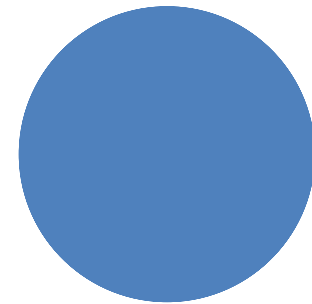
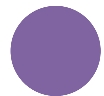
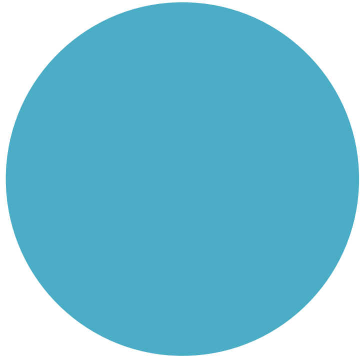
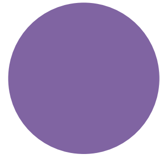
CARDIAC ARREST IN PREGNANCY

Dr Chandia Edward Buga
Obstetrician & Gynecologist
Critical Care Fellow CHBAH

- Definition and Incidence
- Physiological Changes of Pregnancy that affect Resuscitation.
- BLS and ACLS principles unique to Pregnancy
- Causes of Cardiac arrest
- Post Cardiac Arrest Care
- Prevention.

Presentation Overview

Definition and Incidence

CARDIAC ARREST IN PREGNANCY

Cardiac arrest is defined as a cessation of cardiac activity.

Given it’s low frequency, management is not guided by RCTs but rather expert opinion, case series and prospectively reported data.

The survival rates of maternal cardiac arrest are better than most of other adult cardiac arrests.

BJOG An International Journal of Obstetrics and Gynaecology

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

General obstetrics

The CAPS Study: incidence, management and outcomes of cardiac arrest in pregnancy in the UK: a prospective, descriptive study

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

CAPS study

- Incidence of 1:36000 cardiac arrests.
- Maternal survival rate of 58% were achieved with timely resuscitation including Perimortem Caesarean Delivery (PMCD).There was no difference in comorbidities between patients who died or survived.
- Higher number of alive patients if PMCD done at place of collapse.
- Anesthetic complications accounted for the majority of cardiac arrests.

Contents lists available at ScienceDirect

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

Clinical paper

Characteristics and outcomes of maternal cardiac arrest: A descriptive analysis of Get with the guidelines data☆

Carolyn M. Zelop[a,b,*], Sharon Einav[c,d], Jill M. Mhyre[e], Steven S. Lipman[f,g], Julia Arafeh[h], Richard E. Shaw[i], Dana P. Edelson[j], Farida M. Jeejeebhoy[k,l]

Characteristics and outcomes of Maternal Cardiac Arrest.

- The most common causes of maternal cardiac arrest were: Respiratory insufficiency 36%, Hypotension 33%.
- The documented rhythms were PEA 58%, Asystole 26%, Shockable rhythm (VF 6.5%, VT 5.2%),Unknown 11.7%
- Rate of survival of 40.7%.

CASE REPORT

Cardiac arrest in pregnancy: Case report and review of the literature

S Budhram, FCOG (SA), MMed (O&G)

Department of Obstetrics and Gynaecology, Faculty of Medicine and Health Sciences, Stellenbosch University, Tygerberg, Cape Town, South Africa

Corresponding author: *S Budhram (samant@absamail.co.za)*

Budram S et al, S Afr J Obstet Gynaecol 2015.

Cardiac arrest in Pregnancy: a case report

- 34 year old patient , G5p4, Twin pregnancy at 20wks with comorbid Ischemic heart disease , Chronic HPT and hypercholesterolemia.
- Known Heavy smoker
- In hospital Cardiac arrest at 20 wks, Perimortem hysterotomy done after 5 min of CPR, with ROSC obtained after 6 minutes.
- She was ventilated, initiated on anti failure treatment and later discharged from the hospital.

RESUSCITATION 135 (2019) 205 – 211

ELSEVIER

Available online at www.sciencedirect.com

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

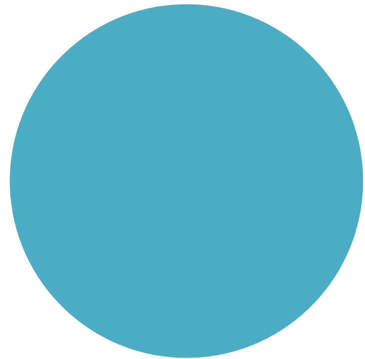
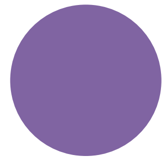
Clinical paper

Maternal out-of-hospital cardiac arrest: A retrospective observational study

Olga Maurin [a], Sabine Lemoine [a,], Daniel Jost [a,b], Vincent Lanoë [a], Aurelien Renard [c], Stephane Travers [a], the Paris Fire Brigade Cardiac Arrest Work Group [a], Frederic Lapostolle [d], Jean Pierre Tourtier [a]*

Maternal out of Hospital Cardiac arrest.

