

Contributors

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1. Physiological maternal adaptive changes during pregnancy, e.g., alterations of endometrium and decidua, menstruation, placenta, fetal membranes, placental hormones, morphological and functional fetal development

Amber N. Edinoff, Brooke Williams, Layne Landry, Elyse M. Cornett and Alan David Kaye

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Jessica Galey, Amy Zheng and Shobana Bharadwaj

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John Pallan, Amy Zheng, Jessica Galey and Shobana Bharadwaj

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Rucha Kelkar, Alina Smoleva, Therese Larson, Sahar Shekoohi and Alan David Kaye

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5. Parturient anesthesia assessment and evaluation  
Hrayr Ghazaryan, Artush Grigoryan and Lincoln Frederick Arbogast

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6. How to create and maintain a safe and an efficient obstetric anesthesia practice  
Anjum Anwar, Huma Wali and Hina Shamim

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Courtney Hood, Kristen L. Fardelmann and Benjamin Cobb

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## 8. Obstetric management of labor and delivery, including preoperative assessment and basic standards for preanesthesia care

Huma Wali, Haneen Alnazzawi and Anjum Anwar

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- 3. Pregnancy counseling risk stratification
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Mariana Montes, Chad T. Dean and Thomas James

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Peter Louis Kovacs, Jayanth Dasika and Venkata Satya Lakshmi Damalanka

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11. Mechanisms of labor pain and anesthesia in healthy parturients

Justin Swengel and Patrick McConville

1. Mechanisms of labor pain and its management

2. Nonpharmacologic treatment of pain

3. Pharmacologic techniques for labor pain control

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12. Nonopioid analgesia

Jayanth Dasika, Peter Louis Kovacs and Venkata Satya Lakshmi Damalanka

1. Nitrous oxide

2. Acetaminophen and nonsteroidal antiinflammatory drugs

3. Sedatives and analgesic adjuncts

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13. Nonpharmacologic and alternative management of labor and delivery analgesia

David Gutman and Michael Marotta

1. Introduction

2. Water immersion

3. Biofeedback

4. Hypnosis

5. Acupuncture

6. Subcutaneous or intracutaneous sterile water injection

7. Manual/massage/reflexology

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14. Local anesthetics and adjuvants in healthy obstetric patients

Jeffery Cao, Munfarid Zaidi, Lee Chang, Melissa Nikolaidis and Yi Deng

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15. Epidural anatomy and epidural anesthesia for labor and cesarean delivery  
Fatoumata Kromah and Nicholas Malki

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16. Neuraxial anesthesia for vaginal delivery

Kristin N. Bembenick, Angela Nguyen, Corrie Jackson, Sahar Shekoohi, Aaron J. Kaye, Alan D. Kaye and Harish Siddaiah

- 1. Introduction
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17. Neuraxial analgesia for cesarean delivery  
Andrew Jensen, Kevin Chen, Melissa Nikolaidis and Yi Deng

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  - 1.3 Trends in cesarean sections
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## 18. General anesthesia for normal, uncomplicated cesarean delivery: Indications and strategies

Fatoumata Kromah

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  - 16.4 Telemedicine and digital health
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19. Airway management of the pregnant patient for labor and cesarean delivery

Moataz Maher Emara, Mohamed Maher Elwaraky, Laila Alhafez and Sally Hamdy Abdelaziz Ahmed

- 1. Incidence of GA and difficult airways in the obstetric population
- 2. Physiological changes during pregnancy: Implications on airway management
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  - 2.2 Airway obstruction and difficulty in intubation
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  - 6.3 Direct and indirect (video) laryngoscopy direct laryngoscopy
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## 20. Postoperative pain management for cesarean delivery

Antonio Gonzalez Fiol, P.J. McGuire, Kristen L. Fardelmann and Aymen Awad Alian

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- 5. General anesthesia
- 6. Local and regional analgesia techniques
- 7. Acute pain management for the patient with substance use disorder (SUD)
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## 21. Postoperative sterilization surgery and anesthesia considerations

Melissa Nikolaidis, Jacy Gressen, Tommy Li and Yi Deng

- 1. Introduction: Postpartum birth control
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- 3. Current policies affecting postpartum sterilization
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## 22. Anesthesia for assisted reproductive techniques

Fouzia Khalid and Amber Naz

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## 23. Anesthesia considerations for pregnant patients with cardiovascular disease

Islam Mohammad Shehata Elsayed, Yasmeen Ahmed Mohamed Taha, Hala Mostafa Goma and Nesrine Abdel Rahman Elrefai

- 1. Cardiac diseases in pregnancy

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  3. Types of cardiac diseases in pregnancy
  4. Risk classification of the patient with cardiac diseases
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25. Anesthesia considerations for patients with renal, hematologic, connective tissue, and immunologic diseases

Rucha A. Kelkar, Alexandra D. Dautel, Lillian V. Lauck, Michael J. Quintana, Sahar Shekoohi and Alan David Kaye

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## 26. Anesthesia considerations for parturients with endocrine disorders

Evan Nicholas Lian, Asher Le and Aladino De Ranieri

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- 3. Thyroid disease
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Philip Rubin and Lisa Leffert

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28. Anesthesia considerations for fetal growth restriction and macrosomia in pregnancy  
Kylie Dufrene, James Ilochi, Caleigh Foto, Julia Hebert, Carlos Narvaez, Sahar Shekoochi and Alan David Kaye

- 1. Fetal macrosomia
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29. Anesthesia considerations for pregnant patients with morbid obesity and neoplasm  
Erica Johnson, Teshi Kaushik and Christina Faya

- 1. Introduction and background
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30. Anesthesia considerations for parturients with substance abuse or psychiatric disorders  
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- 34. Anesthesia considerations for patients with preeclampsia  
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#### 40. Anesthesia considerations for patients with spine surgery

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#### 42. Peripartum hemorrhage and management Dana Darwish, Christopher Choi and Faiza A. Khan

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#### 43. Point-of-care coagulation testing for obstetric hemorrhage Elvera L. Baron and Daniel Katz

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#### 54. Anesthesia for fetal surgery

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## 56. Fetal evaluation, including the premature fetus and the compromised fetus

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## 59. Retrolental fibroplasia and anesthesia

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## 62. Ultrasound evaluation of the spinal vertebrae

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