International Journal of Internal and Emergency Medicine

Review Article
Published: 27 Nov, 2020

Teaching Approach of Cardiac Arrest in Pregnancy

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Abstract

Background: Sudden Cardiac Arrest (SCA) in pregnancy is a particularly challenging clinical condition. Although management and resuscitation of these patients are quite similar to other adult patients except for few modifications because of the changes of pregnancy, but the uniqueness of this situation lays in the fact that here you are dealing with two patients instead of one.

Targeted Population: All Pregnancy patients who are requiring urgent management in the ED, with Emergency Physicians for teaching protocol.

Aim of the Study: Appropriate knowledge and training for pregnancy patients by teaching protocol to Emergency Physicians.

Methods: Collection of all possible available data about the pregnancy with cardiac arrest in the Emergency Department. By many research questions to achieve these aims so a midline literature search was performed with the keywords “critical care”, “emergency medicine”, “principals of resuscitation in pregnancy", "Maternal Collapse”. Literature search included an overview of recent definition, causes and recent therapeutic strategies.

Results: All studies introduced that the initial diagnosis of pregnancy with cardiac arrest and their therapy is a serious condition that face patients of the emergency and critical care departments.

Conclusion: Appropriate knowledge and training for pregnancy patients by teaching protocol to Emergency Physicians are extremely important for a better outcome, since a poor resuscitation techniques and knowledge deficit are strongly linked to poorer outcomes.

Keywords: Cardiac arrest in pregnancy; Emergency physicians; Protocol; SCA; SCD

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Received Date: *29 Oct 2020*
Accepted Date*: 18 Nov 2020*
Published Date*: 27 Nov 2020*

Citation:
Elbaih AH, Mohammad A. Teaching Approach of Cardiac Arrest in Pregnancy. Int J Intern Emerg Med. 2020; 3(3): 1036.

Introduction

Epidemiology of cardiac arrest

Cardiac arrest also known as Sudden Cardiac Arrest (SCA) or aborted sudden cardiac death. If the patient dies, it is known as Sudden Cardiac Death (SCD), however by convention SCD is used in both fatal and non-fatal cardiac arrests and is thus used interchangeably with SCA [1]. Cardiac arrest is defined as the sudden loss of heart function in a person with or without an established heart disease [2]. As the name indicates, it is a condition where the heart is "arrested", as it loses its pumping function and stops beating in a proper manner. Cardiac arrest is often confused with other terms such as "heart attack" and "heart failure" and it is important to differentiate between these terms. Heart failure is a progressive and chronic condition in which the heart cannot pump enough blood throughout the body to meet the body's demand. Heart attack on the other hand, also known as Myocardial Infarction (MI), is a result of a blockage of one of the coronary arteries, which provide oxygen-rich blood supply to the heart muscles, resulting in their death. A heart attack is a "circulation" issue, while a cardiac arrest is an "electrical" malfunction of the heart. It is important to take into consideration that although these terms are technically different they are still strongly interconnected. A heart attack may cause cardiac arrest, which will result in heart failure.

SCA in pregnancy is a particularly challenging clinical condition. Although management and resuscitation of these patients are quite similar to other adult patients except for few modifications because of the changes of pregnancy, but the uniqueness of this situation lays in the fact that here you are dealing with two patients instead of one. Despite the fact that the mother is our main focus during management of these types of cases, the life of the fetus should be taken into consideration as well.

The global incidence of SCA is around 3.7 million annually, which represents about 6% of all

deaths [3]. Survival among these cases is estimated at less than 1% [4]. In the united states alone, the total yearly incidence of cardiac arrest is approximately 535,000 cases, of these 326,000 cases occur outside the hospital, which represents about 13 per 10,000 people experience cardiac arrest outside a hospital sitting, while 209,000 cases occur within a hospital [5]. The estimated survival of cardiac arrest patients in USA is about 5% to 8% with almost 60% of them managed by the emergency medical services team [3]. Here in Saudi Arabia, cardiac arrest is responsible for about 7.76 cases per 1000 adult hospital admissions [6]. Cardiac arrest in pregnancy is not very common. In the US cardiac arrest in pregnancy occurs in about 1 in 12,000 admissions for delivery or 1.8 in 10,000 live births [7].

Methodology

This section includes collection of all possible available data about the pregnancy with cardiac arrest in the Emergency Department. By many research questions to achieve these aims so a midline literature search was performed with the keywords “critical care”, “emergency medicine”, “principals of resuscitation in pregnancy", "Maternal Collapse”. Literature search included an overview of recent definition, causes and recent therapeutic strategies. Literature search included an overview of recent definition, causes and recent therapeutic strategies.

