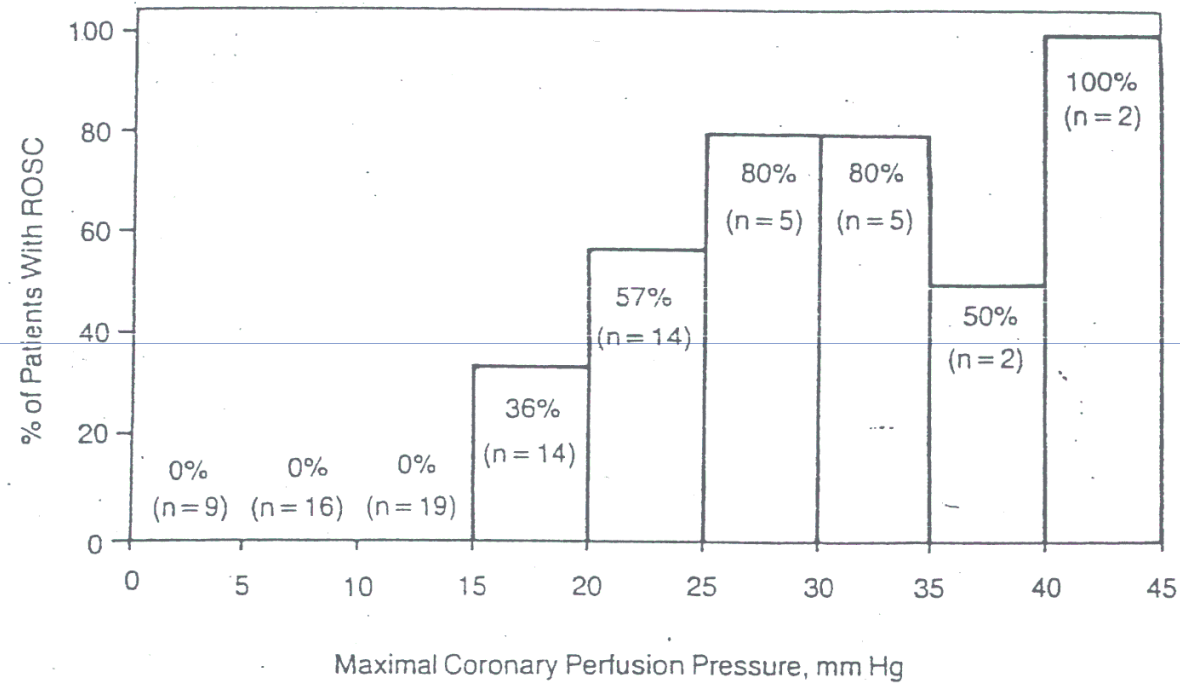


Fig 5.—Percentage of patients with return of spontaneous circulation (ROSC) as a function of the maximal coronary perfusion pressure.

Paradis, 1990 (mensen)

