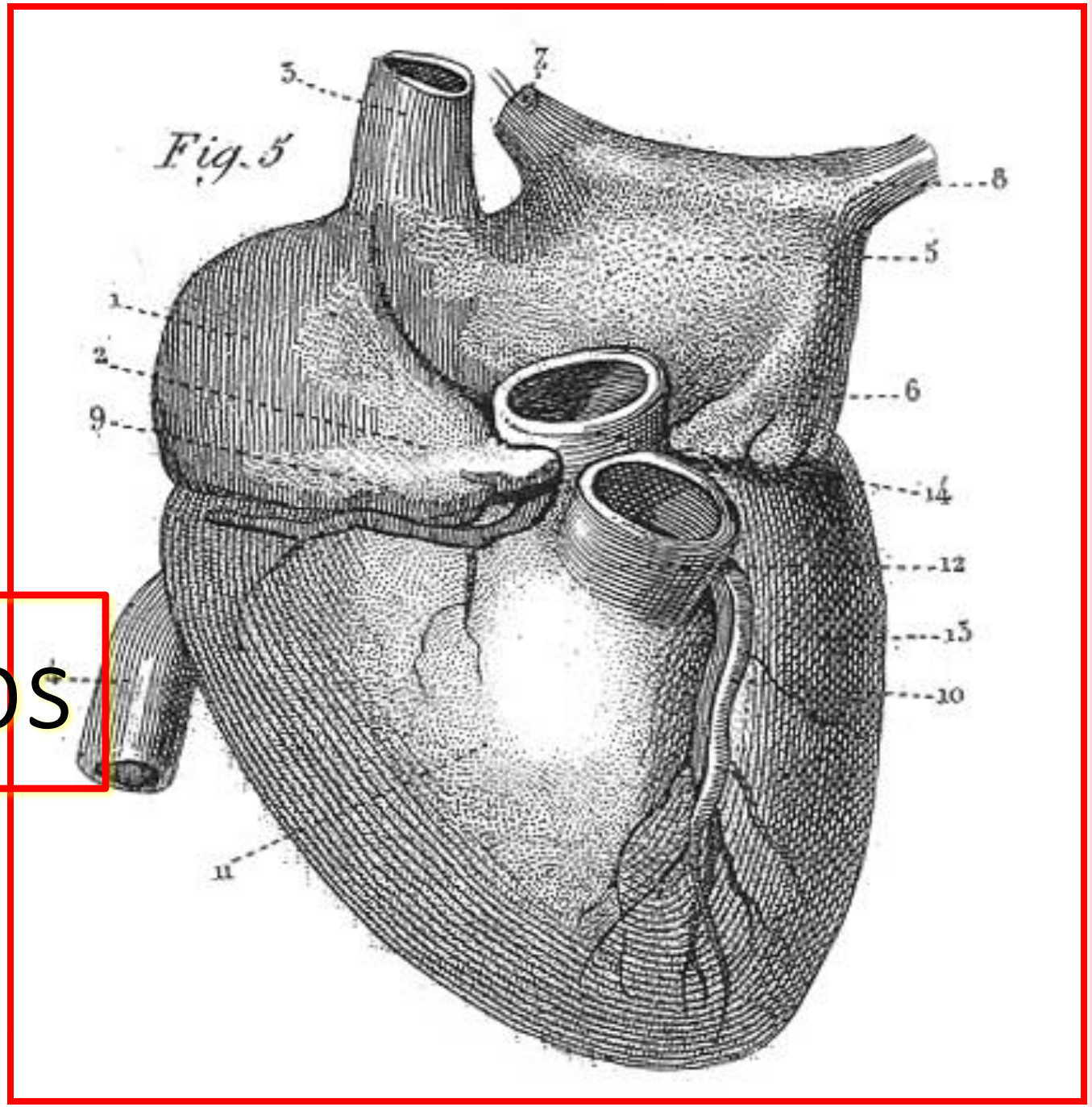
# Maternell kollaps




Ove Karlsson

Sahlgrenska/NU/Karolinska

# Maternell kollaps

- Patientfall x 3
- Statistik
- Orsaker
- Fysiologi
- Vetenskap
- PM/Rutin
- Att fundera på!

# 30-årig kvinna

- Frisk, BMI 29
- II-gravida, I-para
- 2019 grad IV bristning
- Graviditetsvecka 38+3
- Plan: elektivt kejsarsnitt

# Elektivt kejsarsnitt

- Spinal ua
- Fenylefrin pga blodtrycksfall
- Barnet utskaffas med lätthet, placenta framvägg och exprimeras lätt.
- 5-10 minuter efter avnavling, plötsligt händer det något:
  - Pat känner sig konstig och illamående
  - Blodtryck bra
  - Okontaktbar och får sträckkramp

# 30-årig kvinna

# Okontaktbar och kramp, vad göra?

- Ringer efter hjälp
- Söver och intuberar ua
- Lättventilerad.
- Bradykardi
- Inget koldioxid utbyte
- Huuuuu, asystoli…

1. HLR och adrenalin
2. ROSC inom 2 minuter
3. Artärnål, blodgas
4. UCG
5. ROTEM

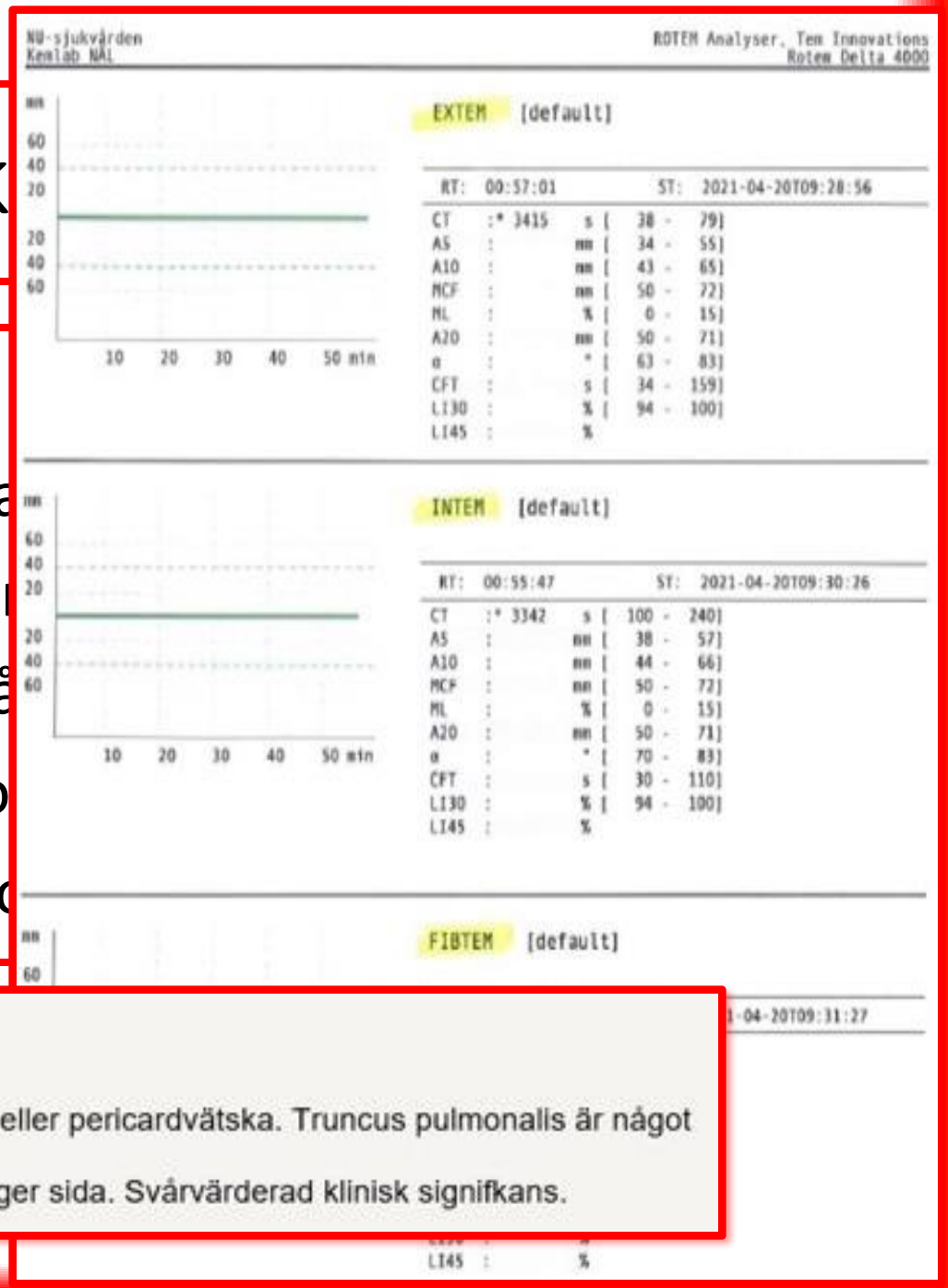
# 30-årig kvinna

# Maternell k

- Diagnos?
  - Hjärtstopp
  - Lungemboli
  - Cirkulations kollaps
  - Blödningschock
  - Allergisk chock
  - Fostervattenemboli

Vad göra?