So the main aims and outcome of the study: Initial assessment and evaluate the pregnancy with cardiac arrest to recognize potentially life-threatening conditions and to convey life-saving treatment so the key note here is that initial diagnosis in suspected cases with treatment.

Rationale behind the study (why lack of knowledge on this topic is dangerous?)

SCA is amongst the most common conditions in the world, with a staggering mortality rate approaching 98% to 99%. Every person in the community, not just medical professionals, should have ample amounts of updated information about this topic and how to do the initial management for these patients, in order to increase their chances of survival. Every single minute of delay of Cardiopulmonary Resuscitation (CPR) decreases the patient's chances of survival by 7% to 10% [8]. Sudden cardiac death in pregnancy is a rare yet quite challenging situation, since here you are not just dealing with the risk of losing the mother's life but you have also to be aware and pay close attention to the fetus and do all what's in your power to save it as well. Pregnant women also have some anatomical and physiological changes, which the resuscitator should have enough information about, as these changes slightly affect the resuscitation techniques. Appropriate knowledge and training is extremely important for a better outcome, since a poor resuscitation techniques and knowledge deficit are strongly linked to poorer outcomes.

Etiologies and pathophysiology

The exact mechanism of cardiac arrest for each individual case is often difficult to establish in many patients because most of them are usually unmonitored during the cardiac arrest. But the mechanism can often be deduced using the information available after the process has already started. In patients who were being monitored continuously at the time of the cardiac arrest in the hospital or those with a 24-h ambulatory ECG, Ventricular Tachycardia (VT) or Ventricular Fibrillation (VF) accounted for the majority of the episodes (65% to 85% of cases of cardiac arrest) while bradyarrhythmia, pulse less electrical activity or asystole accounted for the remainder (20% to 30% of cases of cardiac arrest) [3]. The main mechanism of cardiac arrest is due to disturbance of the heart's electrical system causing fatal arrhythmias and eventually a total arrest of cardiac activity. Cardiac arrest will result in the heart failing to pump the blood to the brain, lungs and other vital organs, which in just a few seconds will render the person unconscious with no pulse and eventually death will ensue within minutes if the victim does not receive treatment. Multiple causes have been identified that disturb the electrical function of the heart and cause sudden cardiac arrest, and they can be divided into two branches cardiac and non-cardiac causes. Cardiac causes can be further divided into non-structural and structural, with structural causes having two categories, ischemic and non-ischemic [9].

First starting with the cardiac causes

Structural:

- Ischemic heart disease: which includes Coronary Artery Disease (CAD) with MI, non-atherogenic CAD, coronary artery spasm, etc? Of these, coronary artery disease is considered as the most common cause of cardiac arrest, and was attributed to 65% to 70% of all SCAs [10], and hence should always be considered and investigated in all survivors of cardiac arrests.

- Non-ischemic heart disease: these include cardiomyopathy, valvular heart disease, congenital heart disease, myocarditis, acute myocardial tamponade, etc.

Non-structural: Which represents about 10% of all SCAs and covers certain electrical abnormalities of the heart like, idiopathic ventricular fibrillation, Brugada syndrome, long QT syndrome, complete heart block, commotio cordis, etc?

Second are the non-cardiac causes, which account for 15% to 25% of cardiac arrest. The most common non-cardiac causes of cardiac arrest are; pulmonary embolism, drowning, intracranial hemorrhage, drug induced, etc.

Many of these previously mentioned causes are reversible and thus should be promptly identified and managed appropriately, as they carry a high survival rate if managed within an appropriate time. Reversible causes of cardiac arrest can be remembered by the mnemonic "Hs &Ts" which includes, Hs (hypovolemia, hypoxia, hydrogen ions or acidosis, hypo/hyperkalemia, hypoglycemia and hypothermia) and Ts (toxins including medications or any other drugs, tamponade, tension pneumothorax and thrombosis which can be in coronary arteries or in the lungs).

Risk factors

Most of cardiac arrests occur in the adult population, which could partially be explained by the higher prevalence of heart diseases among this population, resulting in a higher incidence of cardiac arrests with older age [11]. Studies also show a disparity between the risk of sudden cardiac arrest in males compared to females, as men have a 3 to 4 fold higher risk of having a cardiac arrest than women, although currant evidence arising suggest that this disparity is declining [11]. In addition to age and sex, race has also been identified as one of the most important non-modifiable risk factor for SCA, with individuals of African American origins having a much higher rate of SCA and poorer outcomes capered those of Hispanic or Caucasian origins [12].

