

Managing Cardiac Conditions During Labor and Delivery

2 Contact Hours

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Acknowledgments

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Purpose and Objectives

The purpose of this course is to provide the healthcare professional with a broad overview of some of the more common cardiac conditions seen in pregnancy and labor, and to review patient care principles related to high-risk cardiac patients.

After successful completion of this course, you will be able to:

1. Identify the anatomical and physiological changes that occur in the cardiovascular system during pregnancy and delivery.
2. Discuss positioning, pain relief, hemodynamic and fetal monitoring during the first stage of labor.
3. Review the principles for managing second stage in a high-risk cardiac patient.
4. Identify a major potential risk factor for the cardiac patient in the third stage of labor.
5. Describe the management of the cardiac patient in the early postpartum period.
6. List possible causes of cardiac arrest in the high-risk cardiac patient during labor and delivery.

Introduction

The management of the intrapartum client with cardiac disease presents a unique challenge to healthcare providers.

Physiological changes in blood volume, increased cardiac output, and the increasing oxygen demands of the growing fetus during pregnancy place high demands on the maternal cardiovascular system. If pre-existing cardiac disease is present, these extra demands may lead to a cardiac crisis during delivery.

This course will review the basic anatomy and physiology of the cardiovascular system before exploring some of the more common cardiac conditions seen in pregnancy. Note that the cardiac conditions mentioned in this course are not explored in detail or meant to represent a comprehensive review, as this is beyond the scope and purpose of this presentation. A basic glossary of terms used in this presentation is included to facilitate learning.

Finally, a review of some of the intrapartum patient care principles related to high-risk cardiac patients will be presented to assist the labor and delivery nurse in appropriately managing a high-risk cardiac patient in labor.

Anatomy of the Heart

The human heart is a pear-shaped structure, about the size of a clenched fist. The four chambers of the heart, namely the right and left atrium and the right and left ventricle, function to pump blood around the body.

The right side of the heart pumps blood to the lungs, where oxygen is added and carbon dioxide is removed from the blood. The left side pumps blood to the rest of the body, where oxygen and nutrients are delivered to tissues and waste products are transferred to the blood for removal by the lungs and kidneys.

The right side of the heart receives deoxygenated blood from the body, via the venae cavae into the right atrium. When the right ventricle relaxes, blood in the right atrium pours into the right ventricle, and is then pumped into the pulmonary arteries. In the lungs, blood absorbs oxygen and releases carbon dioxide, which is then exhaled.

Anatomy & Physiology

Oxygen-rich blood from the lungs then flows through the pulmonary veins into the left atrium. When the left ventricle relaxes, the blood in the left atrium pours into the left ventricle. When the left ventricle contracts, this oxygen rich blood is propelled into the aorta for distribution to the body.

To ensure that blood flows in only one direction, each ventricle has an inlet and an outlet valve. In the left ventricle, the inlet valve is the mitral valve, and the outlet valve is the aortic valve. In the right ventricle, the inlet valve is the tricuspid valve, and the outlet valve is the pulmonary valve.

Each valve consists of flaps (cusps), which control the flow of blood in one direction. The mitral valve has two cusps; the others (tricuspid, aortic, and pulmonary) have three cusps.

The large inlet valves (mitral and tricuspid) have tethers, which consist of papillary muscles and cords of tissue, and prevent the valves from swinging backward into the atria. If a papillary muscle is damaged, the valve may then swing backwards and start leaking. If a valve opening is narrowed, blood flow through the valve is reduced.