Diepte en schok succes

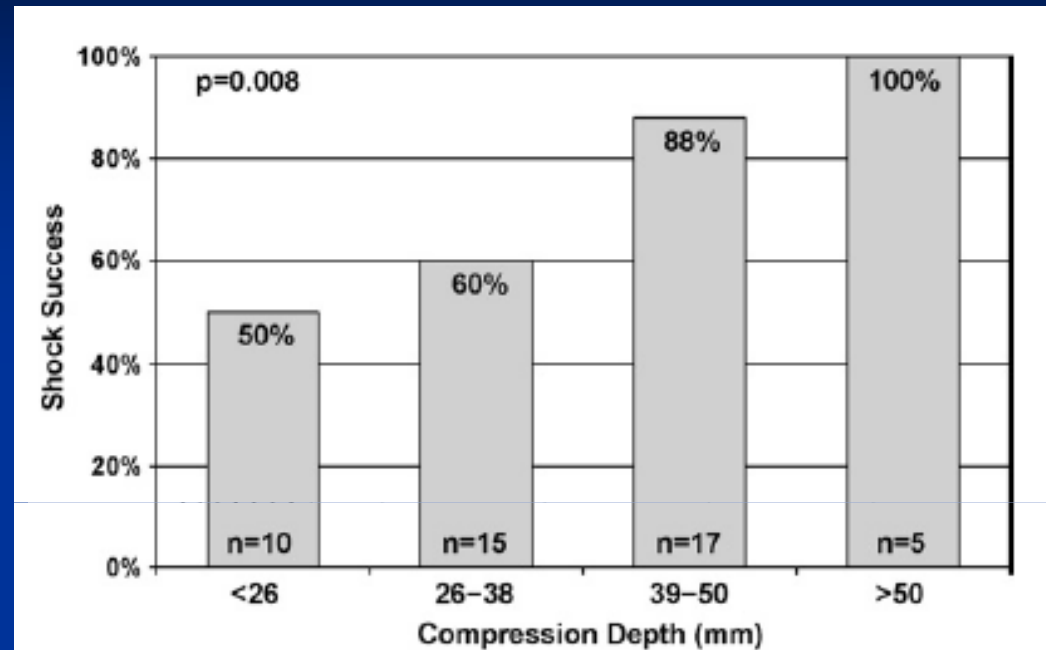


Figure 3 Association between chest compression depth and shock success. Cases are grouped by 30 s average compression depth in approximately 11 mm (0.5 in.) intervals. Chest compression depth of 38–50 mm (1.5–2 in.) represents current CPR guidelines recommendations. Deeper chest compressions are significantly associated with increased probability of shock success.

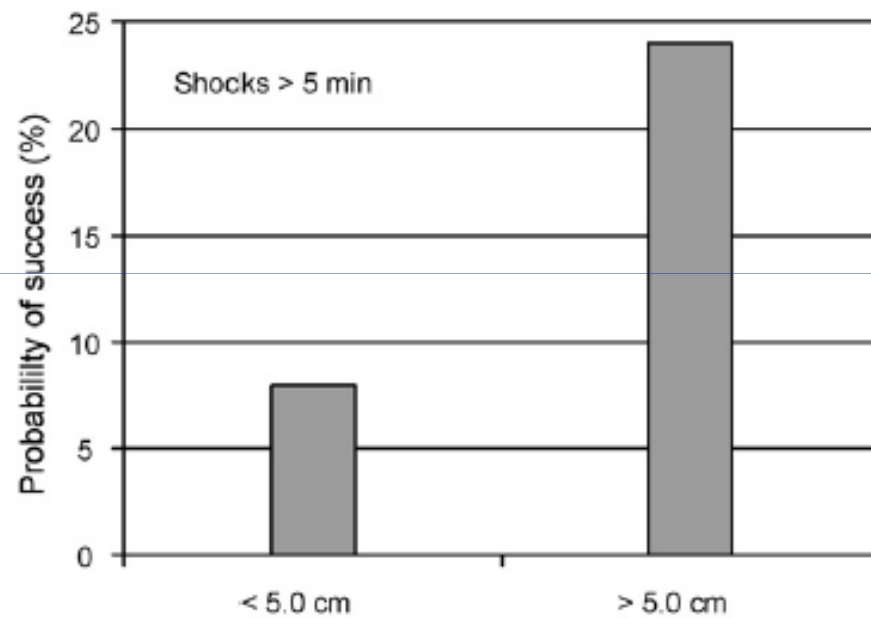


Figure 4 Association between pre-shock compression depth and t-ROSC for shocks delivered 5 min or more after pad application. Here for the Mood median test $p=0.008$. N is 126.