- 16 OHCA, median gestational age was 20 wks and maternal age of 31yrs.
- In 3 pts the initial rhythm was VF.
- 6 pts died after resuscitation at the scene , the remaining 10 were transported to hospital with only two alive at 30 days.
- PMCD performed in three cases.

Physiological Changes of Pregnancy That Affect Resuscitation

Respiratory

- UPPER AIRWAY HYPEREMIA , EDEMA AND INCREASED SECRETION INCREASE THE RISK OF FAILED INTUBATION
- REDUCED FRC, INCREASED MV AND INCREASE O2 CONSUMPTION LEAD TO POOR RESERVE AND FASTER DESATURATION.
- REDUCED CHEST WALL COMPLIANCE REQUIRING AN INCREASED CHEST COMPRESSION FORCE.
- DILUTIONAL ANEMIA MEANS A REDUCED OXYGEN CARRYING CAPACITY.

Cardiovascular

- An increase in SV, HR & CO means high CPR Circulation demands.
- Estrogen primes the myocardium for SVTs.
- Reduction in arterial blood pressure increases susceptibility to a myocardial insult.
- Changes in colloid Oncotic pressure and PCWP increase susceptibility to pulmonary edema and third spacing.

Uteroplacental

- Blood sequestration during CPR means reduced uteroplacental flow.
- Loss of uteroplacental bed autoregulation.
- Aortocaval compression decreases cardiac output by 30%
- Gravid uterus elevates the diaphragm by 4-7cm

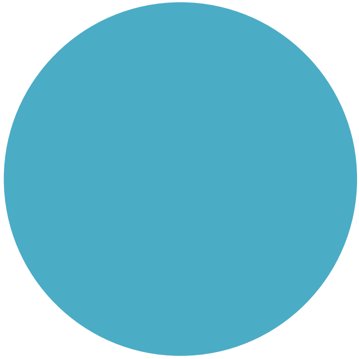
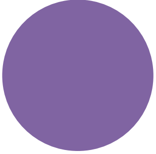
Abdominal

Gastrointestinal

- Reduced peristalsis, gastric motility & gastroesophageal sphincter tone increase the risk of aspiration of gastric contents.
- Intestinal compartmentalization which increases the susceptibility to penetrating injury.

Renal /Urinary

- Compensated respiratory alkalosis which reduced buffering capacity and increases acidosis during CPR.