Test Yourself

The inlet valve to the left ventricle is the:

- A. Mitral Valve – Correct!
- B. Aortic Valve
- C. Tricuspid Valve
- D. Pulmonary Valve

Physiological Adaptations During Pregnancy

The physiologic adaptations that occur during pregnancy and labor can place a woman with cardiac disease at increased risk for cardiac decompensation during the intrapartum period (Witchner, P. et al., 2006).

| Blood Volume | Cardiac Output | Lung Volumes |
|--|--|---|
| During pregnancy, blood volume increases by 40 - 45 percent from non-pregnant levels. The increase is needed for extra blood flow to the uterus, the extra metabolic needs of fetus, and increased perfusion of others organs, especially the kidneys. Extra volume also compensates for maternal blood loss during delivery. The average blood loss with vaginal delivery is 500-600ml, and with cesarean section is 1000ml (Sodre, P. 2010). | Cardiac output also increases during pregnancy, reaching its maximum at 20-24 weeks' gestation and continuing at this level until term. Cardiac output is very sensitive to changes in body position. This sensitivity increases with lengthening gestation, presumably because the uterus impinges upon the inferior vena cava, thereby decreasing blood return to the heart. In latter pregnancy and during the intrapartum period, prolonged positioning in a supine position can severely impede venous return. This can lead to tachycardia and other compensatory actions that should be avoided in the patient with cardiac compromise. | <p>In addition to these changes, there are several pulmonary adaptations that occur during pregnancy that impact cardiac function.</p> <p>As the uterus enlarges, the diaphragm is elevated and the rib cage is displaced upward and widens, increasing the lower thoracic diameter, and expanding lung volumes. However, this elevation of the diaphragm does not significantly impede respiration.</p> <p>These alterations in lung volumes and capacity during pregnancy impact lung function. In the healthy pregnant woman, these changes are relatively insignificant. However, when cardiac disease is present, these physiological adaptations during pregnancy may compromise cardiovascular stability during labor.</p> |

Effects of Labor on The Cardiovascular System

During contractions, the cardiovascular system is subject to additional stress. The heart has to work harder to maintain organ perfusion.

Positioning affects the demands placed on the cardiovascular system. If the laboring patient is positioned in the supine position, uterine contractions can cause a 25 percent increase in maternal cardiac output, and a resultant 33 percent increase in stroke volume (Sodre, P. 2010). However, when the laboring patient is in the lateral recumbent position, the hemodynamic parameters stabilize, with only a 7.6 percent increase in cardiac output and a 7.7 percent increase in stroke volume (Sodre,

P. 2010). These significant differences are attributable to partial occlusion of the inferior vena cava by the weight of the gravid uterus.

The best position for the laboring woman with cardiac compromise is the left lateral recumbent position. In this position, pulse pressure increases only six percent, compared to an increase of 26 percent in the pulse pressure when the supine position is used. Central venous pressure increases in direct relationship to the intensity of uterine contraction and increased intra abdominal pressure.

Additionally, cardiopulmonary blood volume increases 300-500mL during contractions. At the time of delivery, hemodynamic alterations vary with the type of anesthetic used (Sodre, P. 2010).

During labor, cardiac output can be further increased by sympathetic stimulation as a result of pain or apprehension. Depending on the type of pre-existing cardiac disease, labor and delivery may not be tolerated. Women who are typically more vulnerable during labor are those with ventricular dysfunction, pulmonary hypertension or myocardial ischemia.

Minimizing the vulnerability for cardiac decompensation should be the focus during labor.

Effects of Positioning on Cardiovascular Function

| Position | CO During Contractions | SV During Contractions |
|-------------------|------------------------|------------------------|
| Supine | 25% Increase | 33% increase |
| Lateral Recumbent | 7.6% increase | 7.7% increase |

Introduction to Common Cardiac Disorders in Pregnancy

Although cardiac disease complicates only one to four percent of all pregnancies in the United States (Waksmonski et al., 2013), maternal cardiac disease is a major concern during the intrapartum period.

In the past, rheumatic heart disease was the most common form of cardiac disease in pregnant women. However, congenital heart disease is now the most common form of heart disease complicating pregnancy in the United States (Waksmonski, 2013).

In addition, many women are postponing childbearing until the fourth and fifth decades of life. Advancing maternal age with underlying medical conditions such as hypertension, diabetes, and hypercholesterolemia is more common today, and increase the incidence of cardiac complications during pregnancy (Waksmonski, 2013).