Multiple clinical risk factors have been linked to SCA in various studies. These risk factors can be linked to the previously mentioned causes of cardiac arrest. Starting with the most common cause of cardiac arrest, which is coronary artery disease, multiple risk factors

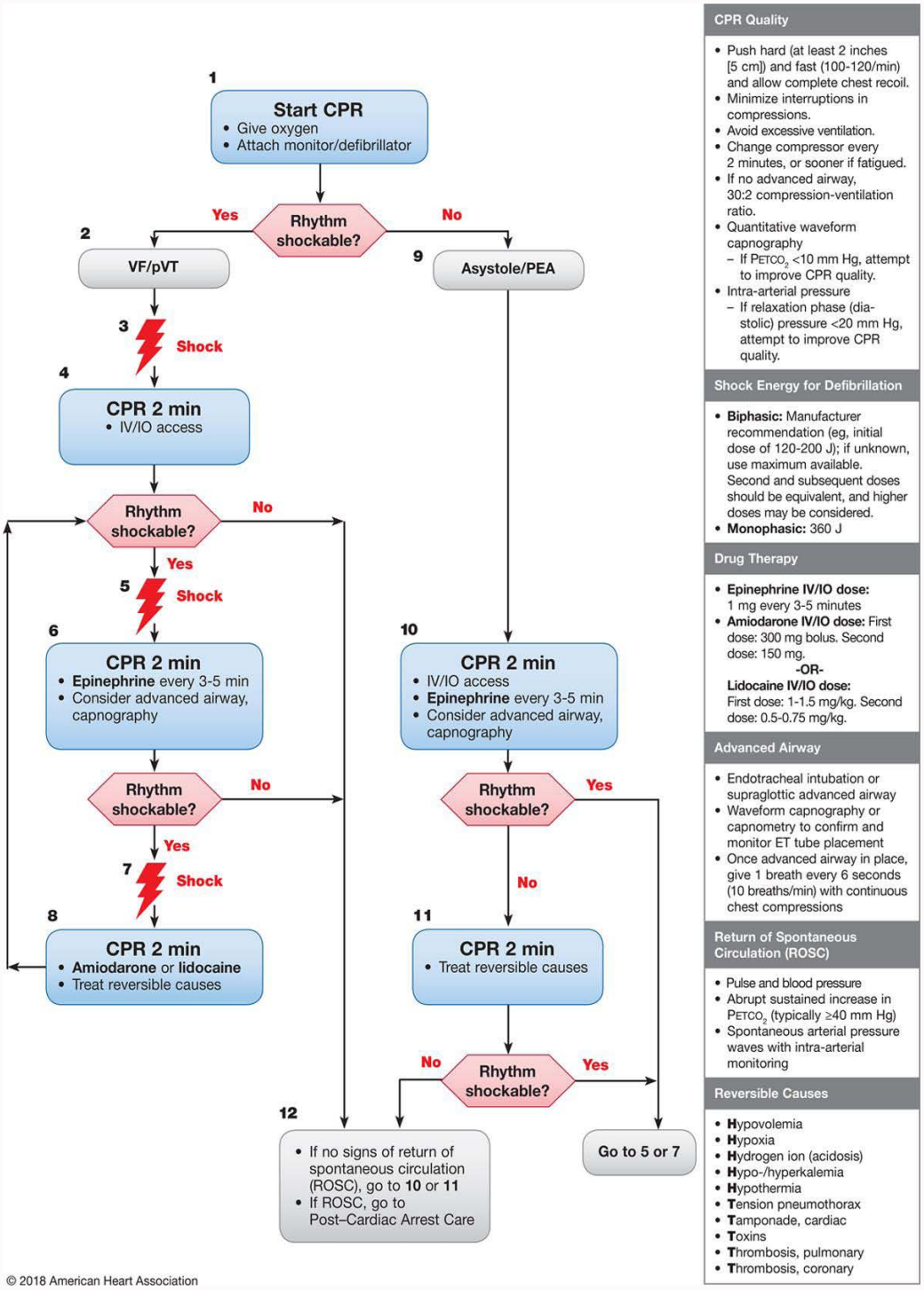

Figure 1: Adult Cardiac Arrest Algorithm-AHA 2018 Update.
Abbreviations: CPR: Cardiopulmonary Resuscitation; ET: Endotracheal; IO: Intraosseous; IV: Intravenous; PEA: Pulseless Electrical Activity; pVT: Pulseless Ventricular Tachycardia; VF: Ventricular Fibrillation

have been related to it including; diabetes, HTN, dyslipidemia, obesity and smoking which were all linked to SCA as well. Family history of sudden cardiac arrest also might represent another possible risk factor [13]. Some clinical conditions have also been linked to a higher risk of SCA, including Chronic Kidney Disease (CKD), atrial fibrillation as well as Obstructive Sleep Apnea (OSA) [14]. Data from various studies have identified multiple psychological and mental illnesses that also carry a risk for developing cardiac arrests, such as depression, anxiety and psychosis [14]. Lifestyle was also found to have a role in the predisposition to SCA. Dietary patterns that includes more fish, Omega-3 fatty acids, magnesium and a Mediterranean-style diet seems to have a protective effect against SCA [14,15]. Vigorous exercise has been identified as a possible trigger for cardiac arrest, especially in those patients who have other concomitant predisposing risk factors, but various data supports the belief that regular low to moderate physical activity results in a lower

