CE 2.0 ANCC Contact Hours

COMPLICATIONS OF CESAREAN BIRTH

CLINICAL RECOMMENDATIONS FOR PREVENTION AND MANAGEMENT

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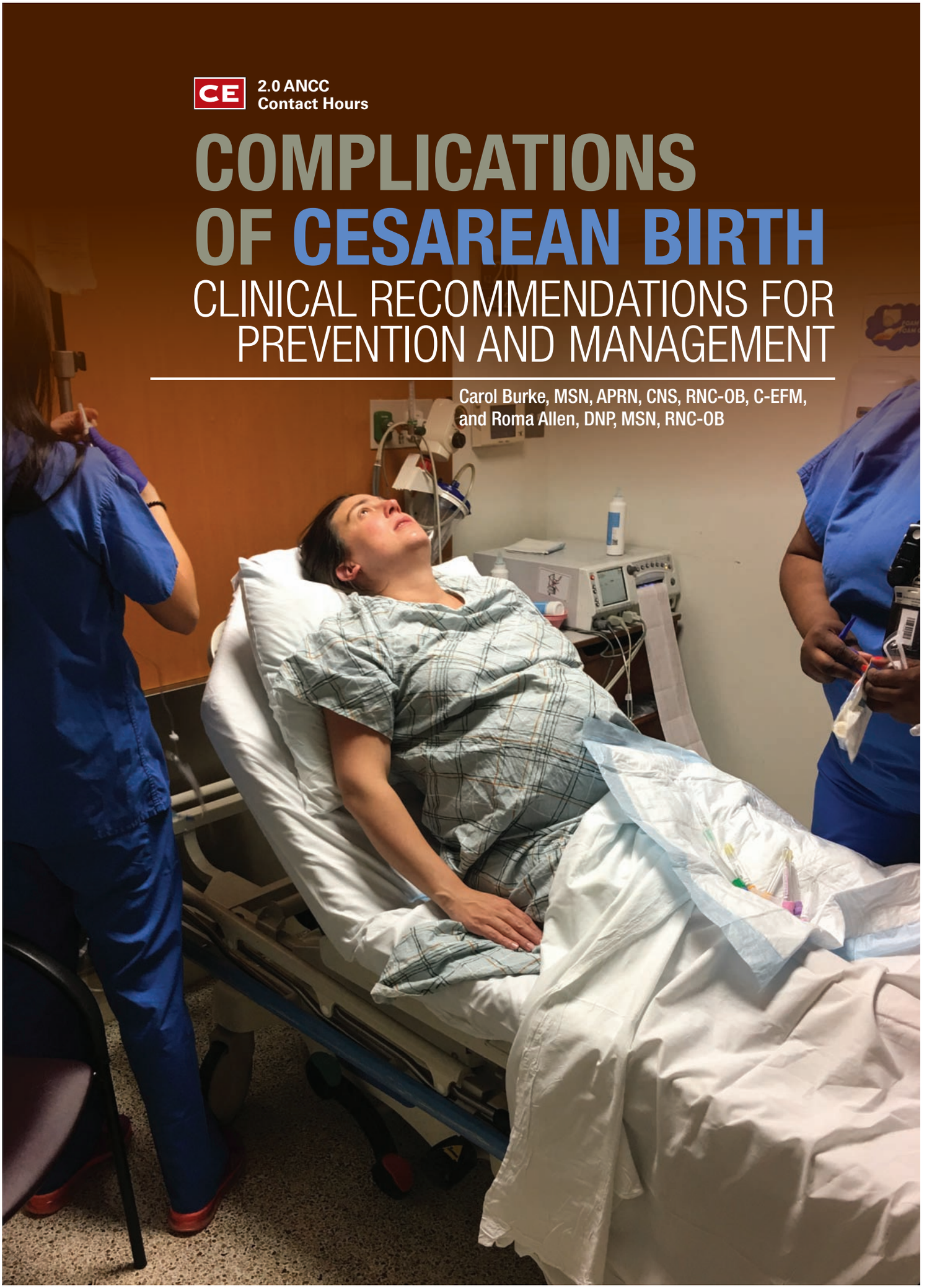

Abstract

The increase in severe maternal morbidity and mortality in the United States correlates with a significant rise in U.S. cesarean birth rates from 5.5% in 1970 to a rate of 31.9% of all births in 2018, far beyond the World Health Organization goal of 10% to 15%. Three key contributors to maternal morbidity and mortality related to cesarean birth include complications of hemorrhage, surgical site infection, and venous thromboembolism. All women should be screened for risk factors associated with these major complications during the antepartum, intrapartum, and postpartum period to assure the availability of immediate resources based on the assessment. Implementing evidence-based maternity care safety bundles, toolkits, and protocols to manage these complications can reduce adverse outcomes.