Congenital heart disease is the most common type of birth defect in the U.S., affecting nearly 1% of births per year (CDC, 2014). Congenital heart defects are conditions that are present at birth and can affect the structure of the heart and the way blood flows. Congenital heart defects can vary from mild (such as a small hole between the chambers of the heart) to severe (such as missing or poorly formed portions of the heart).

Signs and symptoms for congenital heart defects depend on the type and severity of the particular defect. Some defects might have few symptoms, while others might cause a baby to have bluish tinted nails or lips or fast or troubled breathing, to tire easily when feeding, or to be very sleepy.

The causes of congenital heart defects among most babies are unknown. Congenital heart defects also are thought to be caused by a combination of genes and other risk factors, such as exposures to things in the environment, maternal diet, or maternal medication use.

Low-Risk Cardiac Disorders

There are certain cardiac diseases that carry a very low risk to the mother and the fetus. These include:

- Aortic and mitral valve regurgitation
- Hypertrophic cardiomyopathy
- Mitral valve prolapse
- Atrial and ventricular septal defects

Women with these conditions usually do well during pregnancy and delivery.

In particular, mitral valve prolapse is often well tolerated during pregnancy and the prolapse may actually decrease because of the normal changes that the heart goes through during pregnancy (Northwest Memorial Hospital, 2014).

Women with pulmonary valve disease and tricuspid valve disease may also have relatively uncomplicated pregnancies (Northwest Memorial Hospital, 2014).

In addition, a small number of women will develop a cardiomyopathy (weakening of the heart muscle) that appears to be caused by the pregnancy. This form of cardiomyopathy may occur at either the end of pregnancy or several months after delivery. It is not clear why this happens and women may not have a complete recovery and/or the cardiomyopathy may reoccur with future pregnancies.

Higher-Risk Cardiac Conditions

Sometimes, high-risk cardiac conditions may arise during pregnancy in women who have no prior history of cardiac problems. The physiological changes during pregnancy may precipitate cardiac disease. For example, heart failure due to fluid overload may only present during pregnancy or the intrapartum period, as a result of an inability to tolerate the increased fluid volume of pregnancy. These women may have an underlying cardiac weakness, such as a previously undetected valvular disease. The increased demands on the body during pregnancy and labor precipitate the presentation of these diseases.

Some high-risk cardiac conditions encountered during pregnancy and labor include:

[Mitral or aortic valve stenosis:](#)

Is often the result of rheumatic heart disease. These patients may require close observation, medications and specialized monitoring during labor and delivery.

[Pulmonary hypertension:](#)

Due to congenital heart disease or an independent entity.

[Atrial fibrillation:](#)

Is often caused by an underlying cardiac condition. Atrial fibrillation is usually associated with valvular heart disease, hyperthyroidism, pulmonary embolism or hypertension (Northwestern Memorial Hospital, 2014).

[Myocardial infarction \(MI\):](#)

Although quite rare, women may present with a myocardial infarction during the intrapartum period.

These women need to be assessed and treated as if they are not pregnant. Although certain drug choices can be made to decrease the risk to the fetus, management strategies are similar to the non-pregnant state, though certain precautions may be advised.

Test Yourself

Which of the following high risk cardiac conditions is most commonly associated with hyperthyroidism or pulmonary embolism:

- A. Atrial fibrillation – Correct!
- B. Pulmonary hypertension
- C. Myocardial infarction (MI)
- D. Mitral or aortic valve stenosis

Hypertension

Hypertension is the most common medical problem encountered during pregnancy, complicating two to three percent of pregnancies (Gibson, P. 2010). Hypertensive disorders in pregnancy may cause maternal and fetal morbidity, and they remain a leading source of maternal mortality.

Hypertensive disorders during pregnancy may be classified as:

- Pre-existing Hypertension/ Chronic hypertension: Blood pressure exceeding 140/90 mm Hg before pregnancy or existing before 20 weeks' gestation (Gibson, P. 2010).
- Gestational hypertension: Is the onset of newly elevated blood pressure readings after 20 weeks' gestation. Gestational hypertension was previously referred to as Pregnancy Induced Hypertension or PIH.