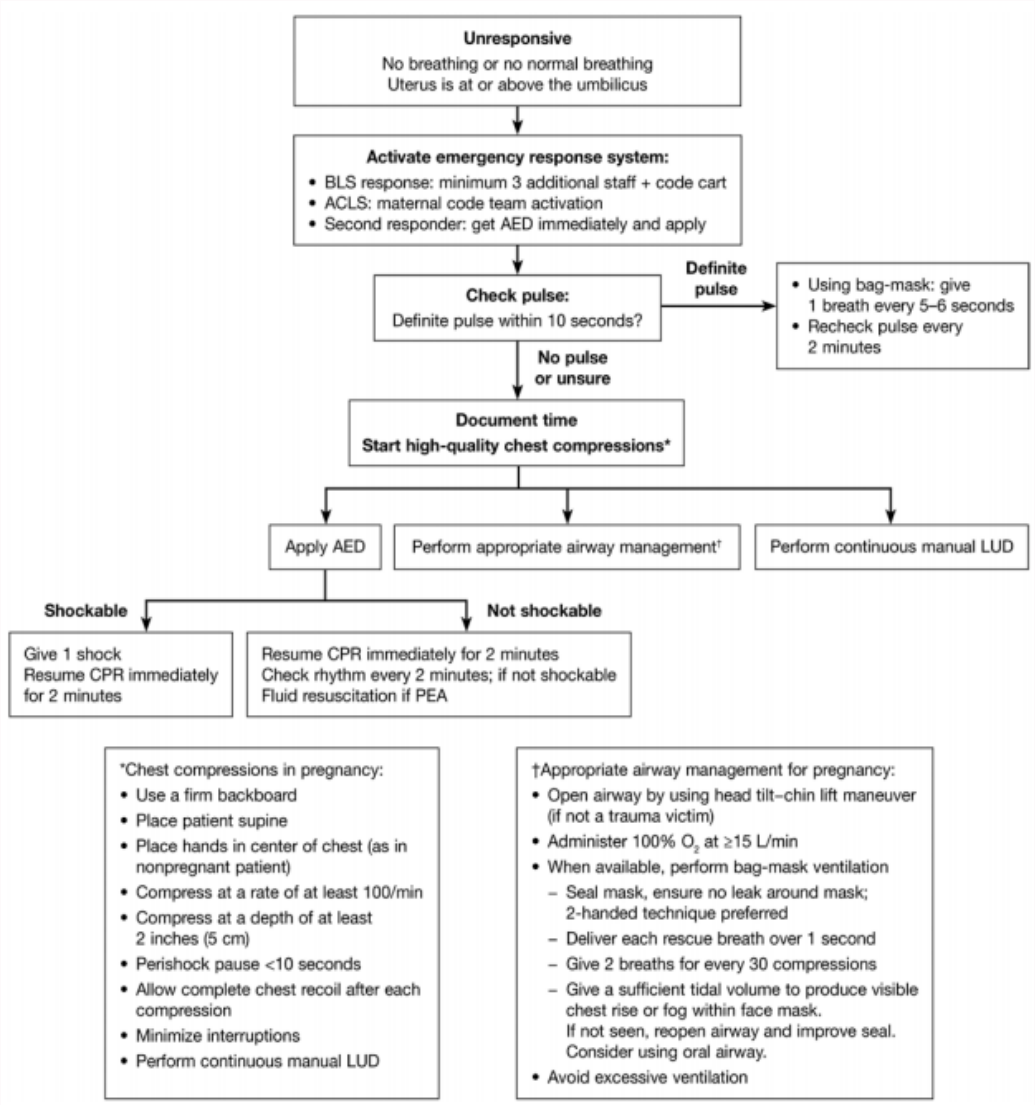

Figure 2: Cardiac arrest in pregnancy in-hospital Basic Life Support (BLS) algorithm: Simultaneous C-A-B-U (chest compressions/Current Airway-Breathing-Uterine displacement).
Abbreviations: ACLS: Advanced Cardiovascular Life Support; AED: Automated External Defibrillator; CPR: Cardiopulmonary Resuscitation; LUD: Left Uterine Displacement; PEA: Pulseless Electric Activity

risk for developing SCA [16].

