

# Respiratory Considerations Including Airway and Ventilation Issues in Critical Care Obstetric Patients



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## KEYWORDS

- Airway changes of pregnancy
- Acute respiratory distress syndrome
- Lung protective ventilation
- Extracorporeal membrane oxygenation during pregnancy
- Reactive airway disease in pregnancy

## KEY POINTS

- Physiologic changes of pregnancy predispose to difficulty with mask ventilation and intubation, rapid desaturation during periods and apnea, and high airway pressures during mechanical ventilation.
- Hypoxic respiratory failure in the parturient can be due to a multitude of causes, both related and unrelated to pregnancy. Acute respiratory distress syndrome is a common final pathway by which many of these etiologies lead to arterial hypoxemia.
- Treatment of hypoxic respiratory failure should focus on lung-protective ventilation with low tidal volumes and moderate levels of positive end-expiratory pressure as well as careful fluid management. For refractory cases, neuromuscular blockade, prone positioning, and extracorporeal membrane oxygenation may be considered.
- Reactive airway disease in pregnancy is common, and consideration should be given to administration of inhaled corticosteroids to improve outcomes.

## INTRODUCTION

Critical care management of the obstetric patient can present unique challenges to obstetricians, intensivists, anesthesiologists, and consultants. Parturients who present with respiratory distress can suffer from a multitude of etiologies ([Table 1](#)), both related and unrelated to their gravid state, and each diagnosis must be pursued as appropriate to the clinical picture. Normal physiologic changes of pregnancy may

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| Table 1<br>Etiologies of respiratory failure in pregnancy |   |
|---|---|
| Hypoxic respiratory failure:<br>pregnancy specific        | APE<br>Pulmonary edema secondary to tocolytics<br>Pulmonary edema secondary to preeclampsia/eclampsia<br>Cardiogenic pulmonary edema secondary to peripartum cardiomyopathy<br>ARDS secondary to placental abruption, obstetric hemorrhage, chorioamnionitis, or endometritis   |
| Hypoxic respiratory failure:<br>nonpregnancy Specific     | Aspiration pneumonia/pneumonitis<br>Viral/bacterial pneumonia<br>Pulmonary embolism<br>Venous air embolism<br>Cardiogenic pulmonary edema secondary to heart failure unrelated to pregnancy<br>Atelectasis<br>Pneumothorax<br>ARDS secondary to transfusion-associated acute lung injury, pulmonary contusion, sepsis, trauma, burns. |
| Hypercarbic respiratory failure                           | Reactive airway disease/asthma<br>Drug overdose<br>Neuromuscular disorders<br>Myasthenia gravis<br>Guillain-Barre   |

Data from Mighty HE. Acute respiratory failure in pregnancy. Clin Obstet Gynecol 2010;53(2): 360–8.

obscure the presentation and diagnosis, and irrelevant of the cause, pregnancy may complicate the management of both hypoxic and hypercarbic respiratory failure in this patient population. In addition to these concerns, both anticipated and unanticipated difficult airway management, including difficulty ventilating and intubating, are more common during pregnancy and may be encountered during endotracheal tube placement.

PHYSIOLOGIC CHANGES OF PREGNANCY

During pregnancy, many normal alterations occur within the pulmonary system, both as the result of hormonal changes and mechanical compression by the gravid uterus. Changes in respiratory mechanics and lung volumes are summarized in [Table 2](#). Increased minute ventilation during pregnancy occurs as early as 12 weeks gestational age and is attributable to stimulation of respiratory centers by progesterone. This increase leads to a decline in the  $Paco_2$  to 30 mm Hg. The resulting metabolic compensation for this respiratory alkalosis leads to a decreased serum bicarbonate concentration to approximately 20 mEq/L, which decreases the buffering capacity of the blood in the pregnant population. The normal  $Paco_2$  to end-tidal  $CO_2$  gradient is also decreased during pregnancy as a result of increased cardiac output, which decreases the proportion of alveolar dead space ventilation.<sup>1</sup>

AIRWAY MANAGEMENT OF THE PREGNANT PATIENT

If during the course of respiratory failure, a pregnant patient requires intubation, the likelihood of difficult mask ventilation and subsequent intubation attempts is

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