Of women who initially present with gestational hypertension, about one third develop the syndrome of pre-eclampsia (Gibson, P. 2010). Pre-eclampsia occurs in up to five percent of all pregnancies, in 10 percent of first pregnancies, and in 20-25 percent of women with a history of chronic hypertension (Gibson, P. 2010). Pre-eclampsia may progress to eclampsia and HELLP syndrome. HELLP syndrome is a life-threatening obstetric complication of pre-eclampsia, and is an abbreviation of the main findings, namely:

- Hemolytic anemia
- Elevated liver enzymes
- Low platelet count

The pathophysiology of gestational hypertension is unknown. However with close monitoring, maternal and fetal outcomes are usually normal. Gestational hypertension may, however, be a harbinger of chronic hypertension later in life.

Managing the Cardiac Patient in Labor

During the intrapartum period, the woman with cardiac complications needs to be closely monitored to prevent deterioration in her condition. Certain adaptations must be made to accommodate decreased cardiovascular functioning.

In general, women with cardiac disease who have done well during the pregnancy usually require only general management with clinical observation during labor and delivery. Women who are

symptomatic during pregnancy or have high-risk factors such as pulmonary hypertension will require oxygen and invasive hemodynamic monitoring during labor and delivery.

Also, prophylactic antibiotic coverage is usually recommended for a woman with cardiac disease, to prevent infective (bacterial) endocarditis. The specific underlying cardiac disease will dictate other adaptations to the labor and delivery plan.

Labor and Delivery Nurses are instrumental in monitoring progress and the early detection of possible complications, to ensure best outcomes for both the mother and infant. Do your best for your patient by familiarizing yourself with the most current Policies and Procedures for your unit. Visit the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN), at www.awhonn.org to learn more about managing the high-risk intrapartum patient.

Test Yourself

The use of prophylactic antibiotic coverage in the first stage of labor is usually recommended for a woman with cardiac disease, in order to:

- A. Prevent infection in the neonate
- B. Minimize risk of infective endocarditis in the mother – Correct!
- C. Decrease stress on the maternal circulatory system during delivery

Timing and Mode of Delivery

The best delivery mode is determined by obstetric rather than cardiac indications (Steer, J et al., 2006). In general, cesarean section rates in women with cardiac disease are between 21 – 54 percent (Steer, J et al., 2006). However, cesarean sections are typically associated with increased cardiopulmonary complications.

Spontaneous vaginal delivery with regional anesthesia and assisted delivery is usually the best management option for the woman with cardiac complications (Steer, J et al., 2006). The timing of labor in the pregnant patient with cardiac conditions is another subject of great debate. Some experts recommend induction of labor to facilitate the smooth coordination and preparation of the multidisciplinary intrapartum team; yet others advise against induction because of the risk of failure and the resultant need for a cesarean section.

If vaginal delivery is selected as the mode of choice, it will be conducted with the laboring woman in an upright position, or in the left decubitus position. This minimizes aorto-caval compression (Steer, J et al., 2006). Active pushing during second stage may also be limited, depending on the degree of cardiac compromise. If cardiac disease is moderate to severe, it may be prudent to completely avoid an active second stage, by the use of regional anesthesia to allow the fetal head to descend to the perineum without active pushing, and then facilitate delivery by forceps or vacuum extraction.

First Stage of Labor

The goal of any mother and healthcare team is the successful, uncomplicated birth of a new infant. The labor and delivery nurse is a critical component of the healthcare team, especially in high-risk situations.

The first stage of labor is the period from the first true labor contractions to complete dilatation of the cervix.

Positioning

Cardiac output is greatly influenced by the patient's position, especially during labor and delivery.

Many women cannot tolerate the supine position, especially after 30 weeks' gestation. Supine hypotension syndrome can decrease cardiac output by 30 to 40 percent (Gandhi et al., 2013). Women with cardiac disease may be asked to labor while lying on their left side.