- Obstetriker avsluta
- Viss atoni, oxytoci
- Viss blödning, 2 på
- Överväger trombo
- CT hjärna, thorax o

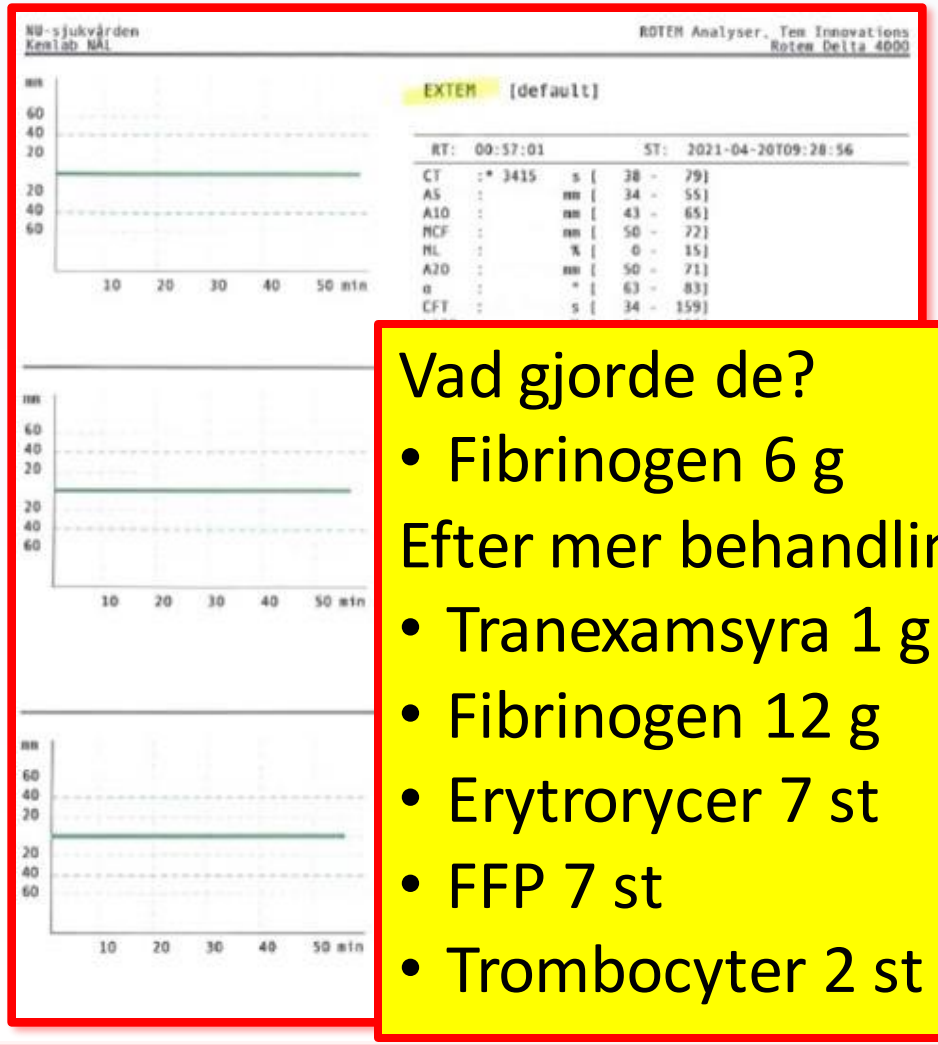



**2021-04-20 DT lungartär, angio med kontrast**

Det finns lungemboli i högersidig ovanlobsartär.
Dekliva atelektaser bilateralt. Inga övertygande ground glass förtätningar. Ingen pleuravätska eller pericardvätska. Truncus pulmonalis är något vid, mäter 34 mm i tvärmått. Ingen dilatation av höger kammare.
Det finns en gasbubbla i truncus pulmonalis. Gas ses också i v subclavia och v mammaria höger sida. Svårvärderad klinisk signifkans.

# 30-årig kvinna

# Maternell kollaps, Rotem




Vad gjorde de?

- Fibrinogen 6 g

Efter mer behandling:

- Tranexamsyra 1 g
- Fibrinogen 12 g
- Erytrorycer 7 st
- FFP 7 st
- Trombocyter 2 st

# 30-årig kvinna

# Maternell kollaps, IVA

- Lättventilerad
- Noradrenalin 0,4 mg/kg/min
- Fortsatt blödning
- Försök uterusballong
- Transfusion
  - Erytrocyter
  - FFP
  - Trombocyter

- Dag 1
  - Extuberad och till avd
- Dag 2
  - UCG ua
- Dag 5
  - Hem

Diagnos: Fostervattenemboli

Maternal, Newborn and Infant Clinical Outcome Review Programme

MBRRACE-UK
Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK

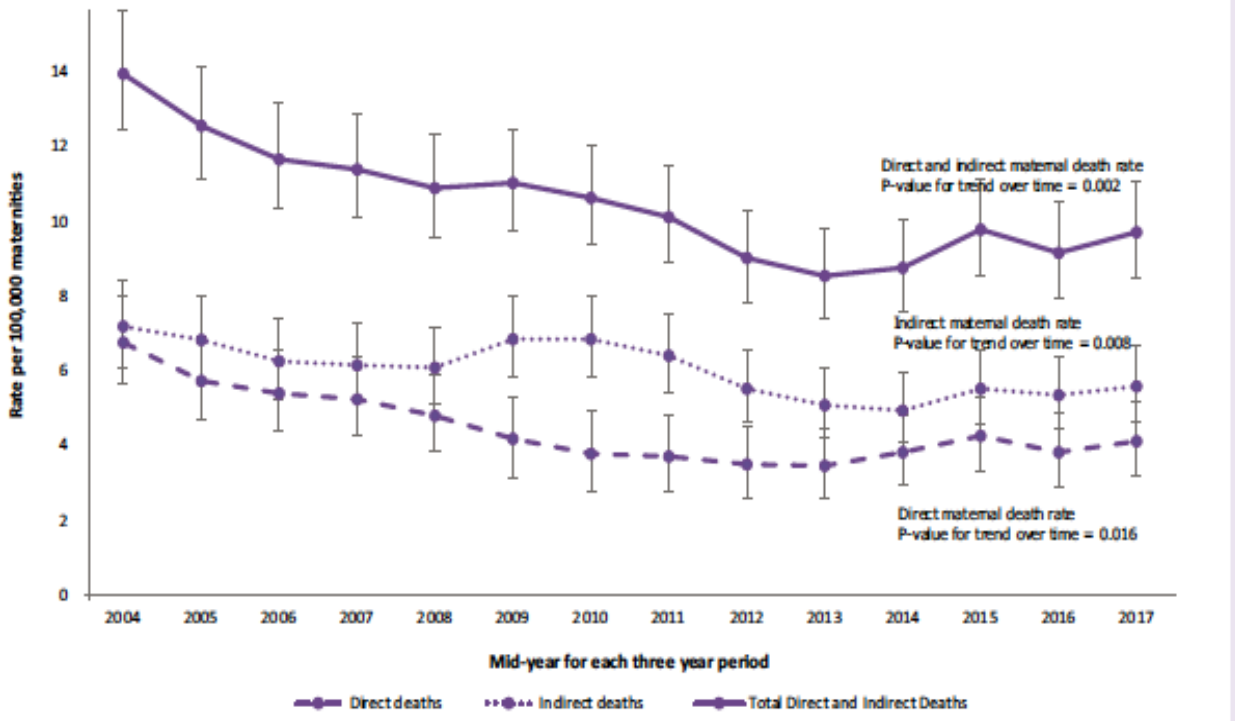
## Saving Lives, Improving Mothers' Care

Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2016-18

51 % av fallen bedömda att ett bättre omhändertagande skulle gjort skillnad för utfallet!

December 2020

**9.7 per 100.000 maternities**




MBRRACE-UK
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Maternal, Newborn and Infant Clinical Outcome Review Programme

MBRRACE-UK
Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK

All women with any symptoms or signs of ill health, including those who are postnatal, should have a full set of basic observations taken (temperature, pulse rate, respiratory rate and blood pressure), and the results documented and acted upon.

Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2015-17

Repeated presentation with pain and/or pain requiring opiates should be considered a 'red flag' and warrant a thorough assessment of the woman to establish the cause.

Women with a BMI 40 kg/m$^2$ or greater should have … bour and consid-
eration should be given to the siting of a second can

November 2019

Pre-pregnancy counselling should be available both within the paediatric cardiology transition service and to women of child bearing age with known cardiac disease. This should include provision of appropriate contraceptive advice.

Take a cardiac-specific history and suspect heart failure if there is not another likely cause of any of the following symptoms:

- Breathlessness when lying down (ruling out aortocaval compression) or at rest
- Unexplained cough, particularly when lying down or which produces frothy pink sputum
- Paroxysmal nocturnal dyspnoea – being woken from sleep by severe breathlessness and coughing, which may produce pink frothy sputum and is improved by moving to an upright position
- Palpitation (awareness of persistent fast heart rate at rest).

