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Cesarean Section: Evidence-Based Practices in Nursing and Obstetrics-An Updated Review

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Abstract:

Background: Cesarean section (C-section) is a common surgical procedure involving the delivery of a fetus through an incision in the abdominal wall and uterus. It has evolved significantly since its origins in AD 1020, becoming the most frequently performed surgery in the United States. Over the years, its prevalence has increased, reaching 31.9% in 2016. While this rise is driven by factors such as advanced maternal age and medical technology, efforts to reduce cesarean delivery rates have not been very successful. Cesarean sections remain essential for women facing specific risks during labor.

Aim: This review examines evidence-based practices in nursing and obstetrics related to cesarean sections, focusing on indications, procedure techniques, and complications, aiming to provide updated insights into the practice and its outcomes.

Methods: A comprehensive review of recent literature on cesarean delivery was conducted, evaluating surgical techniques, maternal and fetal indications, risks, and post-operative care. The review included studies, guidelines, and expert opinions from obstetricians, anesthesiologists, and nurses.

Results: Cesarean sections are essential in certain clinical situations, including abnormal fetal positioning, maternal conditions, or complications from prior surgeries. The procedure involves careful dissection through multiple layers, and complications can include infection, hemorrhage, and long-term risks such as uterine rupture. Evidence-based practices focus on minimizing risks through proper surgical techniques, patient selection, and post-operative care.

Conclusion: The Cesarean section remains a crucial intervention for certain high-risk pregnancies, though reducing unnecessary cesareans is a key goal in modern obstetrics. Evidence-based practices and careful decision-making can enhance patient outcomes.

Keywords: Cesarean section, obstetrics, evidence-based practices, maternal health, fetal health, surgical techniques, post-operative care, complications.

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Introduction:

The Cesarean section refers to the surgical delivery of a fetus through an incision made in the abdominal wall (laparotomy) and the uterus (hysterotomy). The origins of this procedure date back to AD 1020, and its techniques have undergone significant advancements over the centuries [1]. Today, cesarean delivery represents the most frequently performed surgical procedure in the United States, with over one million women undergoing this operation each year. The prevalence of cesarean deliveries has surged markedly, increasing from a 5% rate in 1970 to 31.9% in 2016 [2]. This rise is attributable to various factors, including an increase in maternal age, advancements in medical technology enabling more complex pregnancies, and shifting obstetric practices. Efforts to mitigate cesarean rates—such as advocating for vaginal births after cesarean and supporting natural labor when clinically appropriate—have seen limited success. Experts suggest that a substantial reduction in cesarean delivery rates is unlikely to be achieved in the near future [3]. While cesarean sections entail risks of both immediate and long-term complications, they remain the safest or sole viable option for certain women to deliver a healthy newborn.

Anatomy and Physiology

The cesarean delivery process requires precise navigation through multiple anatomical layers to safely reach the fetus. The procedure begins with a skin incision, progressing through the subcutaneous tissue to expose the fascia overlying the rectus abdominis muscles. This fascia comprises two layers: one derived from the external oblique muscle's aponeurosis and another formed by the fused aponeuroses of the transverse abdominis and internal oblique muscles. Upon separating the vertically oriented rectus muscles, the parietal peritoneum is incised to enter the abdominal cavity. In a gravid state, the uterus is often encountered immediately upon abdominal entry, contrasting with the anatomy of a nongravid woman. In cases of prior abdominal surgeries, adhesions involving structures such as the omentum, bowel, anterior abdominal wall, bladder, and uterus may complicate the procedure.

Once the uterus is visualized, the vesicouterine peritoneum (vesicouterine serosa) that connects the bladder to the uterus becomes apparent. Incising this layer is necessary to create a bladder if required. Adhesions from previous cesarean deliveries may complicate this step, making bladder separation from the uterus challenging. The uterus itself consists of three layers: the perimetrium (outer serosal layer), myometrium (middle muscular layer), and endometrium (inner mucosal layer). A hysterotomy involves incising all three layers to access the uterine cavity. The uterine vasculature is bilaterally aligned along its lateral borders, necessitating meticulous surgical precision to avoid injury. The uterine arteries, which are branches of the anterior division of the internal iliac artery, experience a significant increase in blood flow during pregnancy, reaching a unilateral flow rate exceeding 300 mL/min by the 36th gestational week [4]. These arteries cross the ureters anteriorly and enter the uterus at the cardinal ligament, where they anastomose with ovarian arteries originating from the abdominal aorta.

