UPPSALA UNIVERSITET

# LINC- A multicenter, randomized trial comparing a mechanical CPR algorithm using LUCAS vs. Manual CPR in out-of-hospital cardiac arrest patients

Sten Rubertsson, Professor
Department of Anaesthesiology and Intensive Care,
Uppsala University, Sweden

LINC study

UPPSALA UNIVERSITET

# Conflict of Interest

PI for the LINC study

Consultation/Advisory-Physio-Control

UPPSALA UNIVERSITET

# Thank you!!!

**Authors;**

Erik Lindgren, M.D., David Smekal, M.D., Ollie Östlund, Ph. D., Johan Silfverstolpe, M.D., Robert A. Lichtveld, M.D., Ph.D., Rene Boomars, M-PA., Björn Ahlstedt, M.D., Gunnar Skoog, M.D., Robert Kastberg, M.D., David Halliwell, R.N., Martyn Box, R.N., Johan Herlitz, M.D., Ph.D., Rolf Karlsten, M.D., Ph.D.

**The LINC study group;**

Liselott Rehn, R.N., Tomas Nyman R.N., Wendy Bruins

Ph.D.,Anja Radstok R.N., Helena Puggioli, R.N., Anna Lindblad,

R.N., Douglas Chamberlain, M.D., Fredrik Arnwald-Physio-Control, Bjarne Madsen Hardig, R.N., Ph.D. Physio-Control

LINC study

UPPSALA UNIVERSITET

# LINC - from 2008 to 2013

**2.300 000**
population covered

**>1500**
in-hospital employees trained or informed

**771**
paramedics trained, twice a year

**889**
quality tests performed with paramedics

**115**
LUCAS devices in use

**26**
ambulance stations

**14**
hospitals

UPPSALA UNIVERSITET

# What is LINC?

A multicenter, randomized, controlled trial

designed to evaluate the efficacy and safety of:

UPPSALA UNIVERSITET

# Objectives

## Primary

- Superiority in 4-hr survival

## Secondary

- Survival upto 6 month with good neurological outcome CPC 1-2

UPPSALA UNIVERSITET

# LUCAS 2™


**Mechanical Compression-Decompression**

- Electricity-battery
- 100 compressions/min
- 4-5 cm compression depth
- Complete chest recoil
- 50/50 duty cycle
- Allows defibrillation when running

UPPSALA UNIVERSITET

# Inclusion criteria

- Unexpected adult out-of-hospital cardiac arrest where an attempt of resuscitation is considered appropriate

UPPSALA UNIVERSITET

# Exclusion criteria

- Traumatic cardiac arrest, including hanging
- Age believed to be < 18 years
- Known pregnancy
- Patients body size not fitting the LUCAS
- Defibrillated
  - before LUCAS arrives at scene
  - crew witnessed VF/VT with ROSC

UPPSALA UNIVERSITET

(48.1%)