Echocardiography is recommended in any pregnant patient with unexplained or new cardiovascular signs or symptoms. (Regitz-Zagrosek et al. 2018)

Immediate electrical cardioversion is recommended for any tachycardia with haemodynamic instability and for pre-excited atrial fibrillation.

In the event of maternal cardiac arrest, resuscitation (and delivery) should be performed according to existing guidelines.

In case of emergency, drugs that are not recommended by international agencies for use during pregnancy and breastfeeding should not be withheld from the mother.

Perimortem caesarean section is an important part of … an. Ambulance crews should not delay this by prolonged attempts a … ore transferring the woman to hospital.

In maternal resuscitation, if there is no response to CPR after 5 minutes, undertake a TIME CRITICAL transfer to the nearest Emergency Department, ideally with an obstetric unit attached. Place a pre-alert as soon as possible to enable the Emergency Department team to organize a maternity team, as an immediate perimortem caesarean section (resuscitative hysterotomy) may be performed.

- Före graviditet
- Anamnes + status
- Symtom hjärtsjukdom
- Bröstsmärta
- UCG
- BMI > 40
- El-konvertering
- Perimortem snitt
- Transport sjukhus

BJOG An International Journal of Obstetrics and Gynaecology

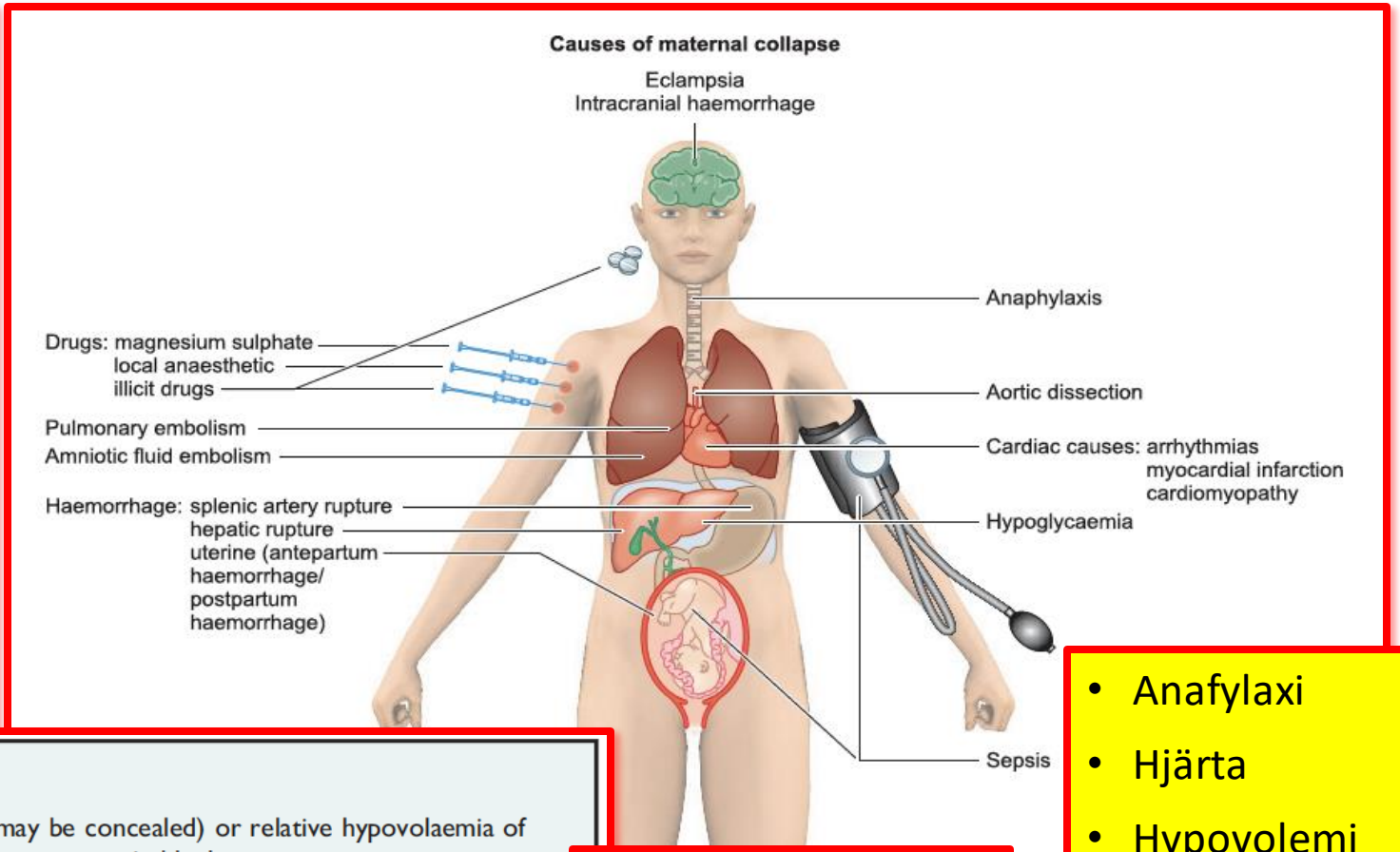
Royal College of Obstetricians & Gynaecologists

# Maternal Collapse in Pregnancy and the Puerperium

Green-top Guideline No. 56

December 2019

*Please cite this paper as:* Chu J, Johnston TA, Geoghegan J, on behalf of the Royal College of Obstetricians and Gynaecologists. Maternal Collapse in Pregnancy and the Puerperium. BJOG 2020;127:e14–e52.




| Reversible cause | | Cause in pregnancy |
|---|---|---|
| 4H's | Hypovolaemia | Bleeding (obstetric/other; may be concealed) or relative hypovolaemia of dense spinal block, septic or neurogenic block |
| | Hypoxia | Pregnant women can become hypoxic more quickly. Cardiac events – peripartum cardiomyopathy, myocardial infarction, aortic dissection, large vessel aneurysms |
| | Hypo/hyperkalaemia and Hyponatraemia | Hypo and hyperkalaemia are no more likely. Hyponatraemia may be caused by oxytocin use |
| | Hypothermia | No more likely |
| 4T's | Thromboembolism | Amniotic fluid embolus, pulmonary embolus, air embolus, myocardial infarction |
| | Toxicity | Local anaesthetic, magnesium, other |
| | Tension pneumothorax | Following trauma/suicide attempts |
| | Tamponade | Following trauma/suicide attempts |
| Eclampsia and pre-eclampsia | | Includes intracranial haemorrhage |

Behandling:

- BEHANDLA ORSAK
- Intensivvård
  - Hjärta
  - Cirkulation
  - Respiration

- Anafylaxi
- Hjärta
- Hypovolemi
- Hypoxi
- Emboli
- Läkemedel
- Dissektion
- Sepsis
- Fostervattenemboli

# 24-årig kvinna

# Akutmottagning, vad göra?

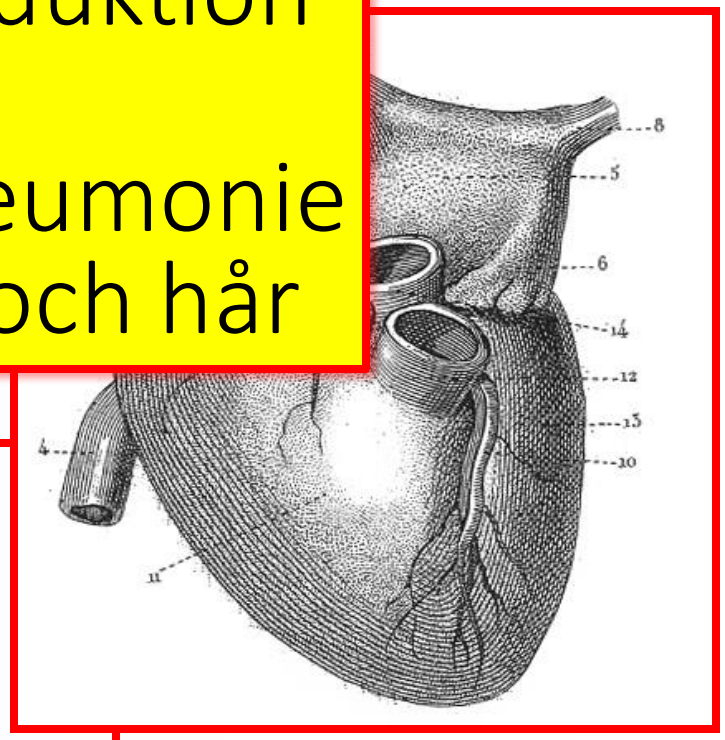
- Frisk
- Förstgravida
- Graviditetsvecka 36
- Hittas livlös av sambo
- Ambulans på plats efter 15 minuter
- Konstaterar asystoli

1. Konstatera dödsfall
2. Fortsätta avancerad HLR
3. Till operation för urakut kejsarsnitt
4. Utföra perimortem kejsarsnitt på plats