Depending on the condition of the amniotic membranes, the surgeon may encounter the amniotic sac upon uterine incision. Comprising the chorion and amnion, the amniotic sac forms the final barrier before fetal delivery. Once this layer is breached, the fetus is delivered, fulfilling the primary objective of the cesarean procedure. After fetal delivery, the surgeon may gain improved visibility of other reproductive structures if the uterus is exteriorized for repair. This includes the fallopian tubes, ovaries, and broad ligament. If the patient has consented to permanent contraception, a tubal ligation may be performed at this stage. The broad ligament, consisting of two peritoneal layers, attaches the uterus to the pelvic

sidewalls and may reveal the ureter if the medial layer is opened. While the cervix and vagina are typically not visible during the procedure, their anatomical relationships remain critical to surgical safety.

Indications:

The decision to perform a cesarean section often arises from clinical situations where vaginal delivery is either unfeasible or poses significant risks to the mother or fetus [5][6]. Certain scenarios necessitate cesarean delivery as a safer alternative, such as when a patient has a history of a prior classical cesarean section or uterine rupture. These indications are considered rigid, as vaginal delivery in such cases could lead to severe complications. However, due to the inherent risks associated with cesarean sections, efforts have been directed toward reducing their prevalence. A primary strategy involves minimizing the incidence of first-time cesarean deliveries, as women who undergo one cesarean are more likely to have subsequent deliveries via the same method. Factors influencing this include personal preference or clinical contraindications to vaginal birth. For instance, cervical ripening using agents like misoprostol is contraindicated in patients with an unfavorable cervix at term due to the heightened risk of uterine rupture. In a 2011 article titled *Safe Prevention of the Primary Cesarean Delivery*, the authors outlined key indications for initial cesarean deliveries, including labor dystocia, abnormal fetal heart rate patterns, fetal malpresentation, multiple gestations, and suspected fetal macrosomia [7].

Maternal Indications for Cesarean Section

Cesarean delivery may be necessitated by maternal factors, such as a history of prior cesarean delivery, maternal request, or physical conditions like pelvic deformity or cephalopelvic disproportion. Other maternal conditions, including previous perineal trauma, pelvic or anal/rectal reconstructive surgery, infections such as herpes simplex or HIV, and systemic diseases like cardiac or pulmonary disorders, also warrant cesarean delivery. Additionally, neurological conditions such as cerebral aneurysms or arteriovenous malformations and cases requiring concurrent intra-abdominal surgery are considerations. In extreme emergencies, perimortem cesarean may be performed to save the fetus [5][6].

Uterine and Anatomic Indications for Cesarean Section

Uterine or anatomical abnormalities also justify cesarean delivery. Conditions such as abnormal placentation (e.g., placenta previa or placenta accreta), placental abruption, or a history of prior classical hysterotomy or full-thickness myomectomy are notable indications. Other considerations include uterine incision dehiscence, invasive cervical cancer, a prior trachelectomy, obstructive masses in the genital tract, and the presence of a permanent cerclage [5][6].

Fetal Indications for Cesarean Section

Fetal factors influencing the decision for cesarean delivery include nonreassuring fetal status, such as abnormal umbilical cord Doppler findings or atypical fetal heart tracings, and complications like umbilical cord prolapse or failed operative vaginal delivery. Other indications encompass malpresentation, macrosomia, congenital anomalies, fetal thrombocytopenia, and a history of neonatal birth trauma [5][6]. A study conducted in 2007 explored the level of fetal risk that patients and their caregivers deemed acceptable to pursue vaginal delivery instead of cesarean section [8]. The findings revealed a low tolerance for any added fetal risk, reflecting the high expectations of pregnant women regarding delivery outcomes. This inherent caution in avoiding fetal harm presents a significant challenge to efforts aimed at reducing cesarean section rates.

Contraindications

There are no definitive medical contraindications for cesarean delivery. In certain situations, such as fetal or maternal demise, a cesarean section remains a viable option, even if the patient or fetus is deceased or critically ill. While optimal conditions for cesarean delivery, including the availability of anesthesia, antibiotics, and necessary surgical equipment, are ideal, the absence of these does not constitute a contraindication when the clinical situation necessitates the procedure. From an ethical standpoint, a cesarean section becomes contraindicated if the patient declines the procedure. Informed

consent, based on adequate education and counseling, is essential for ensuring that the patient's decision is made autonomously. If a patient refuses the cesarean, her right to refuse is upheld, acknowledging her autonomy in the decision-making process. Additionally, several clinical conditions may make cesarean delivery less desirable, resulting in what could be considered relative contraindications. For instance, patients with severe coagulopathies face significant surgical risks, potentially making vaginal delivery a safer alternative. Similarly, individuals with a history of extensive abdominal surgeries may present challenges for safe surgical intervention. In cases of fetal demise, performing a cesarean delivery would expose the patient to the risks associated with the procedure without any benefit to the fetus. The same considerations apply in cases where the fetus has severe anomalies incompatible with life, as the risks of surgery outweigh any potential benefit.

Equipment

The specific equipment required for a cesarean section is contingent upon the clinical circumstances at hand [9]. At a fundamental level, the only essential item is a cutting instrument. In extreme emergency situations, such as a perimortem cesarean following a motor vehicle accident, a sharp object like a piece of glass could theoretically be employed. However, such scenarios are exceedingly rare. More commonly, a variety of consumable and reusable items are employed to enhance safety for both the patient and the fetus during the procedure. The operating room should be equipped with a surgical bed or table capable of adjusting vertically to accommodate the clinician's needs. The table should also be equipped with arm rests, a safety belt to secure the patient, and a wedge or rolled blanket to achieve the necessary left lateral tilt for the pregnant patient. Additionally, surgical step stools must be available for the clinician and assisting staff. To ensure the patient's comfort and prevent hypothermia, a blanket warmer is often present in the operating room. This equipment is used to warm both the patient and the neonate. Prior to surgery, an indwelling catheter is typically placed in the patient's bladder. Overhead lighting is necessary to properly illuminate the surgical field. Common consumables used during the procedure include sutures, gloves, gowns, wound dressings, and hemostatic agents.

Once the patient is positioned on the surgical table, a sterile surgical drape is employed to maintain the sterile field. The drape may be fenestrated or non-fenestrated and is typically secured to two poles positioned at the patient's shoulders. It is designed to shield the surgical field from the patient's view, though transparent drapes are also available for patients who wish to observe the surgery and delivery. Many hospitals utilize a standardized surgical pack tailored for cesarean deliveries, which contains essential draping materials and other instruments, such as surgical towels, bulb suction, umbilical cord clamps, and suction tubing. Anesthesia equipment is positioned at the head of the surgical table and includes monitors to track the patient's vital signs, storage for medications required for anesthesia, and airway management tools. While regional anesthesia is typically employed during cesarean sections, general anesthesia may be necessary in certain cases. Therefore, all necessary equipment for securing and maintaining the patient's airway should be immediately available.

Most hospitals maintain a standardized surgical tray specifically designed for cesarean sections. This tray includes a range of instruments traditionally utilized in the procedure, although variations may exist depending on the region or institution. The tray may contain various scissors (e.g., bandage, Metzenbaum, and Mayo types), clamps (e.g., Kelly, Kocher, Allis, and Babcock), ring forceps, tissue forceps (e.g., Adson, Russian, Ferris-Smith), retractors (e.g., bladder blade, Army-Navy, and Richardson), needle drivers, and suction devices (e.g., Yankauer or Poole). The use of standardized surgical packs and cesarean instrument trays offers significant advantages, particularly in emergency situations, where quick access to the necessary tools is crucial. In addition to these essential instruments, a hysterectomy instrument tray should also be readily available, as peripartum hysterectomies, though rare, are increasingly performed. The immediate availability of appropriate tools in such emergencies can substantially reduce the time required for critical interventions.

Personnel

A cesarean section demands the collaboration of a proficient and coordinated medical team to guarantee the safety and well-being of both the patient and neonate. The personnel involved are integral to managing all stages of the procedure, from preoperative preparation through postoperative care. Key personnel typically involved in the cesarean section include the surgeon, surgical assistant, anesthesiologist or anesthetist, surgical technician or operating room nurse, circulating or operating room nurse, and a clinician dedicated to the care of the neonate. Before the procedure commences, ensuring the patient receives adequate analgesia is paramount. In most cases, this is managed by the anesthesia team, which may consist of an anesthesiologist or a nurse anesthetist. In some institutions, a specialized obstetric anesthesia team is responsible for this task. Alternatively, anesthesia clinicians overseeing all surgical suites may provide the necessary care. In addition to administering analgesia, the anesthesiologist or anesthetist plays a crucial role in managing the patient's airway, monitoring vital signs, managing surgical blood loss, and tracking urine output. Furthermore, the anesthesia staff often oversees the administration of any necessary medications, blood products, or laboratory blood draws. The primary surgeon performing a cesarean section may differ depending on the hospital and region. In most cases, an obstetrician/gynecologist assumes this role, although in some hospitals, particularly in rural settings, a general surgeon may perform the procedure. Family clinicians who practice obstetrics may also take on the role of the primary surgeon.

The surgical assistant's duties vary and may be fulfilled by another clinician, such as a practice partner, obstetric hospitalist, trained nurse, certified nurse-midwife, resident physician, or fellow. The role of the surgical technician traditionally involves providing the surgeon with necessary instruments but may extend to assisting the surgeon during the procedure. The circulating nurse, a non-sterile member of the team, is responsible for retrieving additional equipment or supplies as needed. They also perform documentation tasks and ensure patient safety throughout the procedure. Additionally, the circulating nurse collaborates with the surgical technician to verify the accuracy of surgical instrument, needle, and sponge counts. Post-delivery, a nurse, advanced clinician, or physician is assigned to care for the neonate, including performing initial resuscitation, assessment, and warming. In cases of preterm birth or when the neonate requires specialized care due to congenital anomalies or drug exposures, additional staff from the neonatal intensive care unit (NICU) may be required. In certain practice settings or scenarios, the primary surgeon or anesthesiologist may assist with neonatal care when necessary [10].

Preparation

Adhering to enhanced recovery protocols, prenatal care should encompass patient education regarding the potential for cesarean delivery. It is essential that the patient is well-informed about the entire surgical process, including what to expect before, during, and after the procedure. If a cesarean delivery is planned due to maternal or fetal indications, preoperative management should focus on optimizing maternal comorbidities such as anemia, diabetes, hypertension, or obesity, where possible [11]. A significant risk associated with cesarean delivery is aspiration leading to pneumonitis. To mitigate this risk, preoperative administration of antacids such as sodium citrate and a histamine H2 antagonist is recommended to prevent a low gastric pH. Traditionally, patients are instructed to be "nil per os" (NPO) after midnight. For an unscheduled cesarean, patients are typically advised to fast for six hours prior to the surgery. Enhanced recovery protocols, however, suggest that patients should be encouraged to consume clear liquids up to two hours before the scheduled surgery, with solid food prohibited for six hours prior. Additionally, carbohydrate fluid supplementation may be offered to non-diabetic patients up to two hours before surgery, which can potentially improve patient outcomes. Oral or mechanical bowel preparation is generally not recommended, and in emergency cases, the NPO status may be overridden by urgent maternal or fetal indications.

Preoperative gabapentin administration has been shown to improve pain control following cesarean delivery. However, preoperative sedation should be avoided to prevent risks such as impaired psychomotor function post-delivery and potential fetal complications, including thermogenesis difficulties,

low Apgar scores, and "floppy baby syndrome" [11]. Cesarean delivery inherently carries a risk of infection due to the nature of the incision, which is classified as a clean-contaminated surgical wound. This risk is heightened in the postpartum period, with women undergoing cesarean sections being at a significantly higher risk of infection—up to 20 times greater than those who have vaginal deliveries [12]. To reduce this risk, prophylactic antibiotics are commonly administered and can reduce infection rates by 60% to 70% [12]. Antibiotics should be administered preoperatively, ideally before umbilical cord clamping. The choice of antibiotic will depend on the clinical scenario and the patient's allergy history. Antibiotic therapy typically covers a broad spectrum, including gram-positive and gram-negative bacteria as well as some anaerobes [14].

For women weighing less than 80 kg, a single intravenous dose of 1 g of cefazolin is standard, with the dose increased to 2 g for those weighing 80 kg or more. For patients weighing 120 kg or more, the cefazolin dose may be increased to 3 g to ensure adequate tissue concentrations [15]. In cases where patients have contraindications to cefazolin, such as significant allergies, alternative prophylaxis with clindamycin (900 mg) and aminoglycoside (5 mg/kg) is recommended. If the patient has a history of methicillin-resistant Staphylococcus aureus (MRSA), the addition of vancomycin is also advised. Infection risk during the cesarean section is also influenced by vaginal flora, especially when the patient undergoes the procedure after labor or membrane rupture. Recent studies have indicated that in these cases, the addition of 500 mg of intravenous azithromycin to traditional antibiotic prophylaxis can be beneficial in reducing infectious morbidity [16]. