**Supplemental Digital Content**

**Table S1: Perioperative Considerations for Minimally Invasive Maternal-Fetal Interventions**

**Preoperative Considerations**

* Complete maternal history and physical examination.
* Complete fetal workup to exclude other anomalies
* Perform imaging studies to determine fetal anomaly, placental location, and EFW.
* Participate in the multi-disciplinary team meeting with the mother and accompanying family members and also in the team meeting on the day of surgery.
* Plan for emergent delivery depending on the gestational age and the perceived viability of the fetus.
* Administer pre-medications to the mother
	+ Consider aspiration prophylaxis with nonparticulate antacid (sodium citrate 30 mL PO), H2-receptor antagonist (e.g., famotidine 20 mg IV) and/or metoclopramide (10 mg IV).
	+ Consider tocolysis with indomethacin (50 -100 mg PO or rectally), if indicated.
	+ Antibiotics (e.g., cefazolin 2-3 g IV).
* Send type and screen for the mother.
* Consider transfer of EFW-based unit doses of fetal resuscitation drugs to scrub nurse in sterile fashion (e.g., 2 unit doses of epinephrine 10 mcg/kg, 2 unit doses of atropine 20 mcg/kg), for fetal resuscitation if it becomes necessary.
* Place sequential compression devices on lower extremities for VTE prophylaxis.

**Intraoperative Considerations**

* Apply standard ASA monitors.
* Assess FHR, placental location, and fetal position using ultrasonography.
* Maternal position during the procedure will depend on the placental location. If supine, position the mother with uterine displacement.
* Perform a timeout prior to the procedure.
* Anesthetic technique depends on the planned surgical approach, degree of invasiveness, maternal comorbidities, patient and surgeon preference. Anesthetic techniques used include maternal intravenous sedation with local anesthetic infiltration, neuraxial, or general anesthesia.
* Maintain maternal blood pressure with IV phenylephrine, ephedrine, and/or glycopyrrolate; the typical goal is to maintain arterial pressure within 10% of pre-induction baseline with appropriate heart rate.
* Administer routine maintenance IV fluids based on the mother’s volume status and the duration of the procedure.
* Fetal monitoring typically includes FHR monitoring at the beginning and end of the procedures. Fetal echocardiography is used for minimally invasive fetal cardiac interventions
* Administer fetal IM opioid (e.g. fentanyl 10-20 mcg/kg), neuromuscular blocker (e.g. rocuronium 2-3 mg/kg), and atropine (10-20 mcg/kg) for more invasive maternal-fetal interventions such as percutaneous balloon valvuloplasty or fetoscopic endoluminal tracheal occlusion.

**Early Postoperative Considerations**

* Complete postoperative debrief session.
* Continue tocolytic therapy with indomethacin or per local protocols, if indicated.
* Admit overnight for observation, if indicated.
* Monitor uterine activity and FHR.
* Consider administration of VTE prophylaxis (mechanical or pharmacologic) based on maternal comorbidities, current fetal status, and concern for reoperation or urgent delivery.

Abbreviations: ASA, American Society of Anesthesiologists; EFW, Estimated fetal weight; FHR, Fetal heart rate; IM, Intramuscular; IV, Intravenous; PO, Per oral; VTE, Venous thromboembolism prophylaxis.

**Table S2: Perioperative Considerations for Open Maternal-Fetal Surgeries**

**Preoperative Considerations**

* Complete maternal history and physical examination.
* Complete fetal workup to exclude other anomalies.
* Perform imaging studies to determine fetal anomaly, placental location, and EFW.
* Participate in the multi-disciplinary team meeting with the mother and accompanying family members and also in the team meeting on the day of surgery.
* Plan for emergent delivery depending on the gestational age and the perceived viability of the fetus.
* Type and crossmatch 2-4 units of packed red blood cells for the mother and 1 unit of O-negative, leukocyte reduced, irradiated, cytomegalovirus-negative packed red blood cells crossmatched against the mother for the fetus.
* Transfer EFW-based doses of fetal intramuscular drugs to scrub nurse in sterile fashion that includes an opioid (e.g. fentanyl 10-20 mcg/kg), neuromuscular blocker (e.g. rocuronium 2-3 mg/kg), and atropine (10-20 mcg/kg).
* Transfer EFW-based unit doses of fetal resuscitation drugs to scrub nurse in sterile fashion (e.g., 2 unit doses of epinephrine 10mcg/kg, 2 unit doses of atropine 20 mcg/kg).
* Administer pre-medications to the mother
	+ Consider aspiration prophylaxis with nonparticulate antacid (sodium citrate 30 mL PO), H2-receptor antagonist (e.g., famotidine 20 mg IV) and/or metoclopramide (10 mg IV).
	+ Tocolysis with indomethacin (50-100 mg PO or rectally).
	+ Antibiotics (e.g., cefazolin 2-3 g IV).
* Place high lumbar (L1-3) epidural catheter for postoperative analgesia. Administer only test dose before surgery.
* Place sequential compression devices on lower extremities for VTE prophylaxis.
* Initiate forced-air warmer to maintain maternal normothermia.