# 24-årig kvinna

Rättsmedicinsk obduktion

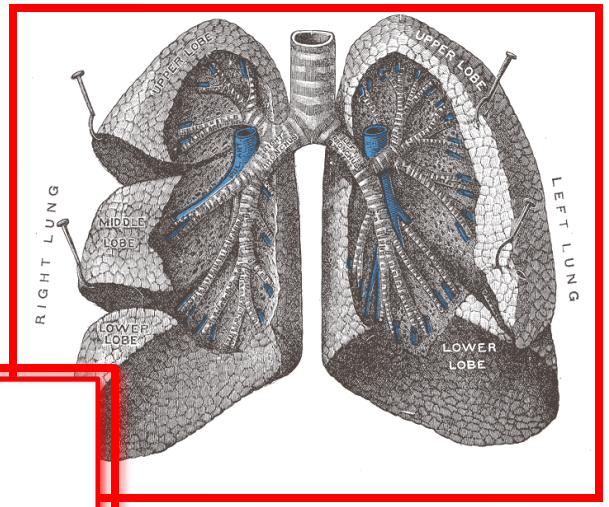
Staphylococcus pneumonie
Amfetamin i blod och hår




På akutmottagning:

- Perimortem kejsarsnitt på akutrummet
- Barnet förlöses 50 minuter efter konstaterat hjärtstopp
- Barnet visar inga livstecken
- Avbryter HLR efter ytterligare 20 minuter

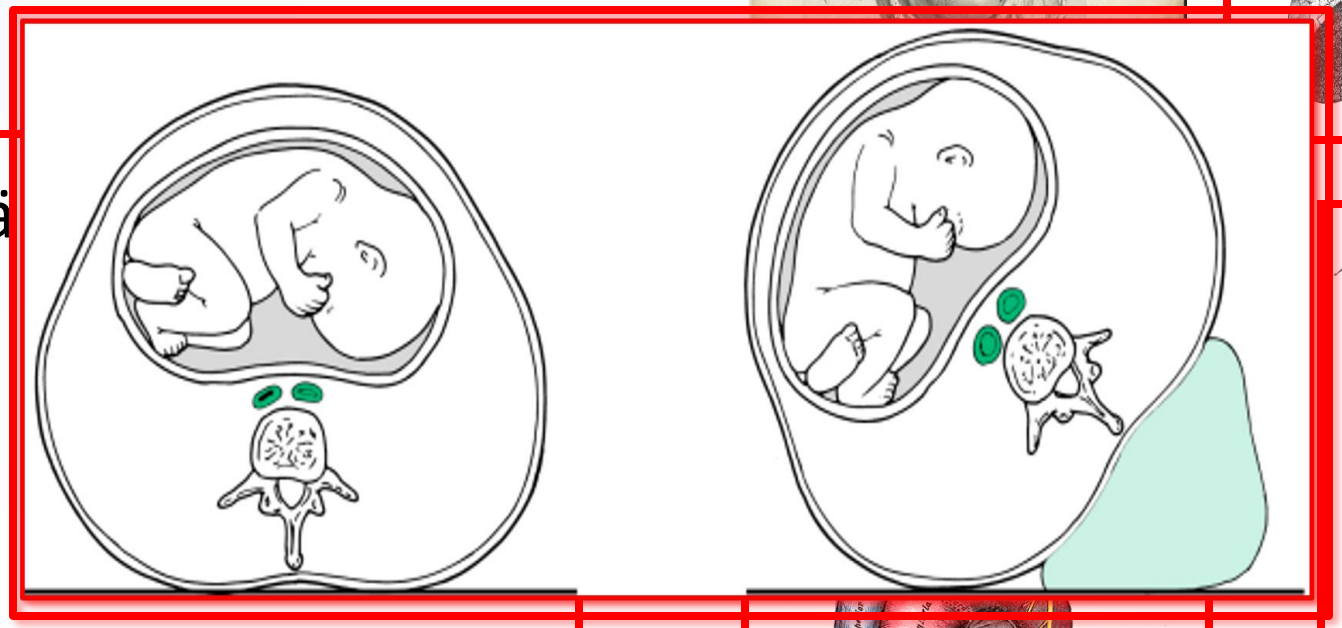
# Graviditet

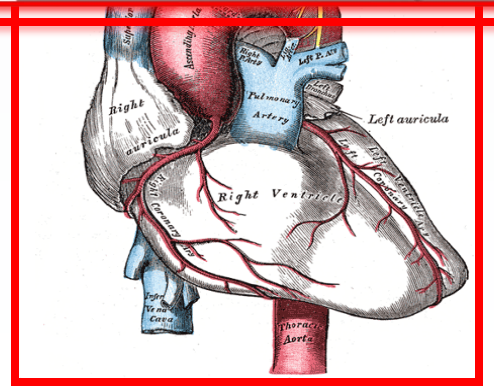


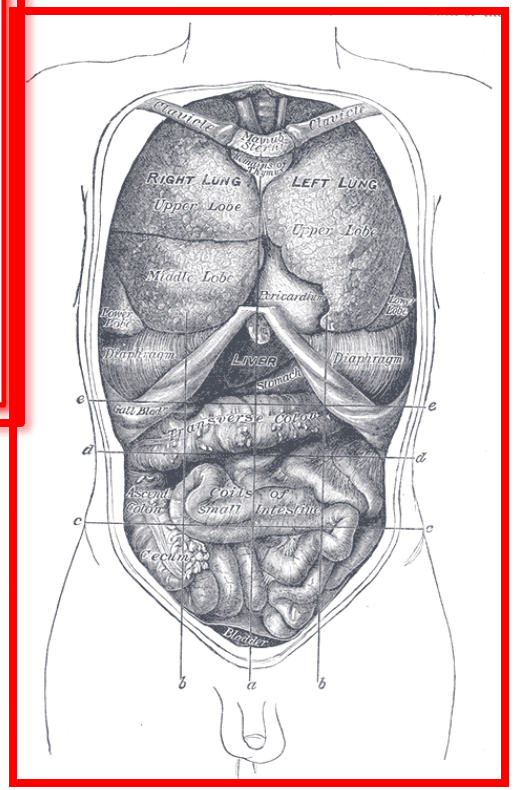

Fysiologisk förä

- Metabolism
- Respiration
- Cirkulation
- GI-kanalen

→ HLR på gravid kvinna svårt





# Perimortem cesarean delivery

*Vern L. Katz, MD, Deborah J. Dotters, MD, and William Droegemueller, MD*

**Postmortem cesarean delivery is an operation that has been practiced since antiquity. In previous centuries low infant survival rates led to negative opinions regarding the operation's usefulness. A review of the past centuries' cases and a review of fetal physiology suggest that to obtain optimum infant survival, cesarean delivery should be initiated within four minutes of maternal cardiac arrest. The physiology of cardiopulmonary resuscitation during pregnancy is analyzed, and recent cases of maternal cardiac arrest with successful maternal resuscitation are reviewed. This data suggests that perimortem cesarean delivery initiated within four minutes of maternal cardiac arrest will yield the highest rates of maternal survival. Legal liability from the operation is minimal.** ***(Obstet Gynecol 68:571, 1986)***

**Table 2.** Postmortem Cesarean Deliveries With Surviving Infants With Reports of Time From Death of the Mother Until Delivery (From 1900–1985)

| Cases | No. patients | Percent |
|---|---|---|
| 0–5 min | 42 (normal infants) | 70 |
| 6–10 min | 7 (normal infants) | 13 |
| | 1 (mild neurologic sequelae) | |
| Subtotal | 8 | |
| 11–15 min | 6 (normal infants) | 12 |
| | 1 (severe neurologic sequelae) | |
| Subtotal | 7 | |
| 16–20 min | 1 (severe neurologic sequelae) | 1.7 |
| 21 + min | 2 (severe neurologic sequelae) | |
| | 1 (normal infant) | 3.3 |
| Subtotal | 3 | |
| Total | 61 | 100 |

1. Most fetal survivors were delivered within five minutes
2. Cesarean delivery could be undertaken up to 25 minutes after maternal death
3. Conclusion
   - Cesarean delivery should be begun within four minutes and the infant delivered within five minutes after maternal cardiac arrest
   - Four minutes rule will provide the optimal opportunity for saving the lives of both the mother and child

American Journal of Obstetrics and Gynecology (2005) **192**, 1916–21

ELSEVIER

American Journal of Obstetrics and Gynecology
www.ajog.org

# Perimortem cesarean delivery: Were our assumptions correct?

**Vern Katz, MD,[a,*] Keith**

*Department of Obstetrics/Gynecolo*
*Obstetrics/Gynecology, Oregon He*

**Table III** Effect of perimortem cesarean section on maternal circulation, reported cases 1985-2004[7,9-18,22,23,27-29,33,35]

| Time from maternal cardiac arrest until delivery (min) | Return of spontaneous circulation and or improvement in hemodynamic status | No change |
|---|---|---|
| 0-5 | 5 | 2 |
| 6-10 | 3 | — |
| 11-15 | 1 | — |
| >15 | 4 | 5 |
| Not reported | 1 | 1 |
| Total | 12 | 8 |

**Table II** Reported cases of perimortem cesarean deliveries with cause of maternal cardiac arrest, 1985-2004

| Cause of maternal cardiac arrest | Cases |
|---|---|
| Trauma | 8 |
| Cardiac | 8 |
| Embolism (AFE, air) | 7 |
| Magnesium overdose | 5 |
| Sepsis | 3 |
| Anesthesia | 2 |
| Eclampsia | 1 |
| Spontaneous uterine rupture | 1 |
| Intracranial hemorrhage | 3 |
| TOTAL | 38 |

13 kvinnor överlevde

**Conclusion:** Published reports from 20 years support, but fall far from proving, that perimortem cesarean delivery within 4 minutes of maternal cardiac arrest improves maternal and neonatal outcomes.

