



## Cardio First Angel© – a mechanical reanimation device for increasing effectivity in lay reanimation

### Product description/Results

Dr. med. Thomas Pöttinger<sup>1</sup>, Malte Schirren, Professor Dr. Anne-Laure Boulesteix<sup>2</sup>, Professor Dr. med. Christian Hagl<sup>1</sup>

<sup>1</sup>Herzchirurgische Klinik des Universitätsklinikums München der Ludwig-Maximilians-Universität, Germany.

<sup>2</sup>Department of Medical Informatics, Biometry and Epidemiology (IBE)

#### Introduction:

The problem in Germany's everyday life is, that in case of a reanimation sufficient aid is not given. The survival and avoiding neurological handicaps depend on an immediate and sufficient reanimation by a first aider. Up to 90 % of all patients decrease before the arrival at the hospital. (1, 2).

Essential reasons for the missing action is a lack of reanimation knowledge, a situative excessive demand without an instruction and the fear of direct physical contact.

Based on these perceptions the idea to develop a device for supporting first aiders was founded. The specifications were an easy handling, a compact design and also the usage after a brief introduction. At once also the direct physical contact between patient and lay helpers should be avoided.

The basic points of capability characteristics were based on following scientific analysis: Depth of thorax compression 50-60mm, frequency 100 to 130 per minute (1), optimized position for pressure point (according the hands position on the chest) (1).

#### Product description:

The Cardio First Angel consists of three units and is based on the requirements in a compact design (110mmx170mm) and concepted as oneway product.

The center unit is a stable PE-plastic-base. On the bottom side there is a liquid-absorbing, body and skin compatible foam to spread the pressure consistent. The device shall be placed on the lower third of the corpus sterni on the chest with the lower margin of the breastbone as reference point.

On the base is a complex arrangement of multiple coil springs applied, which transfer the pressing energy to the patients thorax. An energy of  $400 \pm 30$  N, which creates a depth of compression of 50-60 mm, is followed by a clearly hearable clicksound. This clicksound is the acoustic feedback of a sufficient reanimation.

The central unit for the user is the round, signal red button, which leads the pressure on to the patient's chest.

The Cardio First Angels bottom side consists of stable, pressure compensating and liquid-absorbing polyurethane-(PUR) softfoam and is placed directly on the skin over the patients breastbone. A clearance certificate concerning the use of this PUR-foam (KO-T902DH type 1,9H) exists (Illustration 3).

Is the Cardio First Angel used like shown on the buttons pictograms, it should – following the guideline of CPR (1) – be placed on the lower third of the corpus sterni (breastbone) (Illustration 4). So the pressure gets transferred optimal to the heartmuscle inside the bony thorax.

## Methodology

205 probands were tested, composed of three groups. Laymen, a cross section of the population in the Munich city center (n=50), students (n=128) and medical staff (registered nurses) (n=27).

The depth of compression and frequency of the thorax compressions were checked. Therefore a reanimation mannequin (Ambu Man W Torso, ERC 2010) was used. Every proband performed two cycles of a cardiac massage. Every cycle took 30 seconds.

Percept of the first cycle was to do a reanimation the conventional way by hands according the individual knowledge.

The second cycle was performed with the „Cardio First Angel“-reanimationtool. No instruction to the functionality took place.

Between these two cycles there was a proper break to avoid an affection of the results.

The data was transferred to a hard drive via USB and displayed and safed with the internal software of the company Ambu.

## Ergebnisse

1. Although there was no explicit introduction to the Cardio First Angels functionality, 33,3 % of the lay group had a significant profit concerning the frequency and 38% a significant profit concerning depth of compression.
2. 66,2 % of all probands would use the Cardio Fist Angel because of ist easy handling and the distance to the patient.
3. 100% of all probands have had the right position of their hands on the thorax with the device.

## Conclusions

The Cardio First Angel fits to all requirements and has thereby the potential to significantly improve the lay reanimation. An appropriate instruction for the user (training, simulations film, etc.) would clearly improve the efficiency of the device. The extensive commercial launch of such a system could also stimulate the people to grapple with the topic of “reanimation”.

For a higher statistical significane at present there is an expansion of the lay group and the group of medical staff. In addition there will be a test of lays after an appropriate instruction!

Um eine höhere statistische Aussagekraft zu erhalten erfolgt derzeit die Erweiterung der Laiengruppe und der Gruppe des medizinischen Personals. Zusätzlich erfolgt die Testung von Laien nach entsprechender Einweisung!

Fist positive practical experiences in the ICU were already made.