**Intraoperative Considerations**

* Position the mother with uterine displacement and apply standard ASA monitors.
* Assess FHR, placental location, and fetal position using ultrasonography.
* Perform a timeout prior to induction.
* Preoxygenate for 3 minutes before induction.
* Perform a rapid sequence induction to facilitate endotracheal intubation.
* Maintain maternal FiO2 greater than 50% and maintain normocarbia associated with pregnancy.
* Place urinary catheter to monitor urine output.
* Consider obtaining additional large-bore intravenous access.
* Consider arterial line placement for continuous hemodynamic monitoring.
* Maintain maternal blood pressure with IV phenylephrine, ephedrine, and/or glycopyrrolate; the typical goal is to maintain arterial pressure within 10% of pre-induction baseline with appropriate heart rate.
* Initiate intermittent/continuous fetal monitoring with a sterile ultrasound probe. Options for fetal monitoring include FHR, periodic monitoring of fetal cardiac function, umbilical artery dopplers, and ductal flow.
* After skin incision and prior to hysterotomy, increase the concentration of volatile anesthetic (2- 3 MAC) to achieve uterine relaxation. Alternatively, use volatile anesthetic (1.0-1.5 MAC) combined with IV remifentanil infusion (0.3-0.5 mcg/kg/min), with or without propofol infusion (50 - 200mcg/kg/min).
* Consider increasing the volatile agent or adding IV nitroglycerin (50-200 mcg boluses) or a continuous nitroglycerine infusion (1-3 mcg/kg/min) to augment uterine tocolysis, if needed.
* After hysterotomy, administer fetal IM opioid (e.g., fentanyl 10-20 mcg/kg), neuromuscular blocker (e.g., rocuronium 2-3 mg/kg), and atropine (10-20 mcg/kg).
* Initiate uterine infusion or external irrigation of the fetus with warmed crystalloid as needed. Monitor intrauterine temperature.
* Restrict IV fluids to less than 2 liters to reduce the risk for maternal pulmonary edema; consider colloid (e.g., albumin) administration as a portion of total fluids.
* Once uterine closure begins, initiate an IV loading dose of magnesium sulfate (4 to 6 g bolus), followed by an infusion (1- 2 g/hour). Initiation of magnesium may also be considered prior to hysterotomy.
* Activate epidural catheter for postoperative analgesia.
* Administer maternal antiemetics (e.g., ondansetron 4 mg IV).
* Monitor maternal neuromuscular blockade carefully because of possible prolongation from magnesium sulfate. Reverse residual neuromuscular blockade prior to extubation.
* Extubate trachea when the mother is fully awake.

**Early Postoperative Considerations**

* Complete postoperative debrief session.
* Continue tocolytic therapy with magnesium sulfate infusion for 24-48 hours.
* Options for postoperative analgesia include patient-controlled epidural analgesia, IV opioid patient-controlled analgesia, wound soaker catheter, regional anesthetic blocks, etc.
* Monitor uterine activity and FHR.
* Consider periodic fetal echocardiography to monitor for fetal ductal closure.
* Administer VTE prophylaxis (mechanical or pharmacologic) based on maternal comorbidities, current fetal status, concern for reoperation or urgent delivery, and timing of planned catheter removal.

Abbreviations: ASA, American Society of Anesthesiologists; EFW, Estimated fetal weight; FiO2, Fraction of inspired oxygen; FHR, Fetal heart rate; IM, Intramuscular; IV, Intravenous; MAC, Minimum alveolar concentration; PO, Per oral; VTE, Venous thromboembolism prophylaxis.