Babbs, 2008 (mensen)

Diepte en herstel circulatie

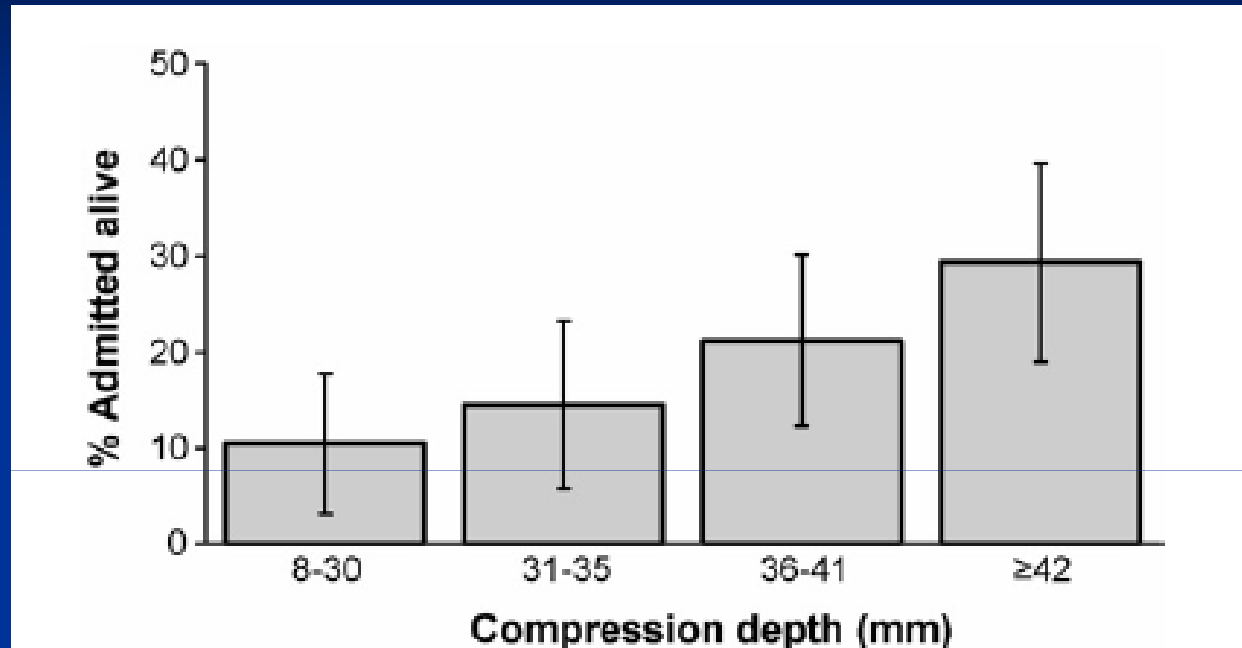


Figure 1 Percentage of patients admitted alive (error bars represent 95% CI) when grouped by increasing compression depth by quartiles.

Kramer-Johansen. et al. Quality of out-of-hospital cardiopulmonary resuscitation with real time automated feedback: a prospective interventional study. Resuscitation 2006.

Table 4. Cardiopulmonary Resuscitation Quality by Cohort

Quality Metric	Baseline	RAPID	<i>P</i> Value
5-Minute mean (SD)	(n= 101)	(n= 123)	
Compression depth, mm	44 (10)	50 (10)	< .001
Compression rate, No./min	100 (13)	105 (10)	.003
Ventilation rate, No./min	18 (8)	13 (7)	< .001
No-flow fraction	0.20 (0.13)	0.13 (0.10)	< .001
Preshock pause, median (IQR), seconds	16.0 (8.5-24.1) (n=108)	7.5 (2.8-13.1) (n=108)	< .001
Postshock pause, median (IQR), seconds	7.1 (2.7-14.8) (n=124)	2.4 (1.9-3.6) (n=106)	< .001
Appropriate shocks, No./total No. (%)	110/151 (73) (n=151)	104/117 (89) (n=117)	.001

Abbreviations: IQR, interquartile range; RAPID, resuscitation with actual performance integrated debriefing.