Keywords: Cesarean birth; Maternal morbidity and mortality; Postpartum hemorrhage; Surgical site infection; Venous thromboembolism.

Cesarean birth in the United States has significantly risen above the optimal threshold to benefit women and infants and has contributed to the continued rise in maternal morbidity and mortality (World Health Organization [WHO], 2011). The U.S. rate of cesarean birth was 5.5% in 1970 and more than doubled 10 years later (Centers for Disease Control and Prevention, 1995). In 1985, WHO recognized the associated risks and established a goal of 10% to 15% for total cesarean births as the U.S. rate reached 22%. A systematic review by WHO (2015) analyzed distribution of health outcomes with cesarean births and concluded there was no associated reduction in maternal and newborn mortality when cesarean rates exceeded 10%. The Healthy People 2020 goal for cesarean birth of healthy low-risk women without a prior cesarean is 23.9% (Office of Disease Prevention and Health Promotion, 2019). Based on the most recent data for 2018, almost 1.3 million, or 31.9% of births in the United States are via cesarean (Martin, Hamilton, & Osterman, 2019). Stabilization of the rate over the past 10 years may potentially be related to quality initiatives, labor management strategies, electronic fetal monitoring management protocols for indeterminate (category II) fetal heart rate tracings, continuous labor support, and use of practices to promote physiologic birth (American College of Obstetricians and Gynecologists [ACOG] & Society for Maternal-Fetal Medicine [SMFM], 2014).

Cesarean birth is associated with increased morbidity and mortality.

Cesarean Birth and Increased Maternal Morbidity and Mortality

Cesarean birth is necessary and lifesaving in some cases; however, for most low-risk pregnancies, a cesarean appears to pose a greater morbidity and mortality risk compared with vaginal birth (ACOG & SMFM, 2014; Caughey, 2017; Sandall et al., 2018). Cesarean birth is the most common surgical procedure in the United States and is directly related to risk of maternal death (Martin, Hamilton, Osterman, Driscoll, & Drake, 2018; Sandall et al.). Cesarean birth has contributed to the rise in maternal morbidity and mortality, mainly due to hemorrhage and placental abnormalities in subsequent pregnancies (Curtin, Gregory, Korst, & Uddin, 2015; Korb, Goffinet, Seco, Chevret, & Deneux-Tharaux, 2019). Estimates suggest that severe maternal morbidity events are approximately 100 times more common than mortality (WHO, 2011). With approximately 4 million births annually in the United States, episodes of severe maternal morbidity, including transfusion, intensive care, ruptured uterus, and unplanned hysterectomy affect approximately 52,000 women (Callaghan, Grobman, Kilpatrick, Main, & D'Alton, 2014). According to the most recent data, in the United States, the rate of severe maternal morbidity at birth increased 45% from 2006 through 2015, from 101.3 to 146.6 per 10,000 birth hospitalizations (Fingar, Hambrick, Heslin, & Moore, 2018). The most common indicators of severe maternal morbidity were blood transfusion, disseminated intravascular coagulation, and hysterectomy, which in 2015, involved 121.1, 11.0, and 11.0 births per 10,000, respectively (Fingar et al.).

We present three known postpartum complications of cesarean birth: postpartum hemorrhage (PPH), surgical site infection (SSI), and venous thromboembolism (VTE). These complications contribute to maternal morbidity and mortality, increased healthcare costs, and prolonged hospital stays (Butwick et al., 2017; D'Alton, Main, Menard, & Levy, 2014; Haidar, Nasab, Moussa, Sibai, & Blackwell, 2018). Childbirth is by far the most common reason for hospitalization in the United States (McDermott, Elixhauser, & Sun, 2017); therefore, any reduction in maternal morbidity associated with cesarean birth has potential to have a significant impact on healthcare cost and resource allocation.