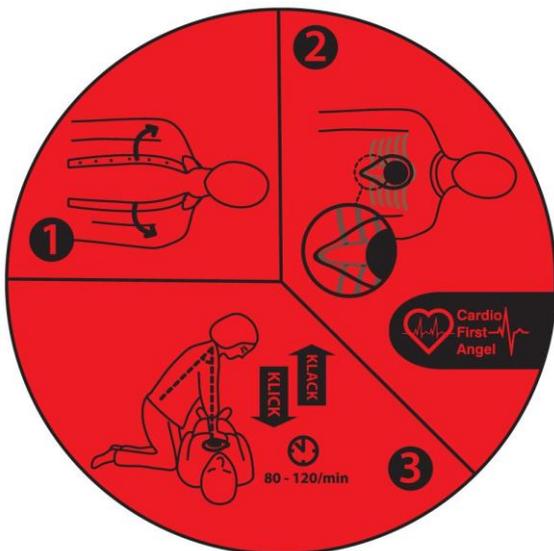
The soon use by ambulance is planned.

Illustrations:

Illustration 1: Product details



Illustration 2: Printed reanimationinstructions (button)



## PU- Schaumstoff KO-T9020H

### Erklärung zur physiologischen Unbedenklichkeit der Materialtypen KO-T9020H Typ 1.90H

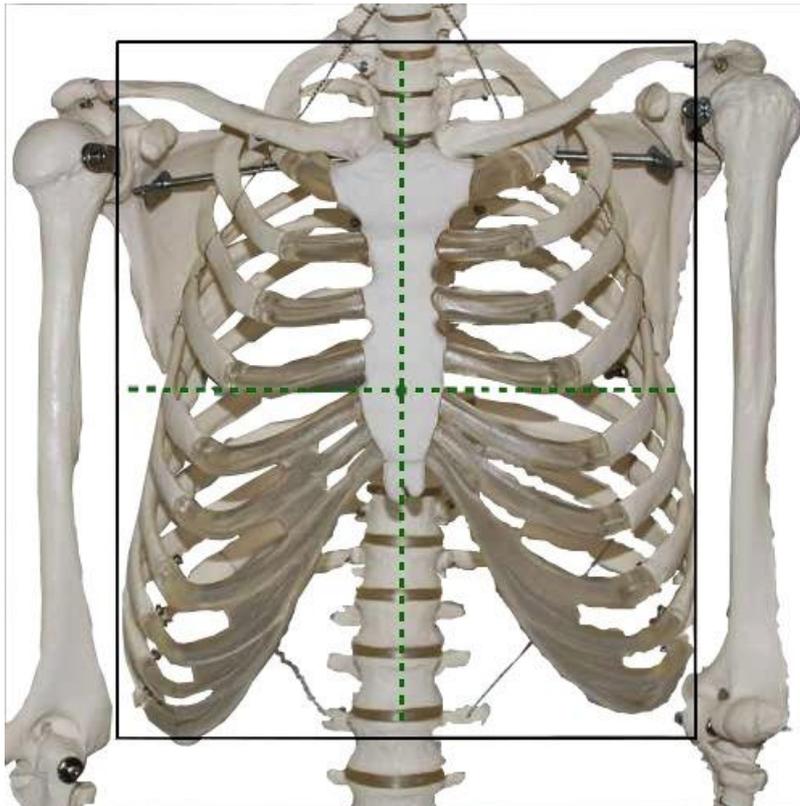
Wir können Ihnen hiermit folgende Bestätigung bezüglich der physiologischen Unbedenklichkeit unserer Type 1.90H geben:

Polyurethan-(PUR) Weichschaumstoffe sind Polyadditionsprodukte aus Isocyanaten und Polyether- bzw. Polyesterpolyolen, die in eine exothermen Reaktion, gesteuert durch Treibmittel (CO<sub>2</sub> aus der Isocyanat/Wasserreaktion) und modifizierter Mitverwendung von Katalysatoren, Stabilisatoren und sonstige Hilfsstoffen, zu einer breiten Palette unterschiedlicher Schaumstoffen reagiert.

**PUR Schaum ist nach heutigem Stand der Erkenntnisse physiologisch unbedenklich.**  
Die zur Herstellung von PUR-Schaumstoffen eingesetzte Grundstoffe enthalten weder Cadmium, Nitrosamine, Formaldehyd, Asbest, PCP (polychlorierte Biphenyle), PCP nach Monomere wie z.B. Styrol oder Vinylchlorid. Somit enthalten auch die hergestellten Schaumstoffe nicht die vorgenannten Stoffe.  
Darüber hinaus enthalten Polyurethan-Schaumstoffe kein freies Isocyanat.

Heitersheim, den 19.03.2013

Illustration 4: Positioning



## List of literature

(1)

Nolan J. P., European Resuscitation Council Guidelines for Resuscitation 2010 Section 1. Executive summary, Resuscitation, 81 (2010) 1219–1276

(2)

Nichol G, Stiell IG, Laupacis A, Pham B, De Maio VJ, Wells GA. A cumulative meta-analysis of the effectiveness of defibrillator-capable emergency medical services for victims of out-of-hospital cardiac arrest. Ann Emerg Med. 1999 Oct;34(4 Pt 1):517-25.