

# THE 4 MINUTE WINDOW: EVOLUTION OF RESUSCITATIVE HYSTERCTOMY IN PREHOSPITAL SETTING

*Karolina Marcinkowska, paramedic, BSc - Medical University of Warsaw, Poland*  
*Marta Matyja, paramedic, BSc - Maastricht University, the Netherlands*

## Resuscitative Hysterectomy (RH)

Also known as perimortem cesarean section (PMCD) is a distinct form of Cesarean section with the aim of relieving aortocaval compression to facilitate maternal resuscitation. It is indicated in women who are at or beyond 20 weeks of gestation (fundal height at or above the umbilicus), though neonatal viability is optimised beyond 24-26 weeks. The procedure is initiated if the patient remains in cardiac arrest following initial rhythm assessment and (if indicated) defibrillation. If the mother is beyond resuscitation, the primary objective shifts to maximizing neonatal survival. Although traditionally considered a hospital-based procedure, it is increasingly being undertaken in prehospital environments by highly trained teams, particularly Helicopter Emergency Medical Services (HEMS). To date, it has been reported in a limited number of countries where advanced HEMS systems are established, including Poland, and the Netherlands. A comparative analysis of the effectiveness is currently performed across the two healthcare systems, will provide insights into this evolving area of practice.

### Effectiveness of RH in Dutch HEMS

- HEMS in the Netherlands was established in 1995. Since then they've performed 7 resuscitative hysterectomies.
- 3 out of 7 women were pronounced dead on the scene.
- Remaining 4 women were transported to the hospital, from which 2 achieved ROSC on the scene and 1 in the ED.
- Neither of the hospitalized women survived.
- Neonate was transported to the hospital in 6 out of 7 cases. Only 1 child was pronounced dead at the scene.
- 3 children died in pediatric ICU, other 3 survived and were discharged home in good to fair neurological condition.

### Effectiveness of RH in Polish HEMS

- Since its establishment in 2000, the Polish Medical Air Rescue performed 4 resuscitative hysterectomies.
- In half of the cases RH was performed due to traumatic cardiac arrest.
- In remaining 2 cases MCA occurred as a result of pulmonary embolism.
- In all cases mother was pronounced dead at the scene, neonate was pronounced dead in 3 out of 4 cases.
- In 1 case of MCA due to pulmonary embolism ROSC of the neonate was achieved. Newborn was then hospitalized in NICU. There are no data on the child's further condition.

### RH Guidelines

(based on *Prehospital Medicine in the Polish Medical Air Rescue*)

- Start the procedure within 4 minutes of ineffective resuscitation.
- Perform an midline vertical incision from umbilicus to pubic symphysis.
- Make a 4 cm midline vertical incision in the upper segment of the uterus.
- Open the uterine cavity using your fingers.
- Lift the baby out of the uterus.
- Clamp and cut the umbilical cord, hand over the child to the person designated to provide NLS.
- Remove the placenta and fetal membranes.
- Pack the uterine cavity and neighbouring tissues with hemostatic gauze, secure everything with the emergency bandage. Administer TXA.
- Reccommence mother's resuscitation if paused.

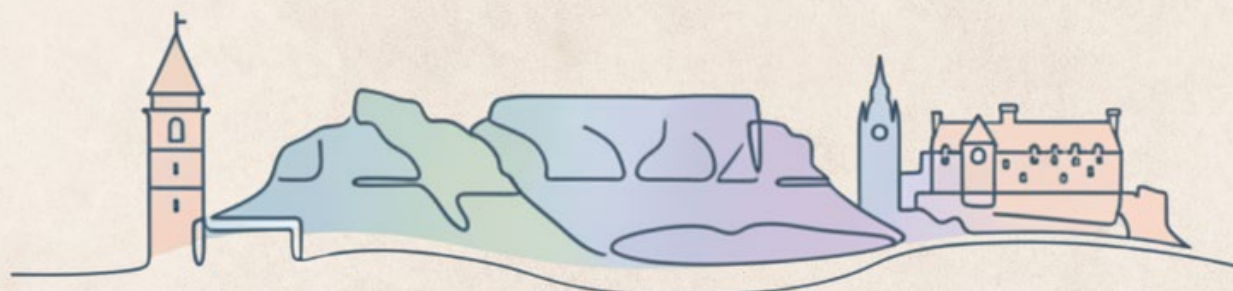
### Historical Outline

- The procedure dates back to the 1800s, when it was performed solely to save the baby after maternal death.
- The “4-Minute Rule” originates from a 1986 paper by Katz et al., who stated that this time frame yields the highest survival rates with normal neurological outcomes for the infant.
- Early medical guidelines were built on two retrospective studies spanning from 1875 to 2004, which showed improved newborn outcomes, but maternal survival rates remaied low.

### Future Direction

Many current studies claim the “4-minute rule” to be outdated as data show maternal and neonatal survival even after 45 minutes of cardiac arrest. Overemphasising the 4 minutes, might discourage HEMS staff from the procedure, even when survival remains possible. On the other hand, there is currently no maximum time limit of performing RH is not advised, leading to either delayed in the procedure or redunancy in performing the procedure. Future research should involve creating clear time guidelines for RH.

### Bibliography



200 years of Caesarean Section  
Dr James Barry's Legacy and A Tale of Three Cities