Circulation

# Part 1: Executive Summary

## 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

### INTRODUCTION

The *2020 American Heart Association* (AHA) *Guidelines for Card*
*citation* (CPR) *and Emergency Cardiovascular Care* provides a co
of evidence-based recommendations for resuscitation and emerg
care. The initial guidelines for CPR were published in 1966 by an a
tee of the Division of Medical Sciences, National Academy of Sci
search Council.[1] This occurred in response to requests from sever
agencies about the need for standards and guidelines regarding tra

Since then, CPR guidelines have been reviewed, updated, an
cally by the AHA.[2–9] In 2015, the process of 5-year updates wa
online format that uses a continuous evidence evaluation process
reviews. This allowed for significant changes in science to be revie
manner and then incorporated directly into the guidelines if d
The intent was that this would increase the potential for more in
from guidelines to bedside. The approach for this 2020 guideline
alignment with the International Liaison Committee on Resuscita
sociated member councils and includes varying levels of evidenc
the scientific questions considered of greatest clinical significance

Over a half-century after the initial guidelines were publis
remains a leading cause of mortality and morbidity in the Unit
countries worldwide. As reported in the AHA "Heart Disease
tics—2020 Update," emergency medical services respond to
adults and more than 7000 children (less than 18 years of age)
cardiac arrest (OHCA) each year in the United States.[10] In-hos
(IHCA) is estimated to occur in 9.7 per 1000 adult cardiac arr
292 000 events annually) and 2.7 pediatric events per 1000 h
addition, approximately 1% of newly born infants in the United
sive resuscitative measures to restore cardiorespiratory function

Overall, although both adult and pediatric IHCA outcomes hav
since 2004, similar gains are not being seen in OHCA.[10] The pro
tients with return of spontaneous circulation (ROSC) following O
ed by emergency medical services has remained essentially uncha

Much of the variation in survival rates is thought to be due
the Chain of Survival (Figure 1), the critical actions that must oc
sion to maximize the chance of survival from cardiac arrest.[14] A
has been added to each Chain with this version of the guideline
importance of recovery and survivorship for resuscitation out
Chains of Survival have also been developed for pediatric O
adult and pediatric IHCA. Similarly, successful neonatal resuscit
continuum of integrated lifesaving steps that begins with care

*Circulation*. 2020;142(suppl 2):S337–S357. DOI: 10.1161/CIR.0000000000000918



*Cardiac arrest in pregnancy:* We present updated recommendations and a new algorithm highlighting the concept that the best outcomes for both mother and fetus are through successful maternal resuscitation.[74] Team planning for cardiac arrest in pregnancy should be done in collaboration with the obstetric, neonatal, emergency, anesthesiology, intensive care, and cardiac arrest services (Class 1, LOE C-LD). Priorities for treating the pregnant woman in cardiac arrest should include provision of high-quality CPR and relief of aortocaval compression through left lateral uterine displacement (Class 1, LOE C-LD). If the pregnant woman with a fundus height at or above the umbilicus has not obtained ROSC with usual resuscitation measures plus manual left lateral uterine displacement, it is advisable to prepare to evacuate the uterus while resuscitation continues (Class 1, LOE C-LD).[75–79] To accomplish delivery early, ideally within 5 minutes after the time of arrest, it is reasonable to immediately prepare for perimortem cesarean delivery while initial BLS and advanced cardiovascular life support (ACLS) in-

**AHA Scientific Statement**

# Cardiac Arrest in Pregnancy

## A Scientific Statement From the American Heart Association

Farida M. Jeejeebhoy, MD, Chair; Carolyn M. Zelop, MD; Steve Lipman, MD; Brendan Carvalho, MD; Jose Joglar, MD; Jill M. Mhyre, MD; Vern L. Katz, MD; Stephen E. Lapinsky, MB BCh, MSc; Sharon Einav, MD; Carole A. Warnes, MD; Richard L. Page, MD; Russell E. Griffin, LP, FP-C; Amish Jain, MD; Katie N. Dainty, PhD; Julie Arafeh, RN, MS; Rory Windrim, MD; Gideon Koren, MD; Clifton W. Callaway, MD, PhD; on behalf of the American Heart Association Emergency Cardiovascular Care Committee, Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation, Council on Cardiovascular Diseases in the Young, and Council on Clinical Cardiology

*Abstract*—This is the first scientific statement from the American Heart Association on maternal resuscitation. This document will provide readers with up-to-date and comprehensive information, guidelines, and recommendations for all aspects of maternal resuscitation. Maternal resuscitation is an acute event that involves many subspecialties and allied health providers; this document will be relevant to all healthcare providers who are involved in resuscitation and specifically maternal resuscitation. (*Circulation*. 2015;132:1747-1773. DOI: 10.1161/CIR.0000000000000300.)

- High quality CPR
- Patient positioning during CPR
- Manual left uterine displacement
- Emergency Caesarean Delivery
- Within 5 minutes after the time of arrest

International Journal of Obstetric Anesthesia (2016) 27, 46–54
0959-289X/$ - see front matter © 2016 Elsevier Ltd.
http://dx.doi.org/10.1016/j.ijoa.2016.02.008

REVIEW ARTICLE

# Perimortem caesarean deliveries

A.J. Eldridge, R. Ford
*Anaesthetic Department, Queen Alexandra Hospital, Portsmouth, Hampshire, UK*

**ABSTRACT**
Although cardiac arrest in pregnancy is rare, it is important that all individuals involved in the acute care of pregna
suitably trained, because the outcome for both mother and fetus can be affected by the management of the arres
caesarean delivery was first described in 715 BC. Initially the procedure was performed principally for religious or po
Although the potential for fetal survival was proposed, it was rarely successful, probably because the delivery wa
maternal death was established. However, in recent decades, case reports have suggested improved maternal as we
vival if perimortem caesarean section was performed rapidly once maternal arrest has occurred. While evidence fo
based on case reports, the physiological advantages including removing inferior caval obstruction, and hence imp
return to the heart, reducing oxygen requirement and improving chest compliance appear compelling. Factors that reduce errors
ance of training, organizational
robable that both maternal and
ly, no

improves with early delivery. Perimortem caesarean delivery remains a key part of CPR of women in the second half of pregnancy.

AOGS
ACTA Obstetricia et Gynecologica Scandinavica

AOGS REVIEW ARTICLE

## Perimortem cesarean section for maternal and fetal salvage: concise review and protocol

LIOR DRUKKER[1], YAEL HANTS[2], EINAV SHARON[3], HEN Y. SELA[1] & SORINA GRISARU-GRANOVSKY[1]
[1]*Department of Obstetrics and Gynecology, Shaare Zedek Medical Center,* [2]*Department of Obstetrics and Gynecology, Hadassah Medical Center, and* [3]*Intensive Care, Shaare Zedek Medical Center, Hebrew University Medical School, Jerusalem, Israel*

- Behov tydligt protokoll

Best Practice & Research Clinical Obstetrics and Gynaecology 28 (2014) 607–618
Contents lists available at ScienceDirect
Best Practice & Resea
Obstetrics and Gyn
journal homepage: www.elsevier.c

- Sidoförflytta uterus
- Ej vinkla under HLR
- Simulering och tränir

11

## Management of cardiac arrest in pregnancy

Farida Jeejeebhoy, MD, FRCPC, FACC, Lecturer[a,*],
Rory Windrim, MB, MSc, FRCS, Professor[b,1]
[a] *Division of Cardiology, William Osler Health System, and Division of Cardiology, Department of Medicine, Faculty of Medicine, University of Toronto, Toronto M5G1Z5, Canada*
[b] *Division of Maternal Fetal Medicine, Mount Sinai Hospital Toronto and Department of Obstetrics and Gynaecology, Faculty of Medicine, University of Toronto, Toronto, Canada*

Resuscitation 83 (2012) 1191–1200
Contents lists available at SciVerse ScienceDirect
Resuscitation
journal homepage: www.elsevier.com/locate/resusci

- 1980 – 2010
- 94 fall
- 54 % överlevde
- Ok inom 10 min

Review article

## Maternal cardiac arrest and perimortem caesarean delivery. Evidence of expert-based?☆,☆☆

Sharon Einav[a,*], Nechama Kaufman[a,b], Hen Y. Sela[c]
[a] *The General Intensive Care Unit of the Shaare Zedek Medical Centre, Jerusalem, Israel*
[b] *The Department of Emergency Medicine of the Shaare Zedek Medical Centre, Jerusalem, Israel*
[c] *The Department of Obstetrics and Gynaecology, Division of Maternal Fetal Medicine, Columbia University Medical Center, New York, USA*

| Cause | Women who survived (*n* = 37) | Women who died (*n* = 22) |
|---|---|---|
| **Presumed premortem causes (*n* = 59)** | | |
| Cardiac tamponade | 1 | 0 |
| Hypoxia | 4 | 0 |
| Hypovolaemia | 5 | 8 |
| Venous thromboembolism | 1 | 7 |
| Toxic drug cause | 1 | 0 |
| Anaphylaxis | 1 | 0 |
| Sepsis | 0 | 1 |
| Anaesthetic cause | 17 | 0 |
| Amniotic fluid embolism | 5 | 3 |
| Cardiac cause | 5 | 1 |
| Intracerebral bleed | 0 | 3 |
| Aortic dissection | 0 | 2 |
| Asthma | 0 | 1 |
| Pulmonary artery rupture | 0 | 1 |
| **Postmortem causes of collapse (*n* = 19)** | | |
| Amniotic fluid embolism | | 6 |
| Vessel bleed/rupture | | 5 |
| Thrombembolic | | 3 |
| Cardiomyopathy | | 2 |
| Other | | 3 |

Data were available for 59 women. Some women were suspected of having more than one cause, where this is the case both causes have been recorded.

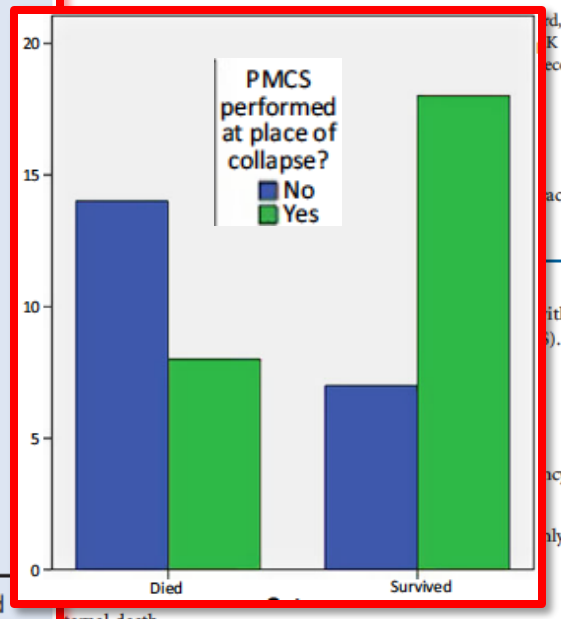
BJOG An International Journal of Obstetrics and Gynaecology

DOI: 10.1111/1471-0528.14521
www.bjog.org

# The CAPS Study: incidence, managemen outcomes of cardiac arrest in pregnancy UK: a prospective, descriptive study

VA Beckett,[a] M Knight,[b] P Sharpe[c]

rd, UK [b] National Perinatal Epidemiology Unit, Univ K
ecology, Bradford Teaching Hospitals NHS Foundati




act available at https://vimeo.com/rcog/authorinsights14521.

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ternal death.

**sults** There were 66 cardiac arrests in pregnancy, resulting in an idence of 2.78 per 100 000 maternities (1:36 000; 95% CI 2.2–). In all, 28 women died (case fatality rate 42%); 16 women arrested solely as a consequence of obstetric anaesthesia, 12 of whom were obese. Basic and advanced life support were rapidly delivered. Those who died were more likely to have collapsed at home. Perimortem caesarean section was performed in 49 women, 11 in the emergency department. The time from collapse to PMCS was significantly shorter in women who survived (median interval 3 versus 12 minutes, $P = 0.001$). Forty-six of 58 babies were born alive; 32 babies to surviving mothers and 14 to women who died.

**Conclusion** Cardiac arrest is rare in the pregnant UK population, however, nearly a quarter of cases are precipitated by obstetric anaesthesia, suggesting an opportunity to reduce the incidence further. Maternal survival rates of 58% were achieved with timely resuscitation, including PMCS, delay in which was associated with maternal death. Inpatient arrests were associated with higher survival rates than arrests that occurred outside the hospital setting.

**Keywords** Cardiac arrest, maternal morbidity, maternal mortality perimortem caesarean section, resuscitation.

**Tweetable abstract** 25% of cardiac arrest in pregnancy is caused by anaesthesia. Rapid perimortem section improves survival.

**Linked article** This article is commented on by JM Mhyre and Bateman, p. 1382 in this issue. To view this mini commentary visit https://doi.org/10.1111/1471-0528.14569. This article has journal club questions by BD Einerson, p. 1383 in this issue. To view these visit http://dx.doi.org/10.1111/1471-0528.14662.

**Table 2.** Time to emergency procedures in minutes, median (range), following maternal collapse

| | Women who survived (*n* = 38) | Women who died (*n* = 28) | *P*-value |
|---|---|---|---|
| Collapse to BLS | 0 (0–17) | 0 (0–23) | 0.28 |
| Collapse to ALS | 1 (0–36) | 0 (0–24) | 0.08 |
| Collapse to PMCS | 3 (0–39) | 12 (0–67) | 0.01 |

Mann–Whitney *U* tests for nonparametric data were applied.

- Prospektiv studie UK
- juli 2011 – juni 2014
- 66 st hjärtstopp
- ¼ orsak anestesi
- Överlevnad 58 %
  - HLR inom tid
  - Perimortem snitt
  - Sjukhus

- Kvinna 30 år
  - Gravid v 24
  - Preeklampsi
  - Obesitas
- Anafylaxi, dextran
- Postpartum LUCAS
- HLR 50 minuter
- Riktlinje Stryker: graviditet inga kontraindikationer

Resuscitation (2006) **68**, 155–159

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RESUSCITATION

www.elsevier.com/locate/resuscitation

CASE REPORT

# Cardiac arrest and resuscitation with an automatic mechanical chest compression device (LUCAS) due to anaphylaxis of a woman receiving caesarean section because of pre-eclampsia☆

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**KEYWORDS**
Cardiac arrest;
Resuscitation;
LUCAS;
Anaphylaxis

**Summary** We report a case of anaphylaxis with pulseless electrical activity (PEA)(verified by ECG and a radial intra-arterial line) in a 30-year-old woman who received 3G Promiten (dextran-1) and a prophylactic intra-venous infusion of Macrodex (dextran) for postoperative thromboembolism during caesarean section for pre-eclampsia in the 24th week of gestation. Manual chest compressions, followed by mechanical chest compressions (LUCAS, Jolife, Lund, Sweden), were performed for 50 min before restoration of spontaneous circulation (ROSC). She awoke the next day with no sequelae. She had some suction cup marks on the sternum but otherwise no complications of the chest compressions. At follow up by phone 1 month later, she and her baby were doing well.
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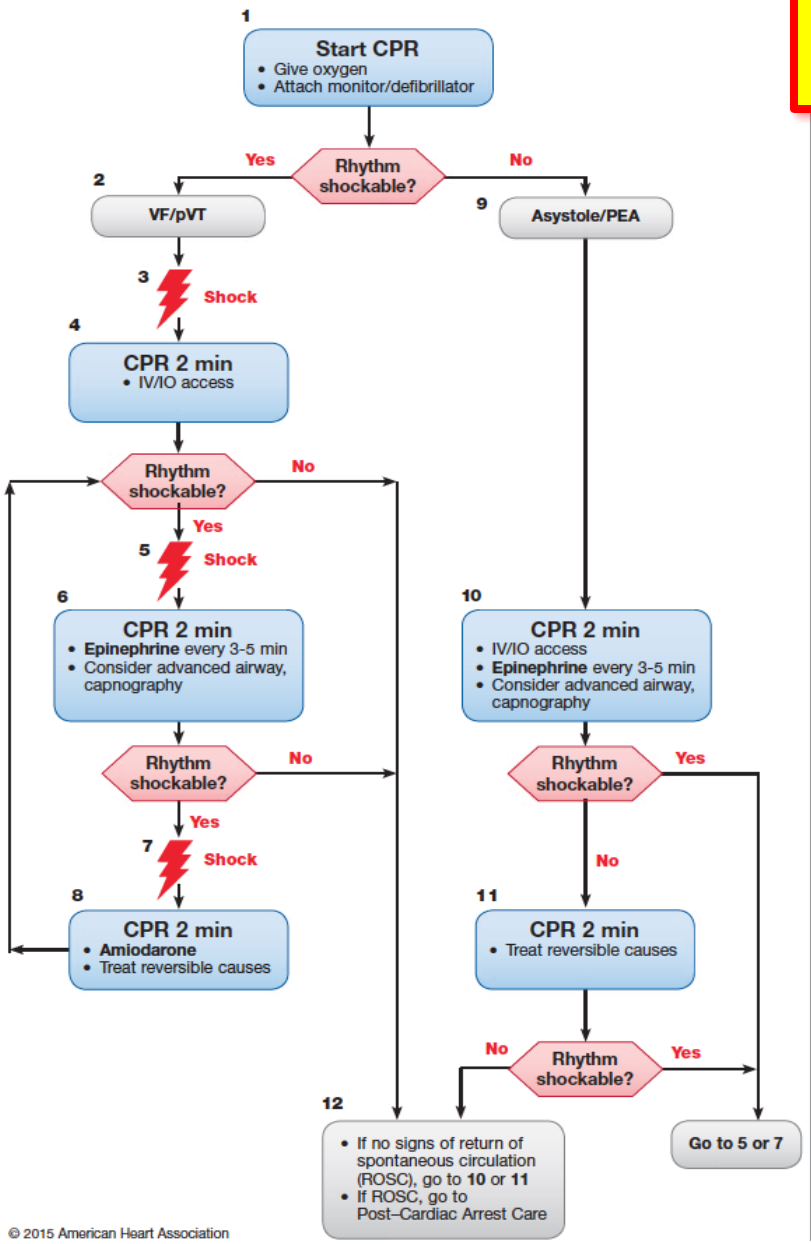
# KRÅNGLIGA?

