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## Intrapartum obstetric management

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### ABSTRACT

Maternal cardiac disease complicates approximately 1–2% of all pregnancies in the United States. Just as during the antepartum period, in the immediate period surrounding delivery, obstetrical patients with cardiac disease (both congenital and acquired) will have specialized needs, tailored to the patient and her specific lesion. While the basic principles of labor and delivery management protocols are relevant to this subgroup of patients, there are certain areas in which adjustments must be made. These include endocarditis prophylaxis, recent anticoagulation, fluid management, and the need for increased maternal cardiac monitoring. Awareness of the challenges of the intrapartum period combined with a multi-disciplinary approach from anesthesia, cardiology, and the obstetrical provider will optimize the patient for a safe delivery.

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### Introduction

There is a growing population of pregnant women with cardiac disease.<sup>1,2</sup> Maternal cardiac disease complicates approximately 1–2% of all pregnancies in the United States.<sup>1</sup> These women require special attention during their entire pregnancy course, and this section will specifically focus on the intricacies of intrapartum care. It is important to note that different cardiac lesions require different intrapartum strategies, and this article will highlight areas in which care should be tailored.

The body undergoes important physiologic adaptations during pregnancy. Plasma volume expands and red blood cell mass increases; however, these changes are disproportionate, and a physiologic hemodilution occurs.<sup>3</sup> Cardiac output increases, both by an increase in stroke volume and heart rate. Blood pressure

fluctuates in pregnancy; initially there is an early drop in the first trimester and then there is a progressive increase during the third trimester. Systemic vascular resistance also decreases initially, with a nadir at 14–24 weeks' gestation, and then rises progressively toward term.<sup>3</sup> Therefore, at term, women have significant elevations in heart rate, stroke volume, and cardiac output with decreased systemic and pulmonary vascular resistance and serum colloid osmotic pressures. However, there is no significant alternation in pulmonary capillary wedge pressure, central venous pressure, or mean arterial blood pressure.<sup>4</sup>

During the labor and delivery process, additional changes occur. Uterine contractions cause approximately 300–500 mL of blood to be pushed back into the systemic circulation.<sup>5</sup> The increase in venous return leads to a transient maternal bradycardia followed by an increase in cardiac output and

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compensatory tachycardia. The increase in maternal cardiac output during labor and delivery may also be caused by pain, anxiety, Valsalva, and maternal positioning. Depending on the cardiac lesion in question, control of cardiac rate becomes important.

## General principles of labor and delivery

### Labor induction

Functionally normal pregnant patients with cardiac disease may go into spontaneous labor. However, for many women with cardiac issues, there is an indication for delivery prior to the onset of spontaneous labor. Cardiac patients are at risk for hypertensive disorders and may need a timed delivery due to anticoagulation. The timing of delivery needs to be individualized, and it should take into account several components, including gravity/parity, cervical exam, and fetal gestational age. During the induction process, lateral decubitus positioning is recommended to minimize the uterine compression of the abdominal aorta and inferior vena cava, which serves to decrease the hemodynamic changes associated with major uterine contractions.

Overall, there is a good safety profile of labor-induction agents. Cervical ripening is often the first step in a labor induction in a nulligravida. One commonly used method is an intra-cervical Foley catheter. This provides mechanical stimulation for cervical dilation and is safe to use.<sup>6</sup> Another method of cervical ripening is via prostaglandins, namely misoprostol (Cytotec) or dinoprostone (Cervidil). Prostaglandins are contraindicated in women undergoing a labor induction with prior cesarean delivery. Both misoprostol and dinoprostone carry a theoretical risk of coronary vasospasm and a low risk of arrhythmias.<sup>7</sup> Dinoprostone can also profoundly affect blood pressures. Oxytocin (Pitocin) can also be used for labor induction but is preferable when a woman has a favorable cervix and/or for inductions of parous women. Although oxytocin has a risk of causing hypotension, the slow titration of oxytocin in labor-induction protocols generally prevents this complication. Artificial rupture of membranes can be used to initiate labor and carries no increased cardiovascular risk.<sup>6</sup>

### Management of the fetal heart rate tracing

The fetal heart rate tracing has become a core element of intrapartum management. Unfortunately, although the use of fetal heart tracings has shown a reduction in neonatal seizures, it has not made a significant difference in reducing perinatal mortality, cerebral palsy, or other measures of neonatal well-being.<sup>8</sup> It has, however, served to increase the cesarean delivery rate.<sup>8</sup>

For fetal heart rate tracing resuscitation in cases of tachysystole or tetanic contractions causing fetal bradycardia, terbutaline is a first-line agent for uterine relaxation. This can cause a transient but significant increase in maternal heart rate. In general, this medication is safe to use.<sup>9</sup> However, maternal tachycardia, chest discomfort, palpitation, tremor, headache, nasal congestion, nausea and vomiting, hyperkalemia, and hyperglycemia are all potential side

effects.<sup>10</sup> In a population of cardiac patients, especially for lesions that are preload dependent, this tachycardia can be especially concerning (for example, in aortic stenosis, tachycardia leads to decreased left ventricular filling and ejection fraction and reduces cardiac output).<sup>11</sup>

### Endocarditis prophylaxis

In labor and delivery management, there are currently few indications for endocarditis prophylaxis. In the absence of an infection, antibiotic prophylaxis is no longer recommended, except for a small subset of patients. This is true for patients undergoing a trial of labor or having a cesarean delivery.<sup>12</sup> The American Heart Association and American College of Cardiology currently recommend intrapartum prophylaxis in high-risk cardiac lesions only when deliveries are associated with infection.<sup>13</sup> Maternal congenital heart disease is no longer an automatic indication for routine endocarditis prophylaxis. There are certain high-risk cardiac lesions that should be considered for prophylaxis:

- A prosthetic cardiac valve or prosthetic material used for cardiac valve repair
- Previous infective endocarditis
- Congenital heart disease that meets one of the following conditions:
  - unrepaired cyanotic defect including palliative shunts and conduits,
  - defects repaired with prosthetic material or device within the past 6 months, and
  - incompletely repaired defects using prosthetic material.<sup>12</sup>

When there is an indication for endocarditis prophylaxis, there are several acceptable regimens (preferably given 30–60 min prior to delivery). These regimens include 2 g of ampicillin IV or 1 g of cefazolin IV. If a patient has a penicillin or ampicillin allergy, then a regimen of 1 g of ceftriaxone IV or 600 mg clindamycin IV is recommended, and if enterococcus infection is a concern, then 1 g of vancomycin IV should be added.<sup>12</sup>

If a patient has had a complete repair with the use of prosthetic materials or devices, this is not an indication for prophylaxis beyond 6 months post-procedure, as endothelialization should be complete by that time.<sup>13</sup> These recommendations are fairly new, and there are often individualized recommendations by cardiac surgeons, cardiologists, and obstetricians for antibiotic prophylaxis.

### Anticoagulation

There are certain conditions that warrant the use of anticoagulation during pregnancy. This becomes a critical issue for intrapartum management, as recent treatment with anticoagulation will affect the options for regional anesthesia available to the patient.<sup>14</sup> Conditions that may necessitate anticoagulation therapy include the following:

- Recent thromboembolic event,
- Mechanical heart valves,

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