Evidence-Based Bundles, Toolkits, and Protocols for Care of Women Having Cesarean Birth

A variety of evidence-based resources are available to guide clinical practice for care of women having cesarean birth. The Alliance for Innovation on Maternal Health (AIM, 2015a, 2015b) program under the sponsorship of the Council for Patient Safety in Women's Health Care has developed evidence-based bundles on obstetric hemorrhage and VTE using the four action domains of readiness, recognition, response, and reporting. Safety bundles are sets of straightforward evidence-based recommendations for practice and care designed to improve patient outcomes. The California Maternal Quality Care Collaborative has developed toolkits for promoting vaginal birth (Smith, Peterson, Lagrew, & Main, 2016) and improving clinical response to obstetric hemorrhage (Lyndon, Lagrew, Shields, Main, & Cape, 2015) and VTE (Hameed, Friedman, Peterson, Morton, & Montgomery, 2018). Application of bundles and toolkits to clinical practice have shown success at reducing the cesarean birth rate (Main et al.,

The rate of cesarean birth in the United States has risen significantly since the 1960s when these data were first collected, now estimated at 31.9% of all births.

2019), and decreasing maternal morbidity related to PPH (Main et al., 2017) and eclampsia (Shields, Wiesner, Klein, Pelletreau, & Hedriana, 2017). A standardized perioperative care program known as enhanced recovery after surgery has been adapted to cesarean birth (Caughey et al., 2018; Macones et al., 2019; Wilson et al., 2018). The program has shown success reducing hospital length of stay, surgical complications, hospital readmissions, and healthcare costs in other surgical specialties including gynecology (Wilson et al.). Standards and guidelines from professional associations support adoption of evidence-based practices for cesarean birth and associated complications. Prevention of the first cesarean birth has been a focus (ACOG & SMFM, 2014), as has timely identification and treatment of complications (ACOG, 2017, 2018; Association of Women's Health, Obstetric and Neonatal Nurses [AWHONN], 2018, 2019).

Hemorrhage with Cesarean Birth

Definition and Incidence

ACOG (2017) defines PPH as a cumulative loss of 1,000 mL or more accompanied by signs and symptoms of hypovolemia within 24 hours after vaginal or cesarean birth. Severe PPH is a leading cause of maternal death and severe maternal morbidity. Compared with vaginal birth, women having a cesarean, especially a repeat cesarean (planned or after labor), incur the highest risk of PPH and hemorrhage-related morbidity (Butwick et al., 2017; Curtin et al., 2015). Data on incidence of PPH are inconsistent because various definitions are used including those for PPH and severe PPH. Analysis of births from 1995 to 2004 using the U.S. Nationwide Inpatient Sample found PPH complicated 2.9% of all births and was associated with 19.1% of all in-hospital postpartum deaths (Bateman, Berman, Riley, & Leffert, 2010). Later analysis using the U.S. National Inpatient Sample of births from 1999 to 2008 found severe PPH, defined as PPH plus a blood transfusion, hysterectomy, or surgical repair of the uterus, to have more than doubled from 1.9 to 4.2 per 1,000 births during that time frame (Kramer et al., 2013). In a recent randomized trial that included >6,000 low-risk nulliparous women who gave birth at term, the PPH rate was approximately 4.5% (Grobman et al., 2018). In this study, PPH was defined as a blood transfusion, nonelective hysterectomy, use of two or more uterotonics other than oxytocin, or other surgical interventions (Grobman et al.).

Risk Factors

Maternal PPH risk assessment should be conducted during the antepartum, intrapartum, and postpartum periods as the woman's risk factors evolve (Main et al., 2015). Risk assessment tools have been shown to identify 60% to 85% of women who will experience PPH (ACOG, 2017). Incorporating a risk assessment tool into the medical record can be useful in making sure all pregnant women are screened on admission. AWHONN, (2018) offers a sample risk assessment tool as does the California Maternal Quality Care Collaborative (Lyndon et al., 2015). Prophylactic measures incorporated into standard clinical practice may reduce the risk of PPH (Dunkerton, Jeve, Walkinshaw, Breslin, & Singhal, 2018).

The greatest risk of hemorrhage associated with a cesarean birth, especially with a scarred uterus, is with abnormal placentation (Korb et al., 2019). Placenta previa is the main risk factor, leading to a 45.5% risk of blood loss >1,000 mL and a 17.5% risk of ≥2,000 mL estimated blood loss (Dunkerton et al., 2018). Additional risk

factors for hemorrhage include uterine atony, intrapartum cesarean compared with prelabor cesarean birth, possibly explained by intrapartum factors of chorioamnionitis, prolonged labor and oxytocin exposure (Curtin et al., 2015; Grotegut, Paglia, Johnson, Thames, & James, 2011), general anesthesia, and multiple gestation (Butwick et al., 2017). Trauma leading to hemorrhage may occur with incision extensions, lacerations, uterine rupture, manual removal, or hematoma formation. Women with an acquired or preexisting coagulopathy or an antepartum or intrapartum hemorrhage are at higher risk for severe maternal morbidity.