## Adult Cardiac Arrest Algorithm—2015 Update

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2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
  - If $PETCO_2$ <10 mm Hg, attempt to improve CPR quality.
- Intra-arterial pressure
  - If relaxation phase (diastolic) pressure <20 mm Hg, attempt to improve CPR quality.

**Shock Energy for Defibrillation**

- **Biphasic:** Manufacturer recommendation (eg, initial dose of 120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic:** 360 J

**Drug Therapy**

- **Epinephrine IV/IO dose:** 1 mg every 3-5 minutes
- **Amiodarone IV/IO dose:** First dose: 300 mg bolus. Second dose: 150 mg.

**Advanced Airway**

give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

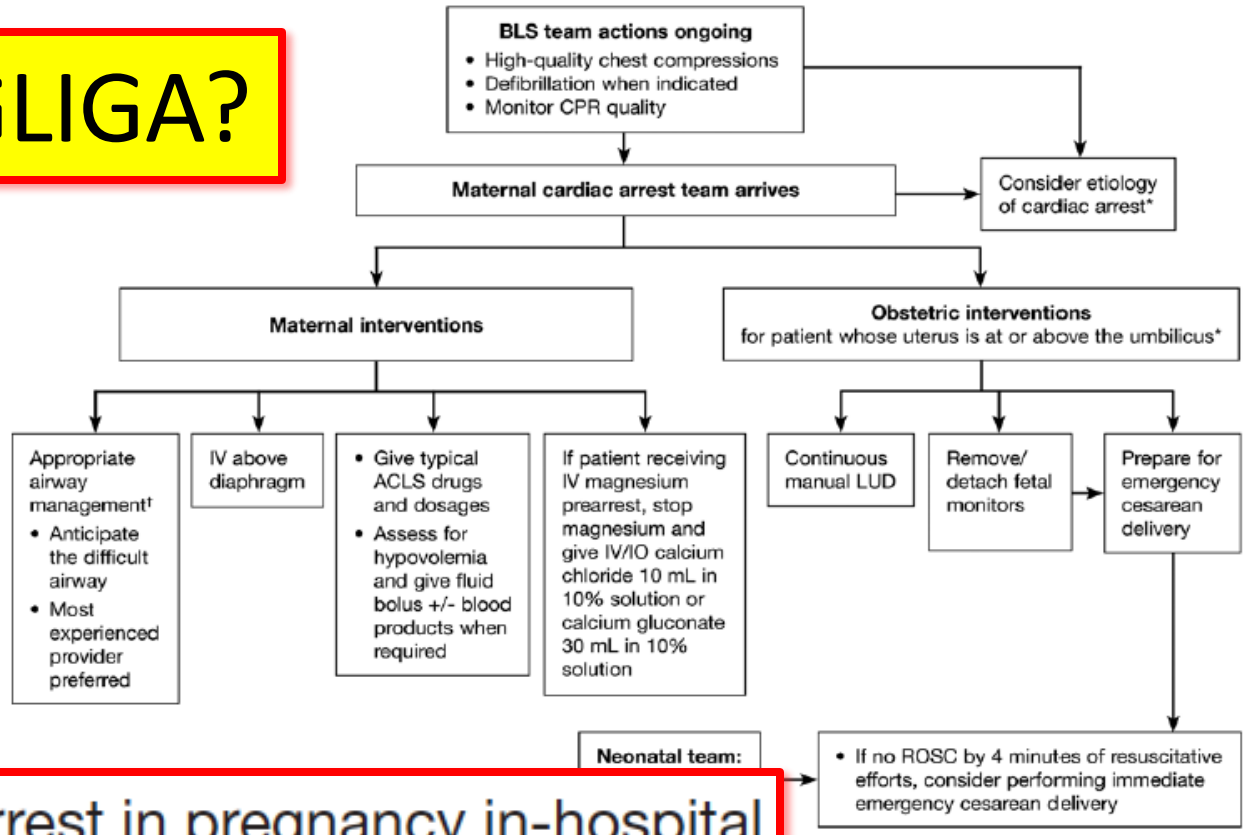
**Return of Spontaneous Circulation (ROSC)**

- Pulse and blood pressure
- Abrupt sustained increase in $PETCO_2$ (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

**Reversible Causes**

- **H**ypovolemia
- **H**ypoxia
- **H**ydrogen ion (acidosis)
- **H**ypo-/hyperkalemia
- **H**ypothermia
- **T**ension pneumothorax
- **T**amponade, cardiac
- **T**oxins
- **T**hrombosis, pulmonary
- **T**hrombosis, coronary

## Cardiac arrest in pregnancy in-hospital




*Potential etiology of maternal cardiac arrest:

- A Anesthetic complications/accidents
- B Bleeding
- C Cardiovascular
- D Drugs
- E Embolic
- F Fever
- G General nonobstetric causes of cardiac arrest (H's and T's)
- H Hypertension

†Appropriate airway management for pregnancy:

- 100% oxygen at ≥15 L/min and continue BLS airway strategies
- Optimally 2 attempts per technique:
  - First intubation attempt—if failed go to
  - Second intubation attempt—if failed go to
  - First supraglottic airway attempt—if failed go to
  - Second supraglottic airway attempt—if failed go to mask ventilation
  - If mask ventilation inadequate—attempt cricothyrotomy
- Avoid airway trauma
- Ventilate with 8–10 breaths/min
- Monitor capnography
- Minimize interruptions in chest compressions during advanced airway placement
- Recommend 6.0- to 7.0-mm inner diameter ETT

| Doknr. i Barium | Dokumentserie | Giltigt fr o m | Version |
|---|---|---|---|
| 20795 | su/med | 2016-11-22 | 3 |

# RUTIN Hjärtlarm gravid kvinna

**Innehållsansvarig:** Ove Karlsson, Överläkare, Läkare Anestesi Operation Intensivvård område 2 (oveka1)
**Godkänd av:** Göran Sandström, Verksamhetschef, Verksamhet Anestesi Operation IVA Östra (gorla4)
**Denna rutin gäller för:** Verksamhet Anestesi Operation IVA Östra; Obstetrik gemensamt

1. **Konstatera Hjärtstopp**
2. **Larma**
   - Ring 39090
   - Säg: Hjärtlarm gravid, Östra sjukhuset. Avdelning? Rum?
   - Avdela personal att visa vägen till patienten.
3. **Sidoförflytta uterus åt vänster**
4. **Påbörja HLR**
   - 30:2 dvs 30 kompressioner och 2 inblåsningar.
   - Fortsätt enligt handlingsplan samt defibrillera vid behov.
5. **Perimortem kejsarsnitt**
   - Indikation
     - Graviditetsvecka > 24.
     - Övervägs från vecka 20.
     - Om cirkulation ej omedelbart återkommer.
   - Barnet bör vara ute senast 5 minuter efter hjärtstopp.
   - Utföres på plats där kvinnan påträffas.
   - Utföres med engångsskalpell, peang, sax och handskar.
   - Personal från KK-Op kommer med mer utrustning.
6. **Om cirkulation återkommer, transportera patient till operation och avsluta operation.**

**Övrigt**

- Vid hjärtstopp gravid kvinna slår växeln ut 2 st larm, "Hjärtlarm" och "Hjärtlarm gravid".
- I sökare står texten "HJÄRTA GRAVID"
- Efter "Hjärtlarm gravid" kommer ett textmeddelande om var patienten finns. Larmgruppen skall dock ringa växeln och kvittera larmet.
- Lag kommer från KK-Op, inklusive obstetriker, neonatolog och barnsjuksköterska. Växeln meddelar sektionsledare, specialförlossning för ID-märkning av barnet.
- Akut väska med utrustning för perimortem kejsarsnitt finns på samtliga avdelningar på KK, HIA, akutmottagning CK samt på infektionskliniken avd 302 och 303.
- Syftet med perimortem kejsarsnitt är att återställa moderns cirkulation.