For safety, women are encouraged to maintain left uterine displacement either by elevation of the right hip or by positioning themselves on their sides. In this position, the uterus is not resting on the inferior vena cava, which may be compressed by an enlarged uterus decreasing blood flow back to the heart. With decreased blood flow to the heart, the heart rate often increases.

In the labor room, patients are frequently positioned on their back to facilitate cervical exams and placement of monitoring devices. If the patients are not reminded to return to their side, especially in the presence of epidural anesthesia, there can be a rapid decrease in venous return, leading to hypotension and possibly cardiac arrest (Gandhi et al., 2013).

Test Yourself

Supine positioning during the first stage of labor can:

- A. Decrease venous return by up to 40%.
- B. Increase maternal heart rate.
- C. Both of the above. – Correct!

Introduction to Pain Relief

Effective pain relief in the intrapartum period is of paramount importance in women with cardiac disease. Effective analgesia reduces cardiac stress and cardiovascular demands on the body.

Effective pain relief may also be achieved by teaching the patient how to effectively use relaxation techniques during labor with a strong emphasis on the need to avoid any Valsalva maneuver (a maneuver in which the patient exhales forcibly with a closed glottis when bearing down or pushing). This maneuver impedes the return of venous blood to the heart.

General Anesthesia

Although general anesthesia is inherently more risky than regional anesthesia, there may be several advantages for the cardiac patient in labor. General anesthesia allows for more therapeutic options during surgery, such as cardioversion if necessary, or postoperative ventilation should it be required after surgery.

There are however, inherent risks associated with general anesthesia. Difficult or failed intubation and the aspiration of gastric contents is always a concern with general anesthesia.

Aspiration prophylaxis should be considered in all patients and left uterine displacement maintained using a wedge under the right hip (Badve & Vallejo, n.d.).

Regional Anesthesia

Regional anesthesia is generally considered safer than general anesthesia today and is thus the preferred method of pain relief for women in labor with cardiac conditions (Badve & Vallejo, n.d.).

Regional anesthesia has the following advantages over general anesthesia:

- Improved maternal satisfaction with the birthing experience

- Improved post-operative analgesia
- Decreased risk of maternal death from failed intubation or aspiration of gastric contents

However, regional anesthesia can still be hazardous to the cardiac patient if it is not closely monitored, as a rapid onset, high-level spinal block can drastically reduce cardiac output by reducing venous return through peripheral vasodilation and by blocking the cardiac sympathetic supply (Badve & Vallejo, n.d.).

In general, epidural analgesia is preferred over spinal in cardiac patients because of the slower onset of sympathetic blockade and less dramatic negative hemodynamic effects (Badve & Vallejo, n.d.).

A decline in blood pressure secondary to epidural analgesia is routinely anticipated in all women, and interventions to improve blood pressure require consideration of the particular cardiac lesion (Badve & Vallejo, n.d.).

Interventions should be directed at maintaining a stable blood pressure by:

- Close monitoring and maintenance of intravascular fluid volume
- Use of pharmacologic agents

Intravascular Fluid Volume:

Accurate assessment and monitoring of intravascular fluid volume throughout labor and birth is essential in women with cardiac disease.

In general, intravascular volume depletion should be avoided in women with defects in left ventricular filling. However, women with obstructive lesions, such as mitral or aortic stenosis or pulmonary hypertension, may require hydration to optimize left-ventricular preload and cardiac output (Badve & Vallejo, n.d.).

Fluid management is directed at avoiding fluid overload and possibly restricting fluids.

Test Yourself

Which of the following type of anesthesia is preferred in the laboring woman with a cardiac condition?

- Spinal Block
- Epidural anesthesia
- General anesthesia – Correct!
- No pain relief should be used if there is a pre-existing cardiac condition

Hemodynamic Monitoring

Evaluation of maternal blood pressure, heart rate and hemoglobin arterial oxygen saturation is routinely incorporated into the labor assessment of a patient with any cardiac compromise. Maternal evaluation is individualized on the basis of the specific cardiac lesion and the potential for existence of any decompensation (Steer et al., 2006). Not all cardiac conditions warrant invasive hemodynamic monitoring.

Once labor begins, evaluation of maternal vital signs should follow established guidelines. Always check the Policies and Procedures in your particular unit.

Certain women may require invasive hemodynamic monitoring with an arterial line or pulmonary artery catheter, continuous electrocardiographic (ECG) monitoring, and continuous pulse oximetry during labor.

In particular, women with obstructive left ventricular lesions (aortic or mitral stenosis), coarctation of the aorta, or aortic aneurysm may require invasive arterial blood pressure monitoring in order to promote timely recognition and treatment of hypertension.

Hemodynamic Monitoring

Women with clinical signs of cardiac decompensation, such as dyspnea or rales, may require invasive hemodynamic monitoring with a pulmonary artery catheter. In addition, women with obstructive cardiac lesions, such as mitral or aortic stenosis, may require pulmonary artery catheterization in order to determine PAWP during labor and delivery because of fixed cardiac output and inability to compensate for decreases in ventricular preload that occur with blood loss or sympathetic blockade with epidural analgesia (Steer et al., 2006).

In addition to an arterial line and a standard pulmonary artery catheter, the assessment of maternal mixed venous oxygen saturation (SvO₂) with a pulmonary artery catheter may be beneficial in the unstable cardiac patient because of the ability to detect oxygen demand changes prior to observable changes in maternal vital signs (Steer et al., 2006).

Continuous SvO₂ monitoring measures the amount of oxygen carried by hemoglobin in the venous circulation, and reflects on the oxygen demand and consumption in an individual patient. The device may assist care providers in determining the effects of position changes, anesthesia, uterine contractions, birth and blood loss (Steer et al., 2006).

Note that the interpretation of SvO₂ values is based upon the premise that less oxygen in the venous blood usually represents an increase in the consumption of oxygen by the body.

Fetal Monitoring

Continuous fetal heart rate monitoring (FHM) is usually a recommended standard of care for the laboring woman with cardiac concerns. Cardiac disease may increase the risk of poor uteroplacental perfusion, placing the fetus at increased risk of hypoxia.

A detailed review of fetal heart rate monitoring is beyond the scope of this course.

Second Stage of Labor

The second stage of labor is the period from complete dilatation of the cervix to birth of the infant. Second stage management is a crucial component of care for the cardiac patient. The aim of care for the cardiac patient during the second stage of labor is to deliver the infant with the least amount of cardiac effort possible. To achieve this, the second stage of labor should be as short as possible, with interventions aimed at keeping the mother relaxed and unstressed.

Tachycardia that may accompany pushing efforts may adversely affect right ventricular preload in women with obstructive cardiac lesions or pulmonary hypertension (Steer, P et al., 2006). In addition, there is also the potential for myocardial ischemia to occur secondary to the tachycardia caused by pushing efforts. Thus, expulsive efforts by the laboring woman should be kept to a minimum, depending on the degree of cardiac compromise.

In order to avoid activity-induced tachycardia, alternative measures to active pushing, such as assisted delivery (vacuum extraction or forceps delivery), should be considered.

Ideally, the obstetric team, together with the patient and her family, develop a plan of care for the second stage management prior to the onset of labor.

Third Stage of Labor

The third stage of labor is the period from birth of the baby until delivery of the placenta, and is a high-risk period for the cardiac patient. Most women with cardiac conditions do not tolerate changes in intravascular volume very well, and the third stage of delivery often involves some degree of hemorrhage. In addition, this is the time period during which oxytocin is often administered to facilitate the delivery of the placenta. Healthcare professionals need to pay close attention to monitoring hemostasis during this critical time period.

As the placenta is delivered and the uterus contracts, there is an increased intravascular volume of approximately 500mls (Steer et al., 2006). At the same time there may be some blood loss. In fact, postpartum hemorrhage is not uncommon in women with cardiac disease (Steer et al., 2006).