Dead on arrival

# Screening in LINC

1144 (22.9%)
Logistics

**4 998** cardiac arrests

436 (8.7%)
Defibrillated before arrival

337 (6.7%)
Trauma

192 (3.8%)
LUCAS did not fit

74 (1.5%)
< 18 year

**2 593** included
(51.9%)

*

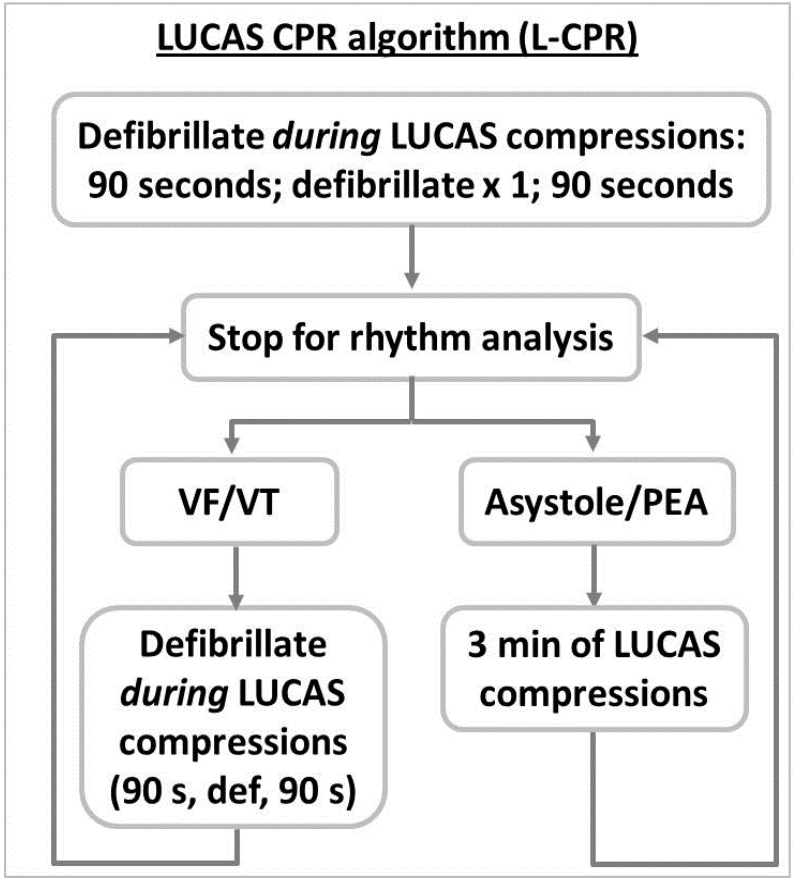
**1 300**
L-CPR
(LUCAS)

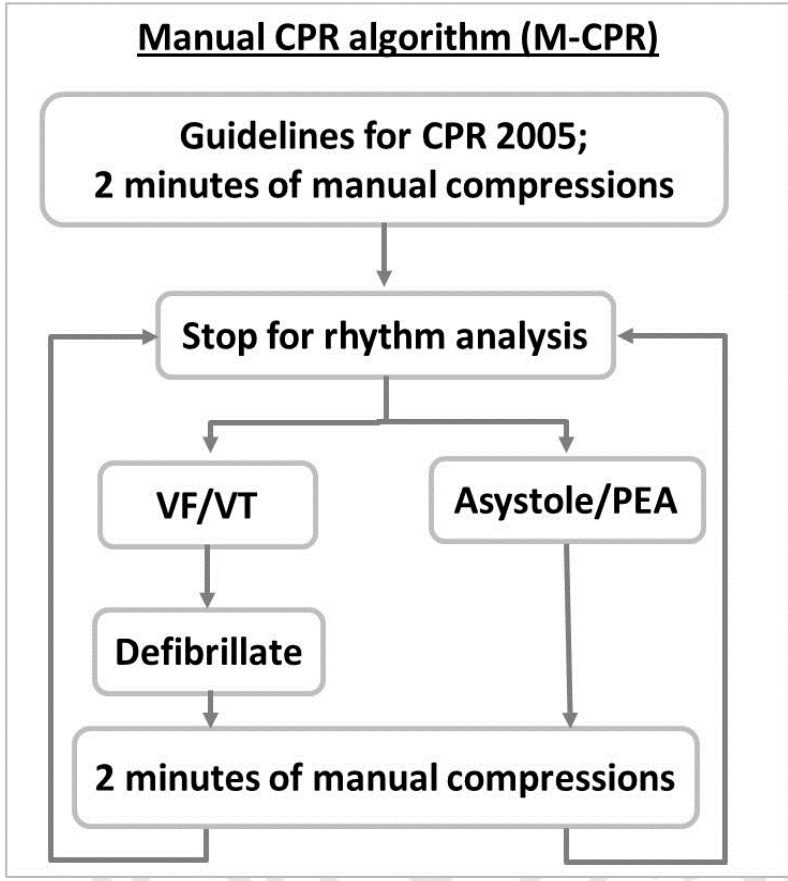
**1 289**
M-CPR
(Manual)

*4 pts did not provide informed consent

UPPSALA UNIVERSITET

# Study Algorithms



UPPSALA UNIVERSITET

# Background variables

**L-CPR**

**M-CPR**

Age (mean)