Etiology

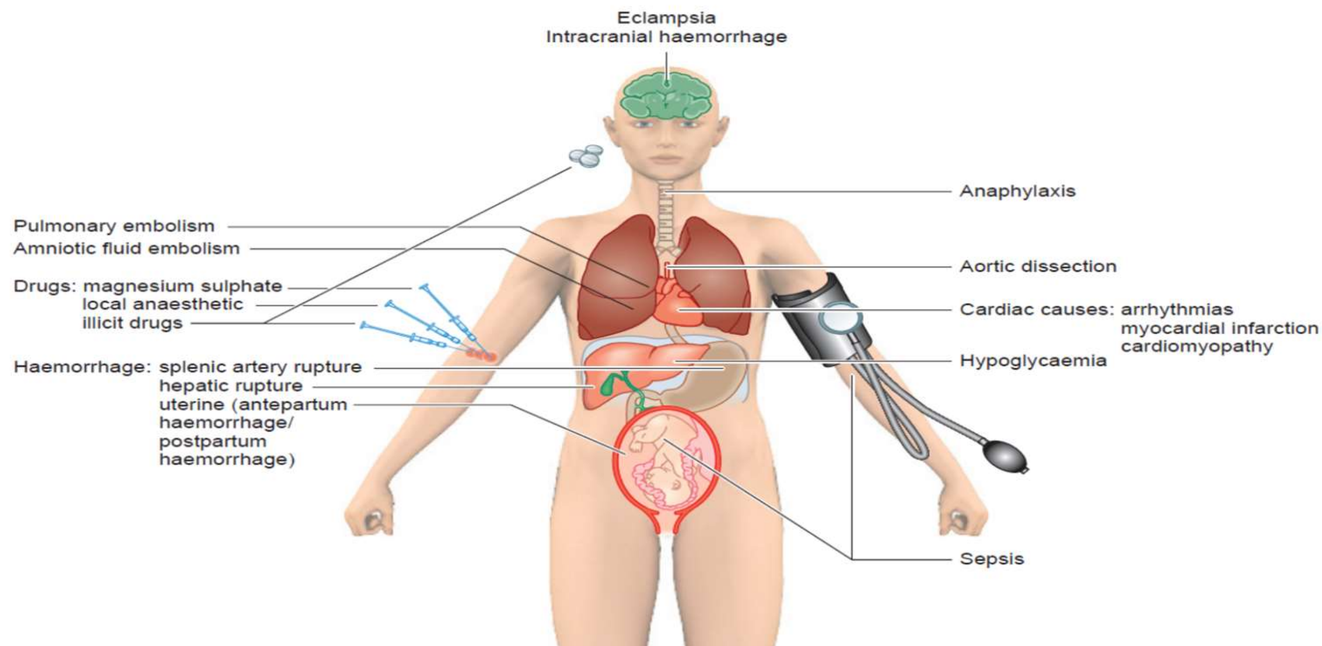
ETIOLOGY

Cause	Rhythm at onset
A-Airway	Bradycardia, not usually asystole
Anesthetics	Bradycardia
Bleeding	Pulseless electrical activity
Cardiac –AMI	VT/VF
CMO	Any rhythm
Aortic Dissection	PEA
Arrhythmia	VT/VF
Structural heart disease	VT/VF
Drugs -Anaphylaxis	Bradyarrhythmia
Hypermagnesemia	Ventricular arrhythmias
Opioid over dose	Bradycardia

Etiology

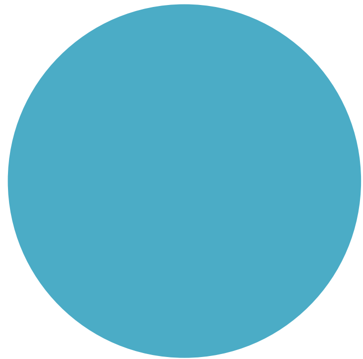
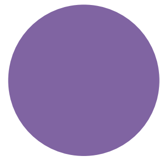
Cause	Rhythm at onset
Hypo-glycemia	Ectopic beats, QTc prolongation
Embolic event- AFE	PEA
VTE	RBBB, S1Q3T3, T wave inv in V1-V4
F- Fever (Sepsis)	Tachycardia, AF
G- General Non Obstetric Causes	
4Hs and 4Ts	PEA
Hypertension	Bradycardia