The use of oxytocin (Pitocin) during this time to control hemorrhage is controversial and needs to be implemented on a risk-benefit basis. Oxytocin can decrease heart rate and cardiac contractility, which can be problematic in the cardiac patient. If oxytocin is used, it should be given by very slow intravenous infusion.

In addition, the administration of ergometrine (ergonovine) to facilitate the delivery of the placenta and control bleeding, should be avoided in the cardiac patient as it can cause peripheral vascular constriction and coronary vasospasm (Steer et al., 2006).

Some obstetricians use mechanical maneuvers to reduce postpartum hemorrhage, such as bimanual compression or uterine compression sutures (Steer et al., 2006).

Immediate Postpartum Period

The immediate postpartum period is a time of increased vulnerability for many women with cardiac disease, especially those with fixed cardiac output who are unable to accommodate the systemic redistribution of cardiac output following expulsion of the placenta (Steer. et al., 2006).

Blood Loss

The degree of blood loss depends on how quickly the placenta separates from the uterine wall and how well the uterine muscle contracts after delivery of the infant and the placenta. Severe postpartum hemorrhage can be a major problem, particularly in women with pre-existing cardiac disease.

The best preventive strategy is active management of the third stage of labor (Anderson & Etches, 2007). Active management, which involves administering a uterotonic drug with or soon after the delivery of the anterior shoulder, controlled cord traction, and, usually, early cord clamping and cutting, decreases the risk of postpartum hemorrhage and shortens the third stage of labor with no significant increase in the risk of retained placenta (Anderson & Etches, 2007).

Clinical trials have shown that the routine use of oxytocin may reduce the amount of blood loss, but there is not enough evidence about adverse effects. More research is needed.

Uterotonic Agents

Uterotonic agents include oxytocin and prostaglandins:

- **Oxytocin** stimulates the myometrium to contract rhythmically, which constricts spiral arteries and decreases blood flow through the uterus. It is an effective first-line treatment for postpartum hemorrhage and 10 international units (IU) should be injected intramuscularly, or 20 IU in 1 L of saline may be infused at a rate of 250 mL per hour.
- **Prostaglandins** enhance uterine contractility and cause vasoconstriction. The most commonly used prostaglandin is **carboprost (Hemabate)**, which can be administered intramuscularly in a dose of 0.25 mg; this dose can be repeated every 15 minutes for a total dose of 2 mg. Carboprost has been proven to control hemorrhage in up to 87 percent of patients.

Methylergonovine (Methergine®) is a synthetic analogue of ergonovine and a commonly used uterotonic agent. It acts by constricting blood vessels and smooth muscle to control excessive bleeding following childbirth. It also causes uterine contractions to aid in expulsion of the placenta. The safety of methylergonovine in women with cardiac disease is unclear because of the potential for significant increase in arterial constriction (Steer, P. et al., 2006).

Test Yourself

The degree of blood loss post delivery usually depends on:

- A. Whether oxytocin is administered post delivery.
- B. How quickly the placenta separates from the uterine wall.
- C. The contractibility of the uterine muscle after delivery of the placenta.
- D. All of the above. – Correct!

Positioning after Delivery

Positioning during the early postpartum period can also impact cardiac function.

The use of the dorsal lithotomy position (supine position with knees bent and thighs apart) is contraindicated in the cardiac patient following delivery as this position may increase ventricular preload immediately following birth (Steer, P. et al., 2006). Instead, positioning a woman on her left side post delivery encourages venous return and alleviates compression of the aorta by the still-enlarged uterus.

Monitoring and recording of maternal vital signs and hemodynamic parameters may require frequent assessment in the immediate postpartum period when hemodynamic instability is greatest.

The consequences of hemorrhage in the patient with significant cardiac disease is far greater than in the healthy woman, as the cardiac disease may impair the body's ability to compensate for blood loss.

Fluid Replacement

Fluid replacement therapy and the use of oxytocin may require careful consideration before they are routinely administered in the patient with cardiac disease.