Management and Evidence-Based Guidelines

Management goals for hemorrhage include hemodynamic stability through preservation of systolic blood pressure, urine output of 30 mL or more per hour, and normal mental status. Following placental delivery, PPH may be immediate, requiring accuracy in recognition for prompt intervention to improve outcome.

Every labor unit should be prepared for the potential of hemorrhage with a PPH emergency supply cart, immediate accessibility to uterotonics, and massive transfusion protocols for the obstetric population (Lyndon et al., 2015). Well-defined obstetric hemorrhage protocols are essential; use a comprehensive plan with the multidisciplinary team, and coordinate blood bank services to ensure rapid availability of blood and blood products (Main et al., 2015). Unit-based drills facilitate awareness of opportunities for improvement of critical resource response and supply acquisition. Management of PPH due to uterine atony includes uterine massage and uterotonics followed by mechanical management when necessary, including intrauterine balloon placement or uterine packing (Lyndon et al.). Surgical techniques include compression sutures (e.g., B-Lynch), and potential assistance by interventional radiology for embolization of pelvic arteries to decrease uterine vascular blood flow, or ultimately hysterectomy (ACOG, 2017). Consideration of referral to a tertiary care center prior to birth may be appropriate for women at the highest risk for morbidity, for example, a suspected placental abnormality associated with PPH (Butwick et al., 2017; Main et al., 2015). A multidisciplinary debriefing following the hemorrhage event can serve to address opportunities to improve quality of care (D'Alton et al., 2014; Lyndon et al.).

The Joint Commission (TJC, 2019) introduced new maternal safety standards for their accredited hospitals that will become effective July 2020. The PPH standards involve establishing clinical protocols, a PPH kit, team education, emergency drills, case reviews, and patient education on signs and symptoms of PPH and when and how to seek care for these symptoms after hospital discharge (Simpson, 2020; TJC). Prevention, early recognition, and timely treatment have been found to have the most potential impact in reduction of the likelihood of harm related to maternal hemorrhage (Lyndon et al., 2015; Main et al., 2017). Adoption of a bundle, toolkit, or protocol to prevent and manage PPH by working together as part of a perinatal quality care collaborative and system-wide perinatal safety initiative via an interprofessional team has been found to be successful (Lyndon & Cape, 2016).

Surgical Site Infection

Definition and Incidence

Surgical site infection occurs in up to 11% of women after cesarean birth and is manifested as endometritis, wound infection, or urinary tract infection; however, the frequency may be underestimated as symptoms may appear after discharge and managed on an outpatient basis (Carter et al., 2017). The Centers for Disease Control and Prevention (CDC) has defined SSI as an infection occurring within 30 days after the operative procedure using three classifications: superficial incisional, deep incisional, and organ/space (Berríos-Torres et al., 2017). Superficial incisional classification involves the skin and subcutaneous tissue and has either purulent drainage, a positive culture, complaints of pain or tenderness, or evidence of swelling, redness, or heat. An SSI that involves the soft tissue, fascia, and muscle is classified as deep incisional. This infection results in purulent drainage or an abscess, and the woman may have a fever, pain, or tenderness. The incision may spontaneously dehisce or be intentionally opened by the physician. The third classification is infection of the organ/space. Postpartum endometritis involves infection of the uterine decidual layer; extension into the muscle layer is termed endomyometritis. Preventing SSIs is a major part of the enhanced recovery after cesarean protocol (Caughey et al., 2018; Killion, 2019).

Risk Factors

There are many risk factors for SSI including those occurring during antepartum, intrapartum, or the perioperative periods (Haidar et al., 2018). Maternal factors include tobacco use; limited prenatal care; BMI greater than 30 kg/m2; corticosteroid use; nulliparity; twin gestations; and previous cesarean. Intrapartum and operative factors include: chorioamnionitis; premature rupture of membranes; prolonged rupture of membranes; prolonged labor, six or more vaginal exams prior to the cesarean, prolonged second stage of labor; large incision length; subcutaneous hematoma; lack of antibiotic prophylaxis; emergency birth; surgical duration greater than 47 minutes; and excessive blood loss. Endometritis has been reported to be almost three times more common after cesarean birth in the second stage of labor compared with the first stage of labor (Axelsson, Brynhildsen, & Blomberg, 2018; Vallejo et al., 2017).

