Using In-Situ Simulation to Improve Safety in the Perimortem Caesarean Section Pathway

R Seatter, CT2 Anaesthesia, South East Scotland Deanery
J Doverty, ST4 Anaesthesia, West of Scotland Deanery
E Elliot, Consultant Emergency Medicine, NHS Forth Valley
J Mardon, Consultant, Scottish Centre for Simulation

Introduction

Maternal cardiac arrest is a rare, high stakes event with an incidence of 1 in 36,000 pregnancies [1]. Delivery of the foetus by perimortem caesarean section (PMCS) within four minutes of cardiac arrest in women beyond 20 weeks gestation has been shown to improve both maternal and foetal survival [2].

In maternal cardiac arrest there is significant demand on health care professionals to provide advanced life support, perform timely PMCS and resuscitate the potentially viable foetus. Human factors and ergonomic science suggest that cognitive overload is likely to occur in those managing uncommon events in high stress environments; systems and processes that work to reduce this overload may improve patient outcomes.

In-situ simulation can be used in healthcare to help identify latent threats within a clinical environment and to help identify compounding human factors [3].

Objectives

To identify and review the current PMCS pathway at Forth Valley Royal Hospital (Scotland) and establish potential latent threats in the system which may be modified to improve patient care.

Methods

- Evaluation and identification of the current pathway through discussion with key stakeholders in the multi-disciplinary team (Obstetrics, Midwifery, Emergency Department, Neonatology, Anaesthetics)
- Development of a process map to establish 'work as imagined'
- Delivery of an In-situ, low-fidelity maternal cardiac arrest simulation (fig 1.) in the Emergency Department, with all members of the MDT participating (this was filmed with consent of participants to allow review of events)
- Simulation Debrief

Figure 1.

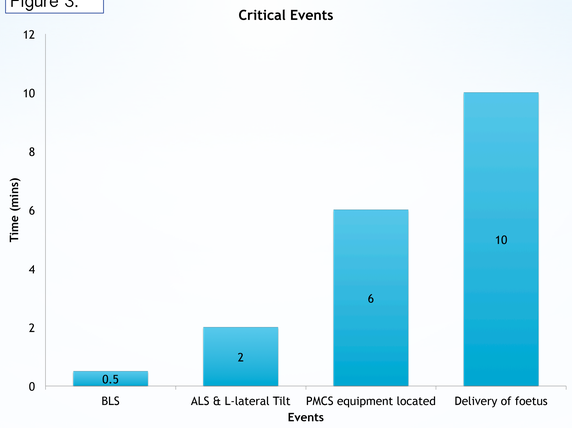
Simulation Scenario

- 36yrs old patient
- 32 weeks gestation
- Self presents to ED with shortness of breath, triaged and brought to resus area, cardio-pulomonary arrest shortly after arrival

Figure 2.

Time	Simulation Events
<1min	ED team present. Maternal cardiac arrest confirmed, CPR commenced, PPE donned, 2222 Obstetric Emergency
1-6 mins	Left lateral tilt, ALS ongoing, non-shockable algorithm
4mins	PMCS planned
6mins	PMCS equipment located
7 mins	Obstetric consultant arrival; Midwifery team arrival
8mins	Anaesthetic team & neonatal team arrival
10 mins	Delivery of neonate
11-15mins	Ongoing maternal ALS and Neonatal resuscitation
16 mins	Neonatal and maternal ROSC and transfer to ongoing care

Figure 3.



Results

The key events of the in situ-simulation scenario are depicted in figures 2 and 3. The primary outcome, time to PMCS was found to be 10 minutes (out-with the recommended 4 minutes).

A number of latent threats were identified through the simulation debrief and review. These included:

- Lack of knowledge of location and content of PMCS equipment in ED
- Unfamiliarity with performing PMCS
- Local obstetric emergency call excluded alerting the neonatal team
- Location of personal protective equipment (PPE) in ED unclear to visiting MDT
- ED resus signage unobvious
- Resucsitaire/neonatal resus equipment not standardised throughout hospital

Changes were implemented on the basis of above findings and included the developed of a PMCS pack with aid memoire in ED, staff education and awareness, changes to the emergency call process to ensure all relevant team members are summoned, updating 'emergency call posters' in ED and standardisation of resuscitare equipment throughout the hospital.

Discussion

Maternal cardiac arrest is a rare presentation to the ED; this unique resuscitation situation where two lives are at risk is associated with additional stress and demand on the health care team. The ergonomics of the working environment can impact upon efficiencies in delivering effective patient care. In-situ simulation can be utilised as a tool to review current practice and identify latent threats in clinical systems.

References

1. Beckett VA, Knight M, Sharpe P. The CAPS Study: incidence, management and outcomes of cardiac arrest in pregnancy in the UK: a prospective, descriptive study. BJOG: An International Journal of Obstetrics and Gynaecology. 2017; 124: 1374-81.
2. Chu J, Johnston TA, Geoghegan J. Maternal Collapse in Pregnancy and the Puerperium: Green Top Guideline No. 56. BJOG: An International Journal of Obstetrics and Gynaecology. 2020; 127: e14-e52.
3. Patterson MD, Blike GT, Nadkarni VM. In situ simulation: Challenges and Results. In: Henriksen K, Battles JB, Keyes MA, et al, eds. A*dvances in patient safety: New Directions and Alternative Approaches (Vol 3 Performance and Tools).* Rockville 2008. Available from: https://www.ncbi.nlm.nih.gov/books/NBK43682/