Helviz Y et al, Curr Opin Anesthesiol 2019

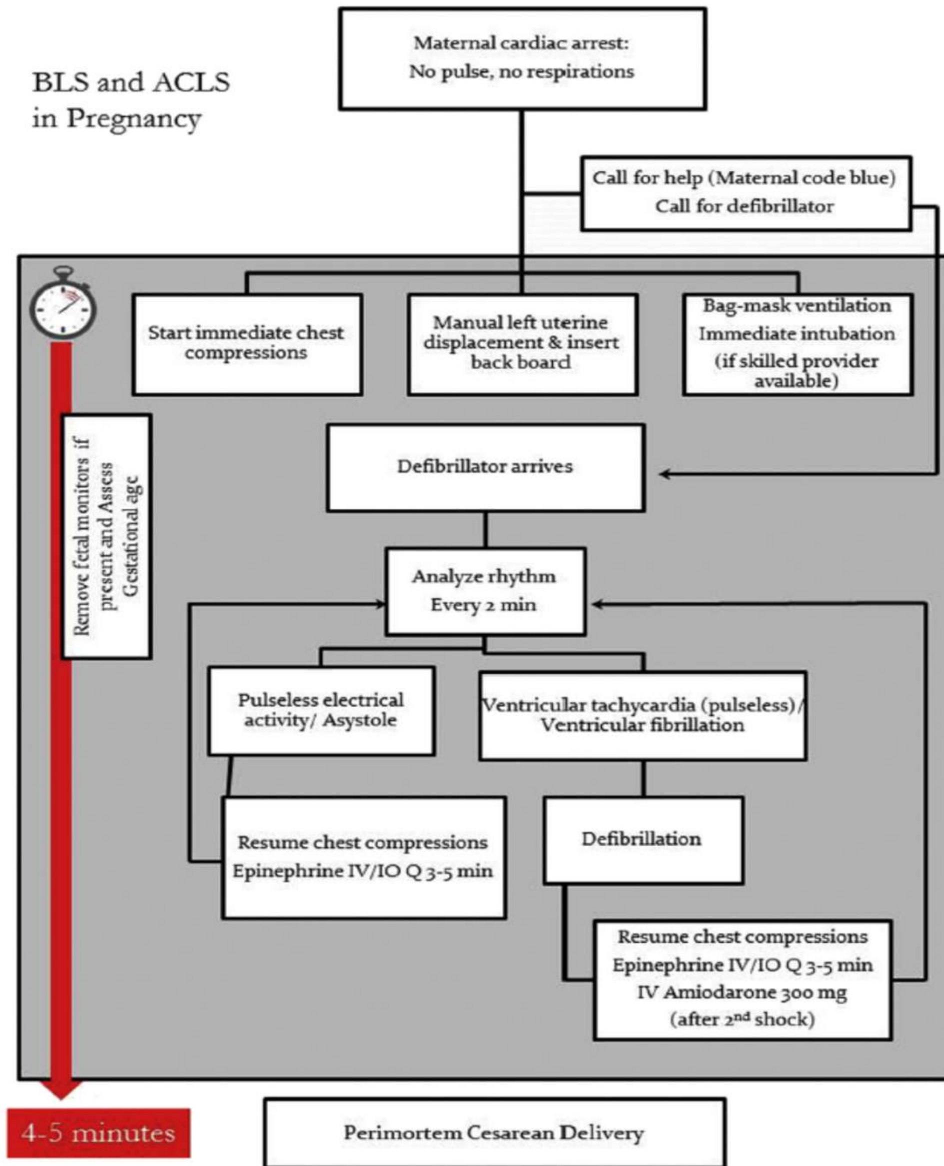


Reversible cause		Cause in pregnancy
4 H's	Hypovolaemia	Bleeding (may be concealed) (obstetric/other) or relative hypovolaemia of dense spinal block; septic or neurogenic shock
	Hypoxia	Pregnant patients can become hypoxic more quickly
		Cardiac events: peripartum cardiomyopathy, myocardial infarction,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

RCOG GTG-56 2011

Management



Kikuchi J et al, Semin Perinatol 2018

Basic Life Support

Place patient fully supine on a firm surface.

Left uterine displacement..

Tilting the bed 30% leftward will not alleviate aortocaval compression

Hand positioning should not be higher in pregnant patients

Early defibrillation.

Airway can be maintained by facemask or LMA as long as airway loss is not the cause of the arrest.

Manual Uterine Displacement

Manual Uterine Displacement

Advanced Life Support

More than 90% of women undergoing CPR get intubated.

Intubate as soon as possible , use smaller size ETT (6.5-7,0)

An expert should be at hand since the rate of difficult obstetric intubation approximates 1:400.

ETCO2 capnography is advocated.

A surgical airway is indicated in instances where ventilation and oxygenation have failed.

Adhere to a breath rate of 8-10 bpm.