Signs and symptoms

The first sign of cardiac arrest is usually loss of consciousness or collapse. Along with this, the patient will have no heartbeat/pulse. In addition, the patient will not be breathing or will have an abnormal breathing (gasping). Patient who is suffering a cardiac arrest will not be arousable and will not respond to touch or talk; also the patient will have no awareness of their surroundings [17]. Cardiac arrest is often sudden and unexpectable; however some patients might experience some symptoms before the cardiac arrest. Some may feel dizziness, racing heart beat or light headedness just before collapsing. In addition, some patients might have dyspnea, chest pain, nausea or vomiting [18].

Some of the important anatomical and physiological changes in pregnancy

Many anatomical and physiological changes occur during pregnancy and sufficient knowledge about these changes is necessary to ensure the highest possible quality of care and the most favorable resuscitation outcomes. Some of these physiological and anatomical changes include [7].

- Increased cardiac output 3% to 50% which mainly linked to the increased stroke volume.
- There is increase in estrogen, progesterone, and nitric oxide which are powerful vasodilators leading to decrease of the systemic vascular resistance, that leads to decrease in the Mean Arterial Pressure (MAP), which reaches its lowest points in the second trimester.
- The uterus enlarges and compresses both the inferior vena cava and the abdominal aorta, which decreases the venous return leading to decreased venous return and raises the after load respectively. This becomes evident at around 12 to 14 weeks of gestation. Because of this, pregnant patients might suffer hypotension during resuscitation since it is usually performed in the supine position [7].