The principles of fluid replacement therapy after delivery follow the same guidelines as during the second stage of labor.

Anticoagulants

Pregnancy in general is associated with a 4-fold increase in the risk of venous thromboembolism (VTE), with the risk rising to 14-fold during puerperium (Marino & Lange, 2013). Due to this increased risk of deep vein thrombosis, anticoagulation therapy is a major consideration in the early postpartum period.

On one hand, anticoagulation significantly increases the risk of hemorrhagic complications post-delivery. Yet, women at high-risk of developing deep vein thromboses (DVTs), such as women with mechanical valve replacements, coagulation disorders or a history of VTE routinely receive anticoagulation during pregnancy and the postpartum period (Steer, P et al., 2006) .

On the other hand, anticoagulation therapy is often incompatible with the medications used in spinal and epidural anesthesia. All medications must be discontinued 12-24 hours prior to initiation of an epidural or spinal block, depending upon the dosage used.

In addition, unfractionated heparin is usually discontinued before initiation of labor or at the onset of labor, in order to normalize coagulation parameters (Steed, P et al., 2006). Typically, an elapsed time of 10 -12 hours between the last dose of heparin and initiation of regional analgesia is required (Gothard & Keogh, 2009).

Intrapartum Period

Although cardiac arrest only occurs in a very small percentage of high-risk deliveries, it is an emergent situation that must be addressed.

Cardiac arrest in the parturient (woman about to give birth) has numerous causes:

- Amniotic fluid embolism (AFE). AFE can present with cardiac arrest, hypotension, bronchospasm, coagulopathy, fetal distress or cyanosis. Even with optimal treatment, AFE is associated with a high rate of morbidity and mortality.
- Hemorrhagic shock. These include patients with placental abruption, placenta previa, or abnormalities of placental implantation.
- Pulmonary embolism.
- Pre-eclampsia and eclampsia.
- Congenital or acquired cardiac disease.
- Surgical complications may lead to massive hemorrhage and cardiac arrest.
- Complications of regional and general anesthesia.

Labor and Delivery Cardiac Arrest

It is now recommended that cesarean section be performed within four to five minutes of the arrest (Society for Obstetric Anesthesia & Perinatology [SOAP], 2013). It has been shown that the shorter the interval between the onset of maternal cardiac arrest and commencement of CPR, and the shorter the time taken to deliver the fetus once CPR commences, the more likely that the mother will survive and the fetus will be neurologically intact.

The labor and delivery nurse will be called upon to act quickly and efficiently should a cardiac arrest occur in the delivery suite. Maintaining current ACLS skills and following facility policies and protocols will positively impact the outcome of the intrapartum patient in cardiac arrest.

Many facilities have an emergency perinatal response team to lead resuscitation efforts. To successfully resuscitate a patient, a coordinated team approach is essential. Healthcare professionals must work efficiently and in an organized fashion to resuscitate these patients. You may be called upon to apply cricoids pressure during intubation or assist with cardiopulmonary resuscitation.

Test Yourself

Current guidelines suggest that following a maternal cardiac arrest, an infant should be delivered within:

- A. One – two minutes
- B. Three to four minutes
- C. Four to five minutes – Correct!
- D. Five to six minutes

Conclusion

A successful outcome for women with heart disease requires specialized care, preconception evaluation, continuation of select medications and close observation during pregnancy, the intrapartum and postpartum periods.

As modern technology evolves, the role of the perinatal nurse expands and becomes more complex. Perinatal nurses are now caring for increasingly more women with cardiovascular complications or other multisystemic problems.

Proactive, preventative nursing is the best defense in decreasing maternal or fetal morbidity and mortality. Maternal-fetal assessments must be continuous, with a clinical focus on maternal and infant stabilization. Perinatal nurses must be prepared for the prospect of an intrapartum emergency at any time.

A collaborative atmosphere and team approach to care enhances positive patient outcomes. Intrapartum nurses are vital members of this team, offering critical assessment skills, prompt interventions, continuous education and support.

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