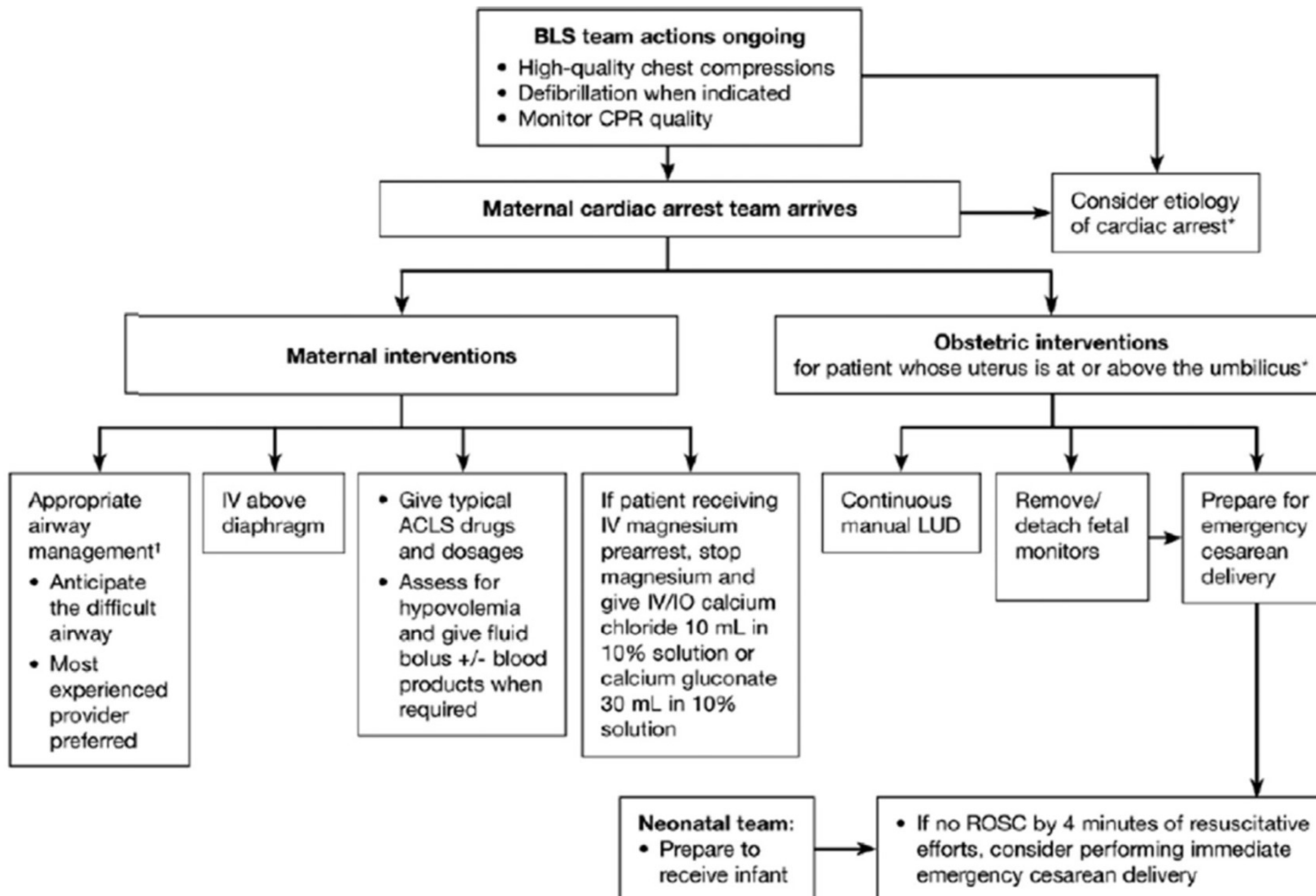
Fetal Delivery

Perform PMCD if ROSC hasn't been achieved within 4-5 minutes of initiation of resuscitative efforts, provided the GA is >20 wks and the uterine fundus has reached the level of the umbilicus.

Arguments supporting PMCD include:

- Higher probability of prolonged unwitnessed arrest
- High likelihood of aortocaval compression
- Intolerably high maternal oxygen consumption requirements.

In the CAPs study, 61% underwent PMCD by 5 minutes. Neonatal survival was higher when PMCD was performed in 5 min 96% vs 70% When performed after 7 minutes



Jeejeebhoy F et al, Circulation 2015

Optimal Oxygen and Carbon dioxide targets during CPR after ROSC

- During a cardiac arrest, the chances of irreversible brain injury increase by 10% every 10 minutes.
- Avoid hyperoxia as evidence of harm has been shown in retrospective human studies.
- Use etCO2 to evaluated correct endotracheal tube placement , CPR quality and to predict ROSC
- Target normocarbia of 40-45mmHg.
- Trials to inform optimal oxygen and carbon dioxide levels are underway.