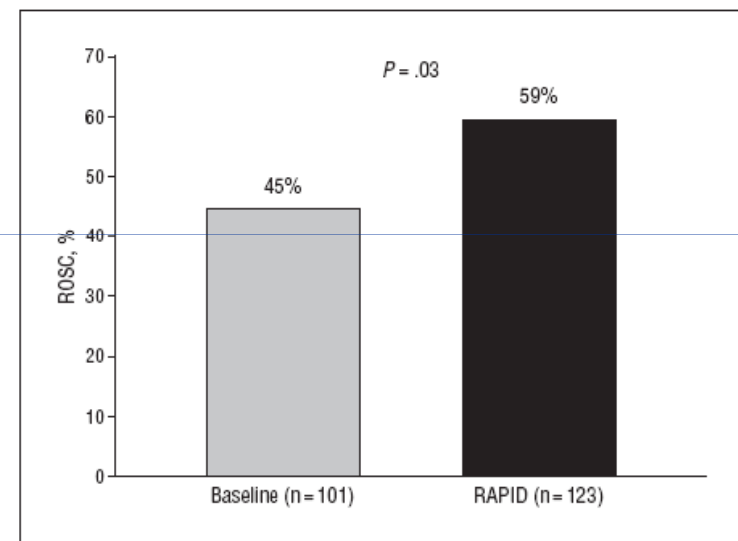
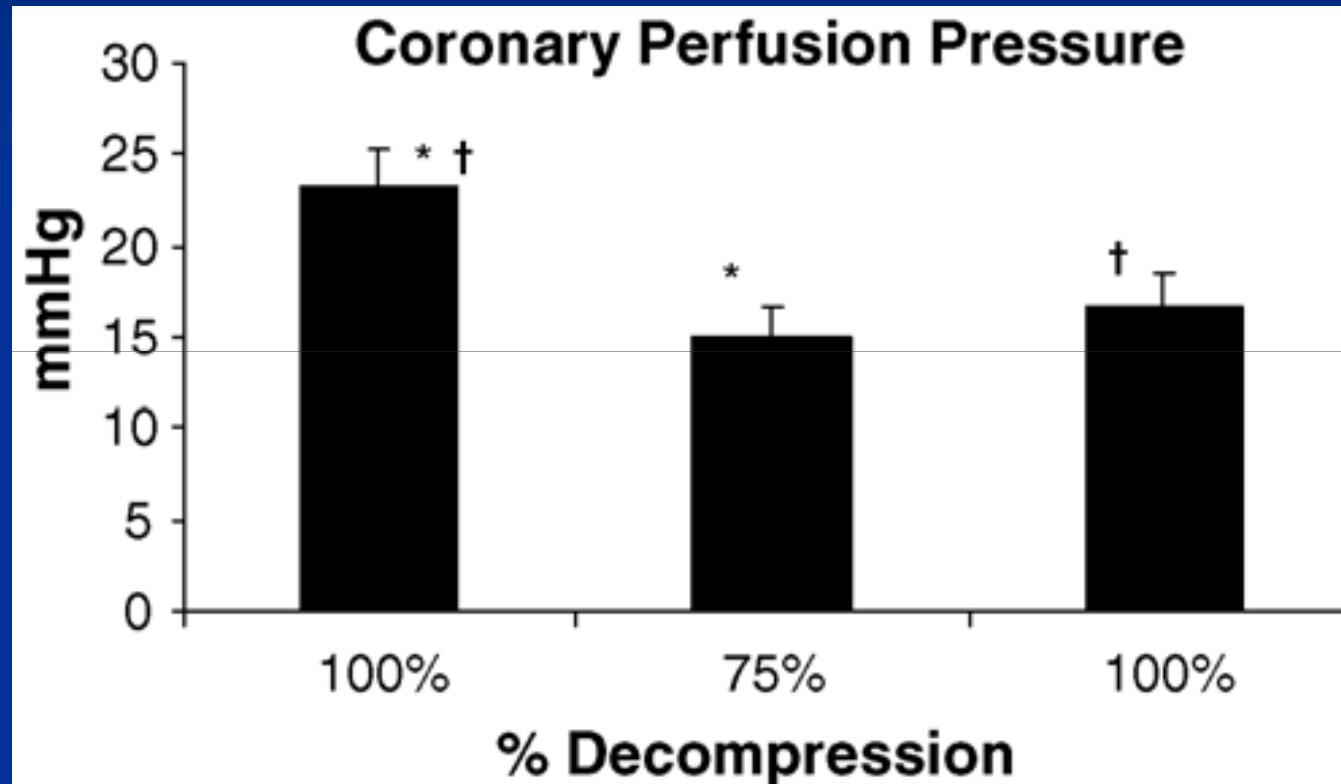


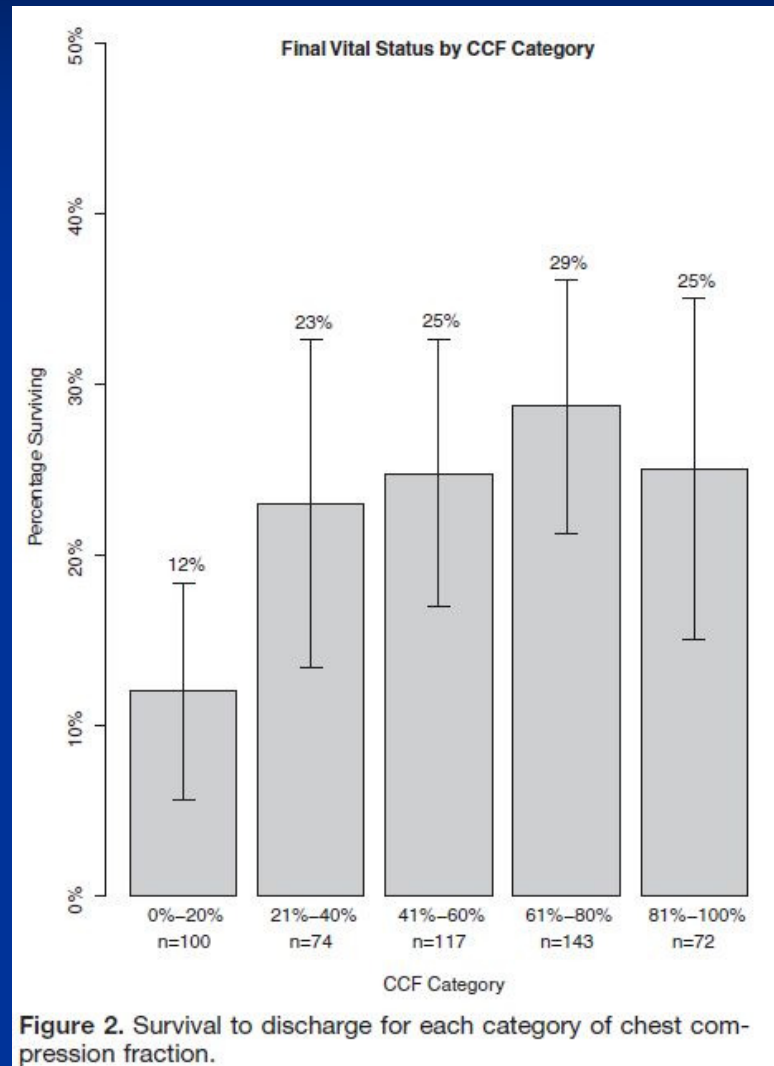
Figure 3. Return of spontaneous circulation (ROSC) by cohort. RAPID indicates resuscitation with actual performance integrated debriefing.

“Volledig loslaten”



Yannopoulos, 2005

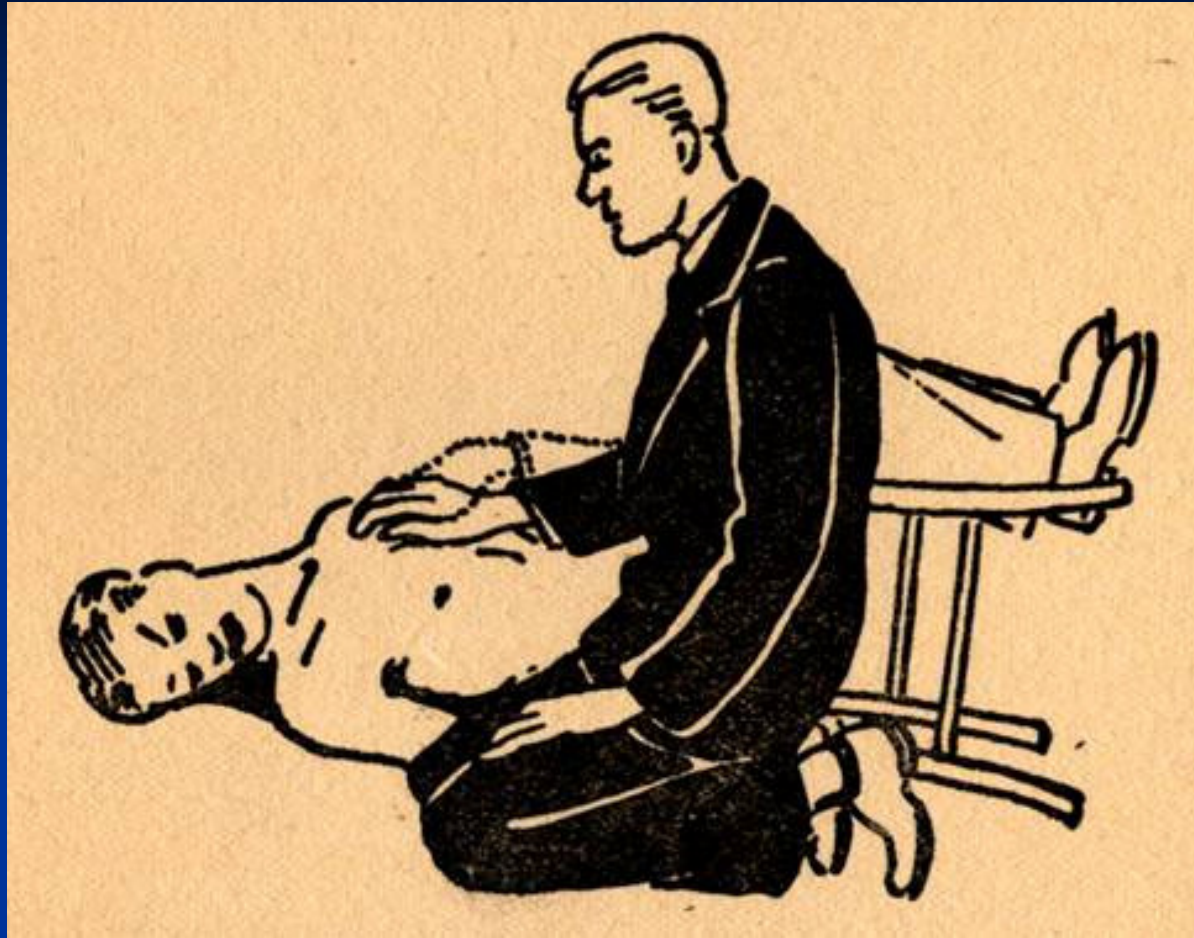
Hartmassage niet onderbreken



Christenson 2009, Circulation

Besluit

- Studies suggeren dat diepere compressies de outcome kunnen verbeteren
- Nog geen gerandomiseerde studies in mensen
- Diepte van 4 cm is een minimum
- Volledig loslaten is noodzakelijk
- Onderbrekingen verlagen overleving
- Gebruik van feedbacktoestellen tijdens reanimatie kan de kwaliteit verbeteren
- Richtlijnen 2010 (18/10/2010)



Hartmassage in 1939

Dieper is beter