Management and Evidence-Based Guidelines

Despite limitations of heterogeneity with primary studies, four evidence-based interventions are associated with a significant reduction in SSI after cesarean birth (AWHONN, 2019; Carter et al., 2017). The four preoperative and perioperative interventions include vaginal cleansing, skin antisepsis, antibiotic prophylaxis, and prevention of hypothermia (Berríos-Torres et al., 2017; Caughey et al., 2018). Vaginal cleansing with a 10% solution povidone-iodine swab stick for 30 seconds should be considered for women in labor, especially those with ruptured membranes (Caughey et al.; Felder, Paternostro, Quist-Nelson, Baxter, & Berghella, 2019). A Cochrane review of 2,635 women in seven randomized trials found that cleansing the vagina with povidone-iodine immediately before cesarean birth reduced risk of postoperative endometritis (Haas, Morgan, Contreras, & Enders,

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2018). High-quality studies found both betadine and chlorhexidine as skin antisepsis preparation sufficient and optimal when the solution is allowed to dry per manufacturer's instructions (Hadiati, Hakimi, Nurdiati, da Silva Lopes, & Ota, 2018; Springel et al., 2017). The enhanced recovery after cesarean protocol recommends chlorhexidine-alcohol as preferred over povidone-iodine for skin preparation (Caughey et al.). Hair removal is recommended using clippers before moving into the operative suite (Association of periOperative Registered Nurses [AORN], 2018).

Prophylactic antibiotic therapy is recommended with administration of a first-generation cephalosporin (e.g., cefazolin) using weight-based dosing ideally 60 minutes before skin incision (American Academy of Pediatrics [AAP] & ACOG, 2017; AORN, 2018, Caughey et al., 2018). For women with penicillin and cephalosporin allergy, alternative antibiotics may include clindamycin with an aminoglycoside. In an emergent situation, antibiotics may be administered during the cesarean, after cord clamping, or immediately after surgery (AAP & ACOG). Additional or higher doses of antibiotics may be indicated in procedures lasting longer than 3 to 4 hours, obese women, and with excessive blood loss. Postpartum endometritis is typically polymicrobial, involving a mixture of two to three aerobes and anaerobes from the genital tract. The most common organisms leading to postcesarean infection in women include *group A streptococci* (GAS) and *group B streptococci* (GBS). *Group A streptococci* is a virulent, potentially lethal organism and when present, increases risk of progression to severe sepsis (Acosta et al., 2014). The fourth evidence-based intervention includes a period of perioperative warming using both active and passive warming measures prior to the administration of anesthesia (AORN; AWHONN, 2019; Caughey et al.; Dendis & Hooven, 2020). Methods such as warm forced air, warmed blankets, and warmed IV fluids are found to be effective at maintaining maternal body temperature and decreasing shivering (Dendis & Hooven; Munday et al., 2014).

Patient education is critical and women need to be informed that symptoms of infection can be focused to the involved site or nonspecific.

Three key complications of cesarean birth are postpartum hemorrhage, surgical site infection, and venous thromboembolism.

Endometritis is generally diagnosed within the first few days postpartum, with fever being the most characteristic and earliest sign. Symptoms also include chills, uterine tenderness, abdominal pain, purulent or foul-smelling lochia. Symptoms of infection requiring provider notification include prolonged incisional healing, wound separation, or signs of urinary tract infection. Risk assessment, early suspicion of infection, and recognition of severity are essential to quality care and early detection of progression to perinatal-associated severe sepsis.

Venous Thromboembolism

Definition and Incidence

Women post cesarean have a higher coagulopathy activation compared with those giving birth vaginally and a fourfold greater risk of developing VTE particularly when complicated by PPH hemorrhage or infection (ACOG, 2018; Blondon et al., 2016). Venous thromboembolism is a term that includes deep vein thrombosis (DVT) and pulmonary embolism (PE). The proportion of VTE is 80% DVT and 20% PE. The left leg is the site of up to 78% to 90% of VTE and 72% occur in the iliofemoral vein with a high risk of embolization (Diaconu, Bălăceanu, & Bartoş, 2013). The CDC estimates that thrombotic PE has accounted for approximately 10% of pregnancy-related deaths over the recent decades (Petersen et al., 2019). A reported incidence of VTE ranges from 0.49 to 2.6 events per 1,000 births (Armstrong, Bellone, Hornsby, Treadway, & Phillippe, 2014).