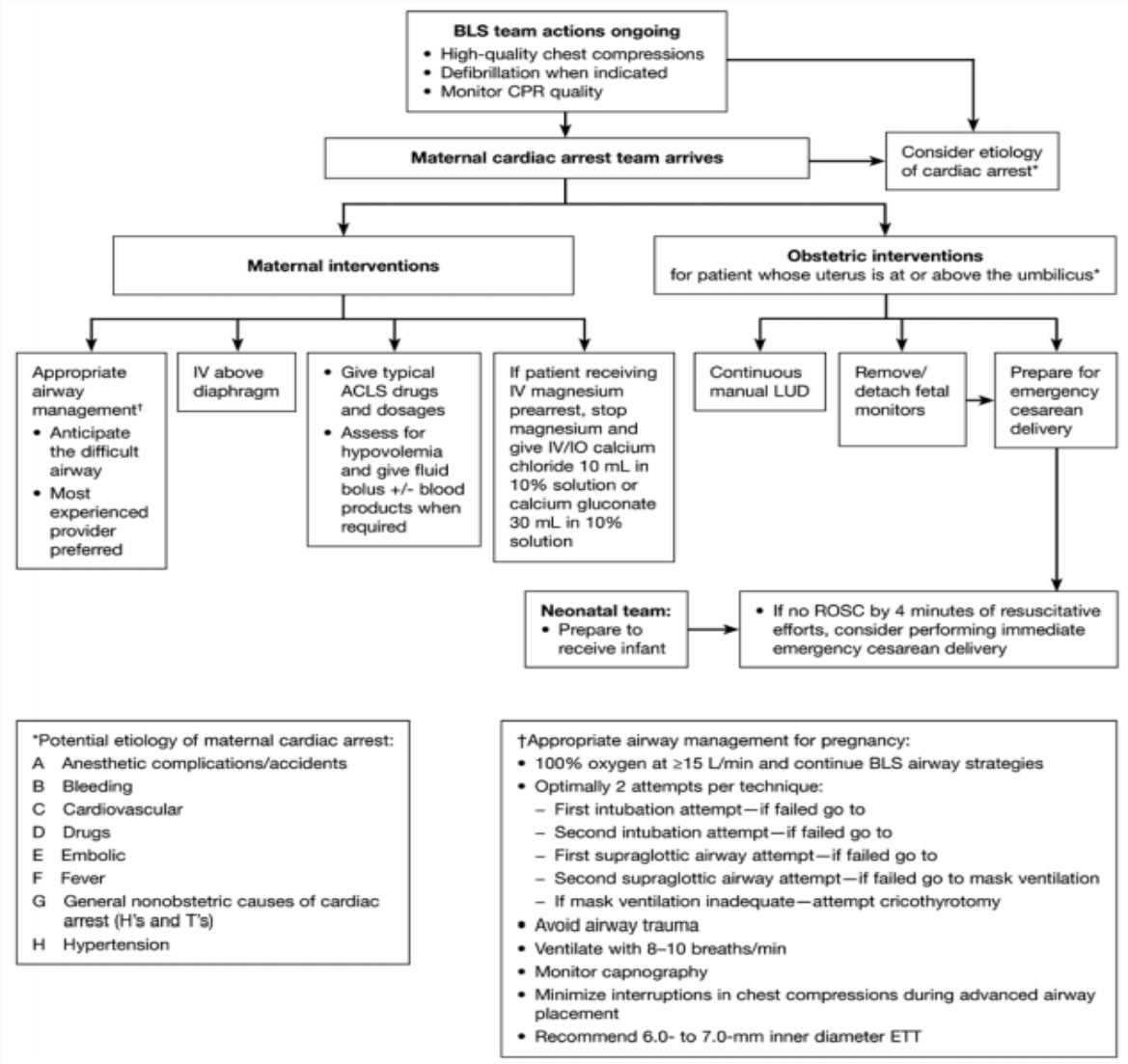

Figure 3: Cardiac arrest in pregnancy in-hospital Advanced Cardiovascular Life Support (ACLS) algorithm.
Abbreviations: BLS: Basic Life Support; CPR: Cardiopulmonary Resuscitation; ETT: Endotracheal Tube; IV: Intravenous; IO: Intraosseous; LUD: Left Uterine Displacement; ROSC, Return of Spontaneous Circulation

- As the uterus becomes larger it elevates the diaphragm which affects breathing in pregnant women. There is a 10% to 25% decrease in the Functional Residual Capacity (FRC). The elevation in serum progesterone level, starting from the first trimester, leads to increase in ventilation which increases by 20% to 40% by term and thus, leading to increase in minute ventilation and in tidal volume [19].

- By the third trimester, the pregnant woman will have a 20% to 30% increase in oxygen consumption, which is largely related to the increased maternal metabolic processes and the fetus demand. This increase in oxygen consumption along with the reduced FRC leads to rapid development of hypoxia in pregnant patients if hypoventilation or apnea were to occur.

Management of cardiac arrest in pregnancy

Quick response to cardiac arrest can reverse it in most victims if it is managed within a few minutes. Management of cardiac arrest in pregnancy is not very different from that of a non-pregnant patient. Cardiopulmonary Resuscitation (CPR) starts with evaluating airway, breathing, and circulation. The main focus of the CPR is the mother first, and the mother is stable we begin evaluating the fetus. First step is evaluating the gestational age of the fetus to determine its viability. If the fetus is not viable, we direct our efforts solely towards the mother's well-being. The fundal height is approximately equivalent to the gestational age. If the fundus is reaching around the level of the pubic symphysis the gestational age is estimated at around 12 weeks. When the fundus is at the level of umbilicus the gestational age is about 20 weeks. When the fundus reaches the level of the xiphoid process the average gestational age is around 36 weeks. The minimum age at which the fetus is considered as viable is after 24 weeks of gestation in which the fundal height will be about 3 cm to 4 cm or more above the umbilicus. As mentioned earlier, hypoxia occurs rapidly in a pregnant woman with cardiac arrest due to their lower oxygen reserve and higher consumption of oxygen. Because of that, oxygen supplementation has to be initiated immediately if it has not yet been started prior to arrival to ER and should be continued until hypoxia, fetal distress and hypovolemia are ruled out. The American Heart Association (AHA) advises that the same

Call for help **Start CPR**	☐ Call maternal code blue (Time: _____) ☐ Backboard (Time: _____) ☐ IMMEDIATE BLS ☐ AED/defibrillator ☐ Maternal airway equipment ☐ Scalpel/cesarean pack ☐ Assign timer/documenter ☐ Document time of cardiac arrest (Time: _____) ☐ Assign cognitive aid reader/recorder
C Circulation Chest Compressions	☐ Left uterine displacement (manual) (Time: _____) ☐ Hands midsternum ☐ 100 compressions/min (Time: _____) ☐ PUSH HARD, PUSH FAST ☐ Change compressors every 2 minutes ☐ Obtain IV access above diaphragm (Time: _____)
A Airway	☐ Minimize interruptions in chest compressions ☐ Chin lift/jaw thrust if not trauma victim ☐ 100% O_2 at ≥15 L/min (Time: _____) ☐ Use self-inflating bag-mask ☐ Oral airway or ☐ Experienced personnel: intubation with 6.0- to 7.0-mm inner diameter ETT or (Time: _____) ☐ Supraglottic airway (eg, laryngeal mask airway with gastric port) (Time: _____)
B Breathing	☐ If not intubated: 30 compressions to 2 breaths ☐ If intubated: 8–10 breaths/min ☐ Administer each breath over 1 second
D Defibrillate	☐ Pads front and side ☐ AED: analyze/defibrillate every 2 minutes (Time: _____) ☐ Immediately resume CPR for 2 minutes ☐ Prepare for delivery
E Extract Fetus	☐ PMCD started (Time: _____) and ☐ Fetus delivered (Time: _____)