**Table S3: Perioperative Considerations for Ex Utero Intrapartum Treatment Procedures**

**Preoperative Considerations**

* Complete maternal history and physical examination.
* Complete fetal workup to exclude other anomalies.
* Perform imaging studies to determine fetal lesion, placental location, and EFW.
* Participate in the multi-disciplinary team meeting with the mother and accompany family members and in the team meeting on the day of surgery.
* Consider the administration of corticosteroids 48 and 24 hours prior to the planned procedure, depending on the gestational age of the fetus.
* Type and crossmatch 2-4 units of packed red blood cells for the mother and 1 unit of O-negative, leukocyte reduced, irradiated, cytomegalovirus-negative packed red blood cells crossmatched against the mother for the fetus.
* Transfer EFW-based doses of fetal intramuscular drugs to scrub nurse in sterile fashion that includes an opioid (e.g. fentanyl 10-20 mcg/kg), neuromuscular blocker (e.g. rocuronium 2-3 mg/kg), and atropine (10-20 mcg/kg).
* Transfer EFW-based unit doses of fetal resuscitation drugs to scrub nurse in sterile fashion (e.g., 2 unit doses of epinephrine 10mcg/kg, 2 unit doses of atropine 20 mcg/kg).
* Ensure the availability of appropriate equipment for fetal airway management and uterotonic drugs for mother.
* Administer pre-medications to the mother
	+ Consider aspiration prophylaxis with nonparticulate antacid (sodium citrate 30 mL PO), H2-receptor antagonist (e.g., famotidine 20 mg IV) and/or metoclopramide (10 mg IV)
	+ Antibiotics (e.g., cefazolin 2-3 g IV)
* Place high lumbar (L1-3) epidural catheter for postoperative analgesia. Administer only test dose before surgery.
* Place sequential compression devices on lower extremities for VTE prophylaxis.
* Initiate forced-air warmer to maintain maternal normothermia.
* Assemble a separate team consisting of a surgeon, anesthesiologist, neonatologist, respiratory therapist, scrub technician, and operating room nurse in an adjoining operating room for completion of surgery on the newborn, if necessary.

**Intraoperative Considerations**

* Position the mother with uterine displacement and apply standard ASA monitors.
* Assess FHR, placental location, and fetal position using ultrasonography.
* Perform a timeout prior to induction.
* Preoxygenate for 3 minutes before induction.
* Perform a rapid sequence induction to facilitate endotracheal intubation
* Maintain maternal FiO2 greater than 50% and maintain normocarbia associated with pregnancy.
* Place urinary catheter to monitor urine output.
* Consider obtaining additional large-bore intravenous access.
* Consider arterial line placement for continuous hemodynamic monitoring.
* Maintain maternal blood pressure with IV phenylephrine, ephedrine, and/or glycopyrrolate; the typical goal is to maintain arterial pressure within 10% of pre-induction baseline with appropriate heart rate.
* Initiate intermittent/continuous fetal monitoring with a sterile ultrasound probe. Options for fetal monitoring include FHR, periodic monitoring of fetal cardiac function, umbilical artery dopplers, and ductal flow.
* After skin incision and prior to hysterotomy, increase the concentration of volatile anesthetic (2-3 MAC) to achieve uterine relaxation. Alternatively, use volatile anesthetic (1.0-1.5 MAC) combined with IV remifentanil infusion (0.3-0.5 mcg/kg/min), with or without IV propofol infusion (50 - 200mcg/kg/min).
* Consider increasing volatile agent or adding IV nitroglycerin (50-200 mcg boluses) or a continuous nitroglycerine infusion (1-3 mcg/kg/min) to augment uterine tocolysis, if needed.
* After the delivery of fetal head and upper torso, administer fetal IM opioid (e.g. fentanyl 10-20 mcg/kg EFW), neuromuscular blocker (e.g. rocuronium 2-3 mg/kg) and atropine (10-20 mcg/kg).
* Consider placing a pulse oximeter on either fetal hand with opaque covering to prevent interference from operating room lights.
* Consider inserting a peripheral IV catheter on either fetal hand, if clinically indicated.
* Initiate uterine infusion or external irrigation of the fetus with warmed crystalloid as needed. Monitor intrauterine temperature.
* Reduce or discontinue volatile agents once the umbilical cord is clamped and initiate alternate anesthetic agents less likely to produce uterine relaxation (e.g., opioids, propofol, nitrous oxide).
* Transfer newborn to adjoining operating room for further resuscitation and stabilization, as indicated.
* Administer IV oxytocin for rapid reversal of uterine relaxation following the clamping of the umbilical cord.
* Periodically assess uterine tone and treat atony with additional uterotonic agents (e.g., methergine, carboprost, misoprostol), if needed.
* Activate epidural catheter for postoperative analgesia.
* Administer maternal antiemetics (e.g., ondansetron 4mg IV).
* Monitor maternal neuromuscular blockade and reverse residual neuromuscular blockade prior to extubation.
* Extubate trachea when the mother is fully awake

**Early Postoperative Considerations**

* Complete postoperative debrief session.
* Options for postoperative analgesia include patient-controlled epidural analgesia, IV opioid patient-controlled analgesia, wound soaker catheter, regional anesthetic blocks, etc.
* Monitor uterine tone and evaluate mother for additional blood loss.
* Administer VTE prophylaxis (mechanical or pharmacologic) based on maternal comorbidities, current fetal status, concern for reoperation or urgent delivery, and timing of planned catheter removal.

Abbreviations: ASA, American Society of Anesthesiologists; EFW, Estimated fetal weight; FiO2, Fraction of inspired oxygen; FHR, Fetal heart rate; IM, Intramuscular; IV, Intravenous; MAC, Minimum alveolar concentration; PO, Per oral; VTE, Venous thromboembolism prophylaxis.