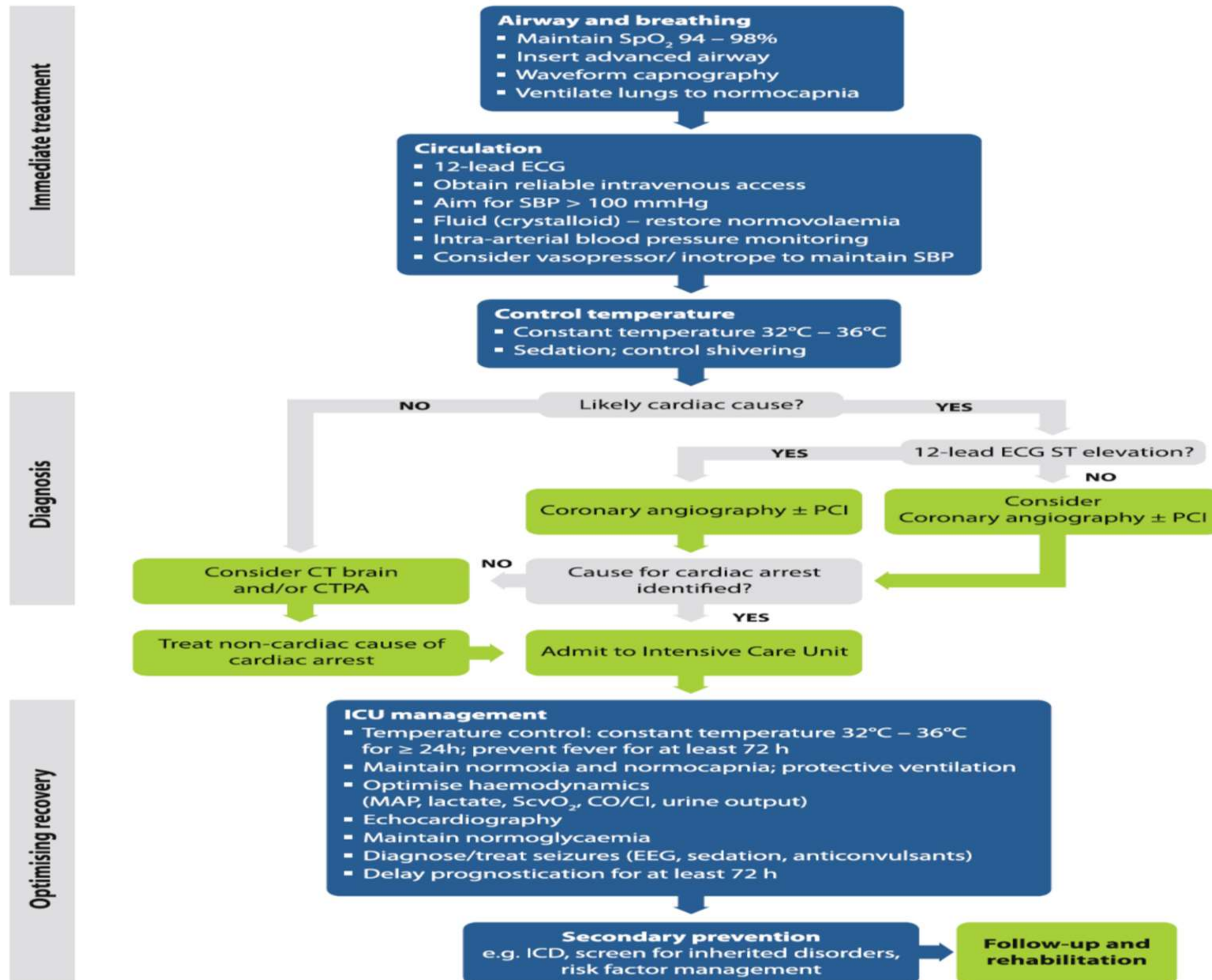
Salvage Therapy and Post Resuscitation care

ROSC is the preliminary step that precludes complete recovery.

Post cardiac arrest syndrome includes: a)Post Cardiac arrest brain injury b)Post cardiac arrest myocardial injury c) Ischemia reperfusion injury.

There is an emerging role of ECMO in refractory cases.

Consider targeted temperature management in refractory cases.

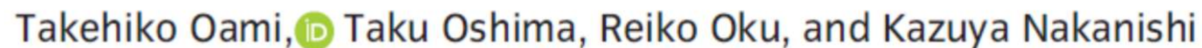


Nolan J et al, Intensive Care Med 2015

Acute Medicine & Surgery 2018; **5**: 292–295 doi: 10.1002/ams2.345

Case Report

Successful treatment of pulmonary embolism-induced cardiac arrest by thrombolysis and targeted temperature management during pregnancy


Takehiko Oami, Taku Oshima, Reiko Oku, and Kazuya Nakanishi

Department of Emergency and Critical Care Medicine, Japanese Red Cross Narita Hospital, Narita City, Chiba, Japan

Prevention

Multi-disciplinary team training and simulations.

Use of a specific PMCD kit.

ESMOE training for Obstetric service providers.

Further research into maternal cardiac arrest with databases adopted to our population.

Conclusion

A rare even that Obstetric providers should be prepared to face.

Skills training and simulation programs must be organized regularly.

Resuscitation must be coordinated in a MDT fashion.

PMCD when ROSC is not obtained within 4-5 minutes