**Granskare/arbetsgrupp**

Monica Eriksson Orrskog, vårdenhetsöverläkare, Normalförlossningen, område 1
Mårten Alkmark, vårdenhetsöverläkare, Specialförlossningen, område 1

Exempel på hur en enklare rutin kan se ut….
Måste anpassas till lokal rutiner och traditioner

1. **Konstatera Hjärtstopp**
2. **Larma**
   - Ring 39090
   - Säg: Hjärtlarm gravid, Östra sjukhuset. Avdelning? Rum?
   - Avdela personal att visa vägen till patienten.
3. **Sidoförflytta uterus åt vänster**
4. **Påbörja HLR**
   - 30:2 dvs 30 kompressioner och 2 inblåsningar.
   - Fortsätt enligt handlingsplan samt defibrillera vid behov.

Före och efter HLR
Ej under HLR

## 5. Perimortem kejsarsnitt

- Indikation
  - Graviditetsvecka > 24.
  - Övervägs från vecka 20.
  - Om cirkulation ej omedelbart återkommer.
- Barnet bör vara ute senast 5 minuter efter hjärtstopp.
- Utföres på plats där kvinnan påträffas.
- Utföres med engångsskalpell, peang, sax och handskar.
- Personal från Operation 2 Östra (KK-Op) kommer med mer utrustning.

## Övrigt

- Vid hjärtstopp gravid kvinna slår växeln ut 2 st larm, ”Hjärtlarm” och ”Hjärtlarm gravid”.
- I sökare står texten ”HJÄRTA GRAVID”
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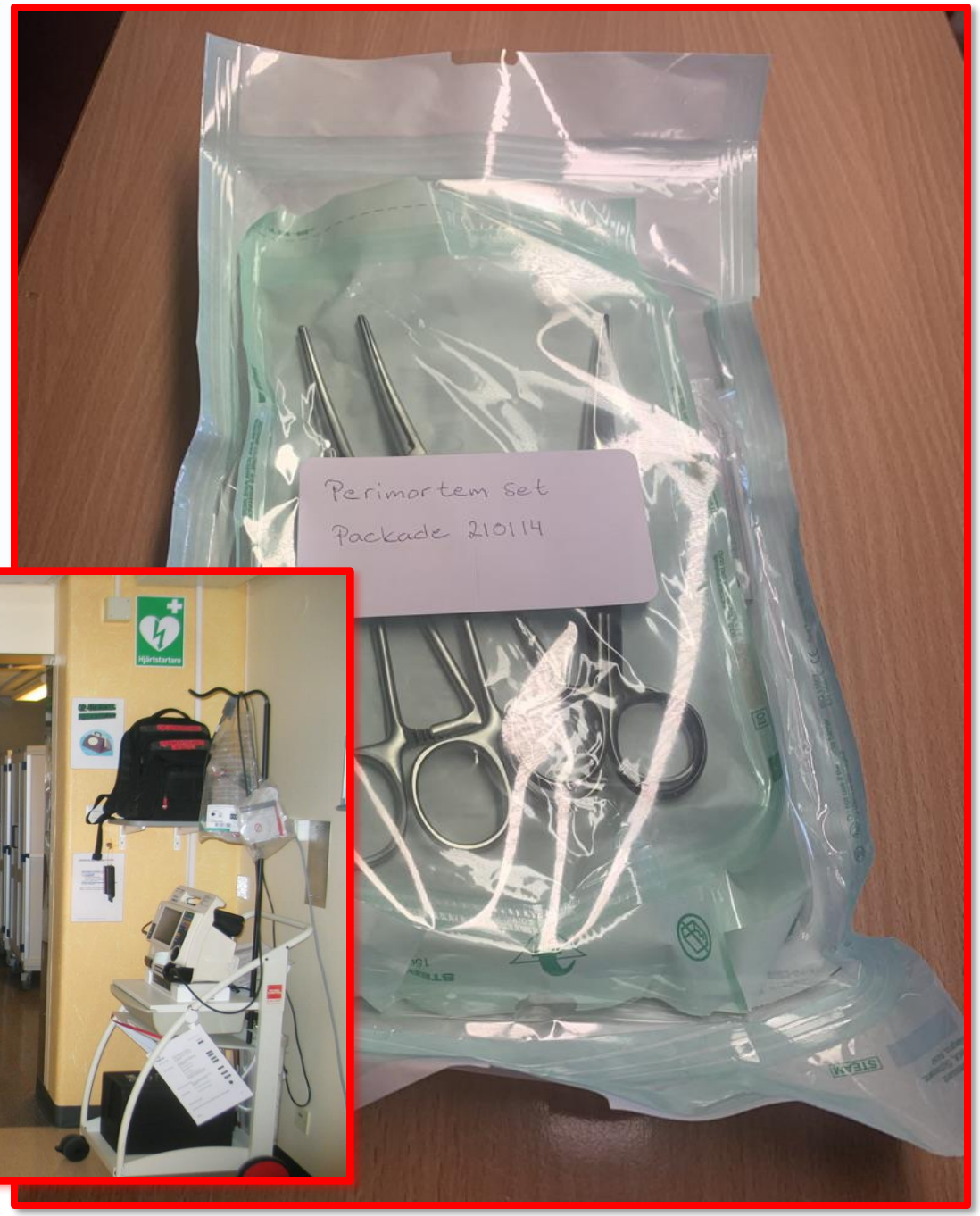
- Syftet med perimortem kejsarsnitt är att återställa moderns cirkulation.

Hjärtstartare


Perimortem set
Packade 210114

## 11.2 Hjärtstopp på sjukhus

Det finns i nuläget inget vetenskapligt validerat och säkert verktyg som kan hjälpa till i beslutet att avbryta pågående HLR. Beprövad erfarenhet säger att HLR bör fortgå så länge rytmen är ventrikelflimmer eller ventrikeltachykardi. Generellt anses 20 minuter asystoli vara förknippat med mycket dålig prognos men det finns undantag med patienter som överlevt betydligt längre perioder med asystoli. Som nämnts i kapitel 4.3 finns prediktionsverktyg för att uppskatta chansen till överlevnad *före* ett eventuellt hjärtstopp inträffar.[31] Sådana prediktionsverktyg kan användas som hjälpmedel tillsammans med andra faktorer (bevittnat/obevittnat hjärtstopp, initial rytm, HLR-duration etc.) men skall inte användas isolerat eller övertolkas.

## 11.3 Hjärtstopp utanför sjukhus

Ett stort antal studier har genomförts med syfte att finna tydliga gränser för när HLR utanför sjukhus anses medicinskt utsiktslöst och bör avbrytas. Svenska HLR- rådets algoritm för avbrytande av HLR prehospitalt tar hänsyn till initial rytm, om hjärtstoppet var bevittnat eller ej, om HLR har utförts innan ambulansens ankomst samt om puls eller livstecken ses under HLR. Vägledningen täcker dock inte alla situationer och det finns fall när fortsatt HLR trots uppfyllda kriterier för avbrytande kan anses motiverat. Generellt anses 20 minuter asystoli även vid hjärtstopp utanför sjukhus vara förknippat med mycket dålig prognos. Vid initial defibrilleringsbar rytm bör HLR pågå i 40 minuter eller längre.

- Dålig prognos vid 20 min asystoli
- Vid initial defibrilleringsbar rytm bör HLR pågå > 40 min
- Att ta hänsyn till:
  - Bevittnat/obevittnat hjärtstopp
  - Initial rytm
  - HLR duration och kvalitet

# Kvinna 35 år

- II-gravida, I-para
- PN 2018
- Postpartum
  - Trött
  - Blåsljud
  - UCG
    - MI 1/3
    - Susp Mb Barlow (mitralprolaps)
- Inför aktuell graviditet
  - UCG oförändrad
  - GUCH konferens
  - Susp Mb Barlow och MAD (Mitral annular disjunction)

# Plötsligt en kväll

- 22.00 ont i käken
- 22.55 hjärtstopp
  - Larm
  - Make HLR
- 23.02 ambulans på plats
  - VF
    - Defibrillering, tot 4 ggr
    - Adrenalin
    - Cordarone
  - LUCAS
- 23.25 Akutmottagning

# Kvinna 35 år

- Akutmottagning
  - 23.30 perimortem snitt
  - 23.32 partus
  - Defibrillering
  - ROSC ca 23.33
- Efter ROSC
  - PCI-lab, koronarangio, aortografi och pulmonalisangio ua
  - UCG
- Till operation
  - Op 01.48 – 02.43
- Under natten
  - Till IVA

# Hjärtstopp, vad göra?

- Dag 1
  - IVA och respirator
- Dag 2
  - Extuberas
  - Initialt desorienterad
- Dag 3
  - HIA
- Under vårdtiden
  - Klarare för varje dag
  - MR hjärta ua
  - ICD
  - Hem dag 20

# Att fundera på!

- Misstänk och utred hjärtsjukdom
- Inför NEWS 2
- Många orsaker till maternell kollaps
- Hjärtlarm gravid kvinna
- Perimortem kejsarsnitt
- HLR träning och simulering
- Att arbeta med detta skapar bra samarbete och bättre relationer
- Multidisciplinärt teamarbete
- Patientnära instrument