Figure 4: Checklist evaluation for teaching cardiac arrest in pregnancy.

resuscitation algorithm used in non-pregnant patients (Figure 1) to be followed in pregnant women, with some adjustments to take into account the anatomical and physiological changes occurring during pregnancy [20]. The primary survey (ABC) needs no alterations to the management of airway or breathing in pregnant patients. The circulation however can be improved by tilting the patient to the left 15°C to 30°C, or have someone push the uterus to the left side in order to relieve the pressure from the IVC and better improve the cardiac preload. The "Cardiff wedge" can also be used, as it tilts the patient at an angle of about 27 degrees, which improves the venous return without significantly impacting the quality of chest compressions. Defibrillation use in a pregnant woman is the same for any other patient and requires no change in position or dosage. Data has not shown any increase in the risk on the fetus with defibrillator use, only the removal of fetal and uterine monitors is required prior to shock delivery [21]. The highest number of alterations in the resuscitation of a pregnant woman is in the secondary survey. Airway management is particularly difficult as the alignment of the larynx is affected because of the increased weight associated with pregnancy, leading to a more challenging intubation. The best position for a pregnant woman during airway management is the sniffing position, where the head of the patient is elevated and flexed while the neck is extended at the atlanto-occipital joint, which facilitates easier intubation. A lower threshold for intubation should be maintained in pregnant women as they have a higher risk of aspiration, because hormonal changes relaxes gastroesophageal sphincter and slows down the GIT motility. Intubation induction medications and their doses are not different from that of non-pregnant patients, however a higher dosage of some medications are necessary if the normal dose is not effective as pregnancy causes hypervolemia which could affect drug function. If the pregnant woman was put on a ventilator, the settings have to be adjusted because of the woman's low oxygen reserve. Oxygen saturation in a pregnant woman has to be kept over 60 mmHg as lower saturations could cause hypoxia to the fetus [20]. Another point that should be taken into consideration during resuscitation of these patients is that because of the significantly increased blood

volume during pregnancy significant volume loss has to occur before the patient starts showing signs of hypovolemia. The majority of ACLS medications can safely be administered during pregnancy, except vasopressors, which has the potential to impair perfusion of the uterus and thus should be avoided unless crystalloid infusion has been administered first [20]. After the mother is stable, immediately start the assessment of the fetus. Checking fetal heart sounds is the first step in the fetal evaluation as absence of fetal heart sounds carries a poorer fetal resuscitation chance. The optimal fetal heart rate is 120 bpm to 160 bpm. Fetal bradycardia could indicate hypoxia, which can be a result of maternal hypoxia, placental disruption, hypovolemia or hypotension. The effect of cardiac arrest on the fetus differs depending on the cause of the arrest. Regardless of the cause, the best chance for survival of the fetus is by maternal resuscitation regardless of the cause. Check Figure 2 and 3 for pregnant patient's in-hospital BLS and ACLS algorithms [7,8] (Figure 4).

Perimortem cesarean delivery (PMCD)

If resuscitation of the mother fails, emergent cesarean section delivery should be considered. The cut-off for fetal viability is 24 weeks or more, if the fetus is younger than this, its chance of survival is extremely poor. Perimortem cesarean delivery should be done as early as 4 min after maternal arrest, because if delivery was delayed for more than 5 min of maternal cardiac arrest the infant is less likely to be viable. Delivery of the infant can sometimes improve the mothers response to resuscitation efforts as the inferior vena cava is no longer compressed, which results in an increased venous return [20-22].

Conclusion

In the topic of cardiac arrest and specifically cardiac arrest in pregnancy there is only one word that is the main key determinant of the outcome of the patient and the fetus, that word is "time". The quicker the cardiopulmonary resuscitation is started and the quicker the AED is attached the higher the survival rate. Also quick decisive decisions are crucial in regards to starting the perimortem cesarean delivery, in order to get the best outcomes of that procedure for the mother and possibly the fetus as well. The topic of cardiac arrest during pregnancy also poses some huge ethical dilemmas for the health care professionals as well as the family of the patient, in regards to the mother *vs.* the fetus well-being, but it is widely accepted that the mother is the main center of focus during the management. Sufficient knowledge and training about the topic and algorithms of cardiac arrest should be promoted not just between health care professionals but also among the general population, since bystander CPR is one of the greatest determinants of patient survival in out-hospital cardiac arrests.