Risk Factors

Various physiological alterations including a hypercoagulable state and anatomical changes secondary to compression of the inferior vena cava and pelvic veins increase the risk of

DVT and PE during pregnancy (ACOG, 2018). The hypercoagulable state is protective for the mother due to the hemostatic challenges necessary with birth. Anatomical changes leading to stasis include venous dilatation, mechanical obstruction to venous return from the enlarging uterus, and decreased mobility. Antepartum patients with limited mobility are at a higher risk for VTE (Armstrong et al., 2014). The risk continues to escalate throughout the pregnancy with the postpartum risk up to 80-fold higher during the first 6 weeks postpartum (Armstrong et al.). All women should be screened using a standardized VTE risk assessment tool at the first outpatient prenatal care visit, antepartum hospitalization, intrapartum, and prior to postpartum discharge (AIM, 2015a).

Management and Evidence-Based Guidelines

ACOG (2018), the Royal College of Obstetricians and Gynaecologists (2015), AIM (2015a), the American Society of Regional Anesthesia and Pain Medicine (Horlocker et al., 2018), the American Society of Hematology (Schünemann et al., 2018), and the California Maternal Quality Care Collaborative (Hameed et al., 2018) have published guidelines for management of and reducing the occurrence of obstetric thromboembolism. Recommendations vary and the decision to administer prophylaxis is based on risk assessment and patient status (D'Alton et al., 2016). All society groups recognize the benefit of early ambulation and adequate hydration. Women giving birth by cesarean should use perioperative mechanical thromboprophylaxis with pneumatic compression devices until the woman achieves full ambulation (ACOG; AWHONN, 2019).

Pharmacologic thromboprophylaxis should be used for women with risk factors including those hospitalized antepartum (AIM, 2015a). Although there are no large clinical trials that identify the optimal dose of anticoagulants in pregnancy, there is clear consensus that low molecular weight heparin (LMWH) is the frontline agent (ACOG, 2018). Some experts encourage providers to consider switching from LMWH to low-dose unfractionated heparin (UFH) at 36 weeks of gestation or earlier, particularly in women with additional comorbidities or women at a high risk for urgent cesarean or preterm labor (AIM, 2015a; D'Alton et al., 2016). Any woman who has given birth that is at risk for VTE should wait at least 1 hour after neuraxial procedure (if no signs of PPH) and at least 1 hour after epidural catheter removal before initiating or restarting subcutaneous UFH thromboprophylaxis (Leffert et al., 2018).

Clinical Implications

When compared with vaginal birth, cesarean birth has been associated with a higher risk of hemorrhage, infection, VTE, severe maternal morbidity, and maternal death. These complications have a negative impact on postpartum recovery, maternal transition to motherhood, and care of her baby. Patient education is vital to ensure women are aware of the early warning signs of complications. AWHONN offers a Postbirth Warning Signs educational handout that can be offered to all women before postpartum discharge (Bingham, Suplee, Morris, & McBride, 2018; Suplee, Kleppel, Santa-Donato, & Bingham, 2017). Using evidence-based care bundles, toolkits, and protocols presented here that provide structured approaches to improving management may help facilitate adoption of best practices and reduce adverse outcomes related to cesarean births. Standards and guidelines from professional associations are valuable in making sure clinical practices are consistent with the latest evidence. The AWHONN (2019) evidence-based clinical practice guideline on perioperative care of the pregnant woman provides detailed recommendations to prevent and manage these complications of cesarean birth. ✣

Suggested Clinical Implications

- Use risk assessment tools during the antepartum, intrapartum, and postpartum periods to identify women giving birth by cesarean who are at increased risk for hemorrhage, surgical site infections, and venous thromboembolism.
- Prepare for an obstetric hemorrhage through unit-based drills that use a rapid response team, access to vital resources, a hemorrhage supply cart, medications, and activation of an obstetric massive blood transfusion protocol that includes coordination with the blood bank.
- Reduce risk of a surgical site infection when following an evidence-based safety bundle including vaginal cleansing, skin preparation, timely antibiotic administration, and maintenance of thermoregulation.
- Use interventions such as early ambulation, adequate hydration, and pneumatic compression devices to reduce risk of venous thromboembolism.
- Review the enhanced recovery after cesarean protocol and adopt it as part of routine care for women having cesarean birth.
- Use the AWHONN evidence-based guideline of perioperative care of the pregnant woman to update unit policies and practices.
- Educate women about early warning signs and potential complications of a cesarean birth as part of their hospital discharge teaching.
- Consider using the AWHONN postbirth warning signs handout for all women giving birth.

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