69.0 y.o

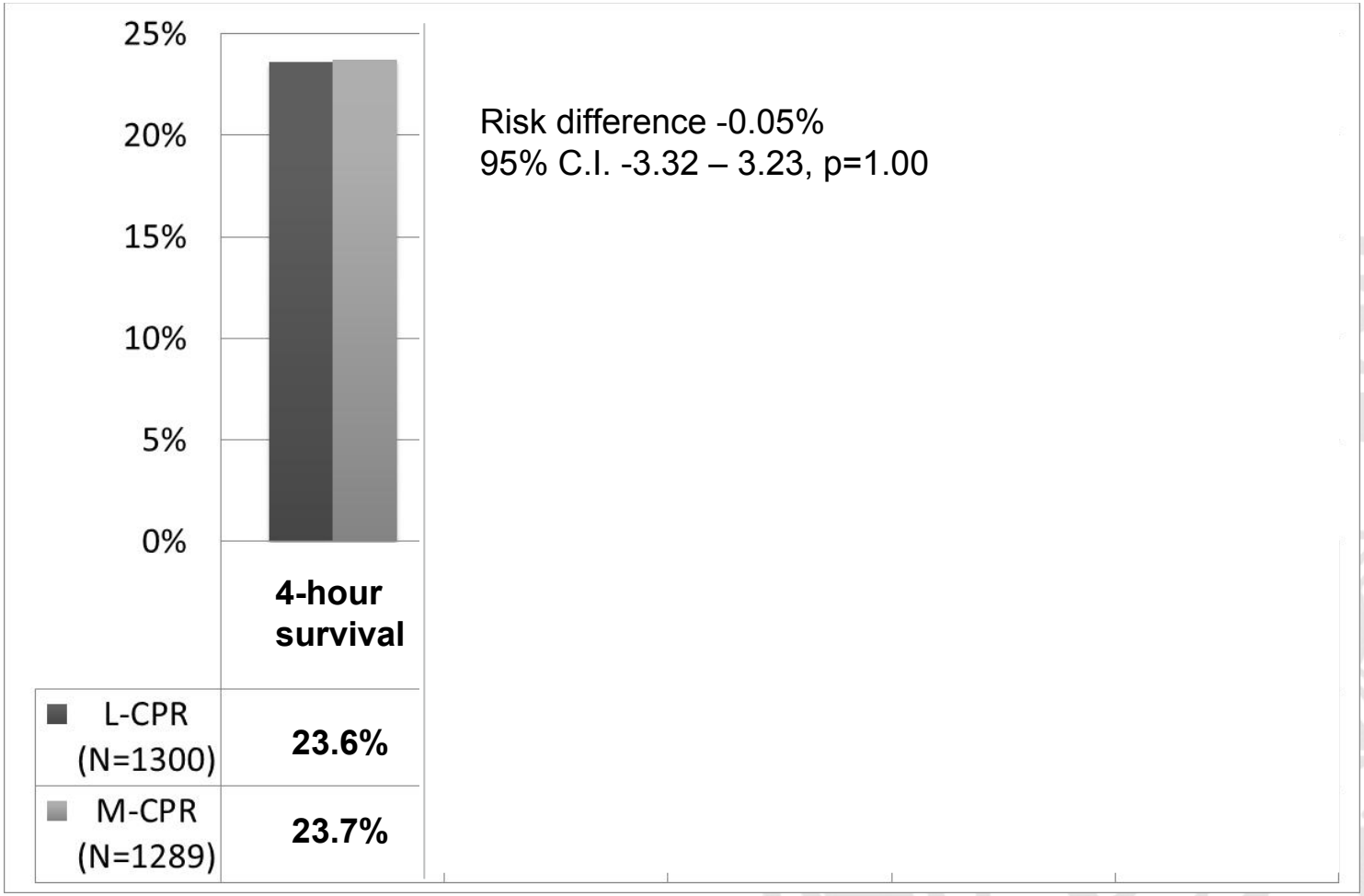
69.1 y.o

Sex-male

67%

UPPSALA UNIVERSITET

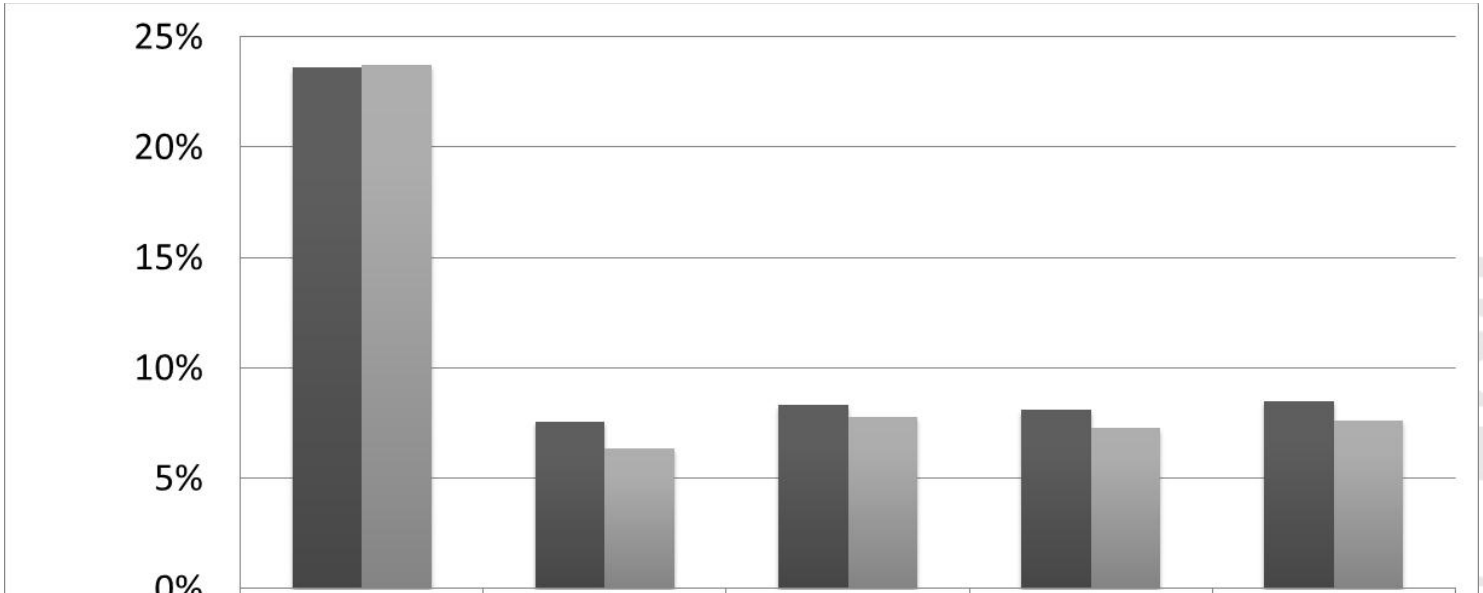
# Primary outcome




Risk difference -0.05%
95% C.I. -3.32 – 3.23, p=1.00

UPPSALA UNIVERSITET

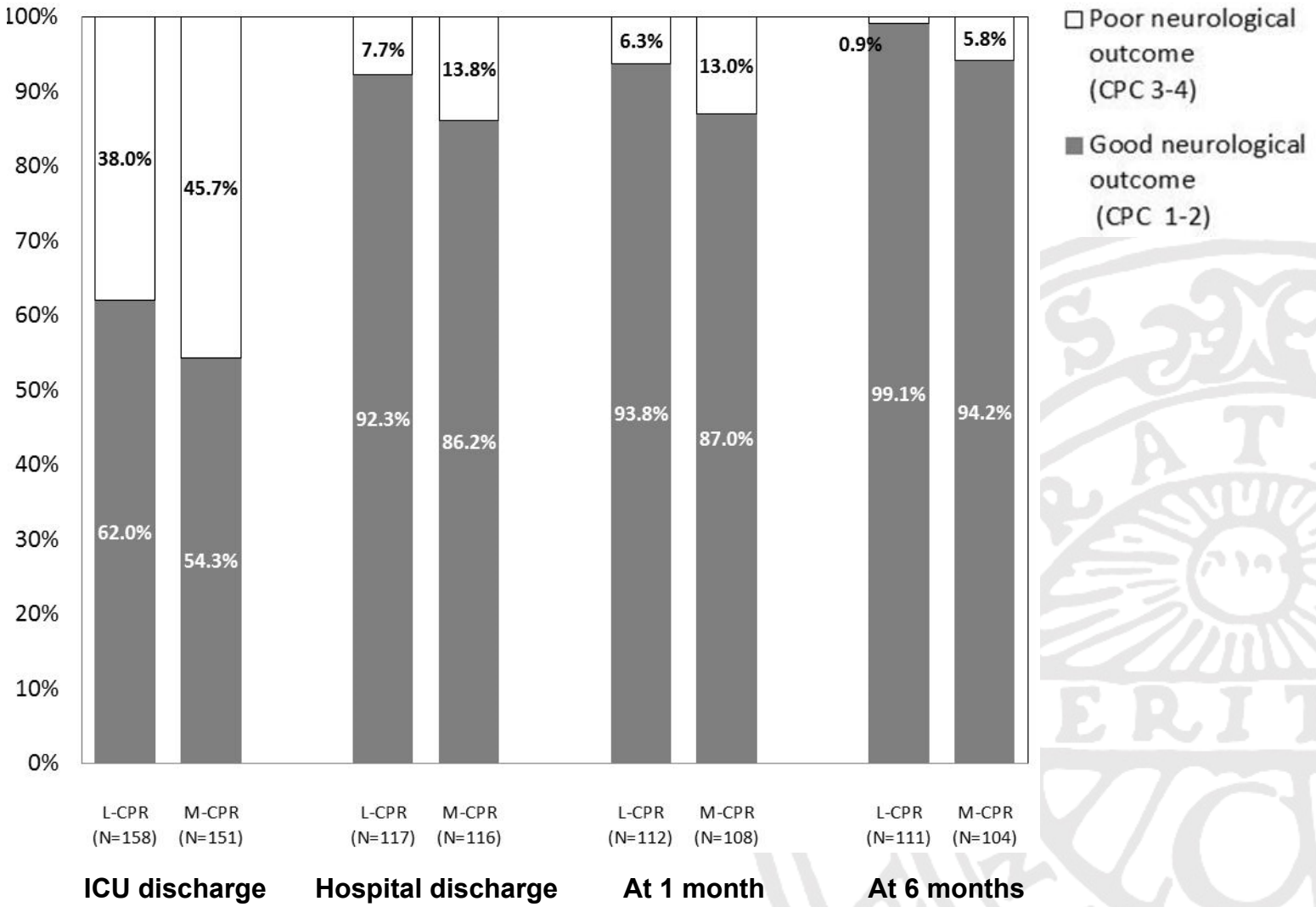
# Outcome




| | 4-hour survival | ICU discharge (CPC 1-2) | Hospital discharge (CPC 1-2) | At 1 month (CPC 1-2) | At 6 months (CPC 1-2) |
|---|---|---|---|---|---|
| L-CPR (N=1300) | **23.6%** | 7.5% | 8.3% | 8.1% | 8.5% |
| M-CPR (N=1289) | **23.7%** | 6.4% | 7.8% | 7.3% | 7.6% |

UPPSALA UNIVERSITET

# Secondary outcome and CPC in all survivors




LINC study

UPPSALA UNIVERSITET

# Conclusions

- Mechanical chest compressions using the LUCAS device in combination with defibrillation during ongoing compressions provided no improved 4-hour survival compared to conventional manual chest compressions in out-of-hospital CA patients

- There was good neurologic outcome in the vast majority of the survivors in both groups

UPPSALA UNIVERSITET

# Summary

- Thus, in clinical practice CPR with the LUCAS device and defibrillation during ongoing compressions seems to have similar effectiveness as manual chest compressions