References

1. Philip JP, Brian O, Scott M, Susan BY. Overview of sudden cardiac arrest and sudden cardiac death. UpToDate. 2020.
2. Ismail MT, Elbaih AH. Principles of intravenous fluids therapy. EMCC. 2020;4(6):24-46.
3. Kronick SL, Kurz MC, Lin S, Dana PE, Robert AB, John EB, et al. Part 4: Systems of care and continuous quality improvement: 2015 American Heart Association Guidelines update for cardiopulmonary resuscitation and emergency cardiovascular care. Circulation. 2015;132(18 Suppl 2):S397-S413.
4. Alzahrani AH, Alnajjar MF, Alshamarni HM, Alshamrani HM, Bakhsh AA. Prevalence and outcomes of sudden cardiac arrest in a university hospital in the western region, Saudi Arabia. Saudi J Med Med Sci. 2019;7(3):156-62.
5. Elbaih AH, Taha M, Elsakaya MS, Elshemally AA, Alshorbagy ME. Assessment of cardiopulmonary resuscitation knowledge and experiences between emergency department nurses hospital pre and post basic life support training course, Egypt. Ann Med Res. 2019;26(10):2320-7.
6. Elbaih AH, Housseini AM. Validity of shock index, modified shock index, central venous pressure, and inferior vena cava collapsibility index in evaluation of intravascular volume among hypovolemic Egyptian patients. A J Diagn Imaging. 2018;4(1):5-13.
7. Wong CX, Brown A, Lau DH, Sumeet SC, Christine MA, Jonathan MK, et al. Epidemiology of sudden cardiac death: Global and regional perspectives. Heart Lung Circ. 2019;28(1):6-14.
8. Whang W, Manson JE, Hu FB, Chae UC, Rexrode MK, Willett CM, et al. Physical exertion, exercise, and sudden cardiac death in women. JAMA. 2006;295(12):1399-403.
9. Taha M, Elbaih A. Pathophysiology and management of different types of shock. NMJ. 2017;6(1):14-39.
10. Mehra R. Global public health problem of sudden cardiac death. J Electrocardiol. 2007;40(6 Suppl):S118-22.
11. Seidl K, Senges J. Worldwide utilization of implantable cardioverter/defibrillators now and in the future. Card Electrophysiol Rev. 2003;7(1):5-13.
12. Elbaih AH, Elsayed MZ, Ahmed RM, Abd-elwahed SA. Sepsis Patient Evaluation Emergency Department (SPEED) score & Mortality in Emergency Department Sepsis (MEDS) score in predicting 28-day mortality of emergency sepsis patients. Chin J Traumatol. 2019;22(6):316-22.
13. Philip JP, Brian O, Scott M, Susan BY. Pathophysiology and etiology of sudden cardiac arrest. Up-to-date. 2020.
14. CDC. State-specific mortality from sudden cardiac death --- United States, 1999. MMWR Morb Mortal Wkly Rep. 2002;51(6):123-6.
15. Elbaih AH. Different types of triage. Arch Med Rev J. 2017;26(4):441-67.
16. Chugh SS, Jui J, Gunson K, Eric CS, Benjamin TJ, Barbara T, et al. Current burden of sudden cardiac death: multiple source surveillance *vs.* retrospective death certificate-based review in a large U.S. community. J Am Coll Cardiol. 2004;44(6):1268-75.
17. Shah KS, Shah AS, Bhopal R. Systematic review and meta-analysis of out-of-hospital cardiac arrest and race or ethnicity: Black US populations fare worse. Eur J Prev Cardiol. 2014;21(5):619-38.
18. Elbaih AH, Al-Nasser AU. Review on ACLS approach of pregnancy in maternal collapse. Int J Case Rep Short Rev. 2020;6(8):38-46.
19. Elbaih AH, Shukri Raed Alnasser SR. Teaching approach for START triage in disaster management. Med Sci. 2020;9(4).
20. Albert CM, Hennekens CH, O'Donnell CJ, Ajani UA, Carey VJ, Willett WC, et al. Fish consumption and risk of sudden cardiac death. JAMA. 1998;279(1):23-8.
21. Elbaih AH, Basyouni FH. Teaching approach of primary survey in trauma patients. Int J Intern Emerg Med. 2020;3(3):1035.
22. Elbaih AH, Nasr GM, Kasabi AE, Yussef HH. Updates emergency ischemic chest pain. EMCC. 2020;4(11):12-47.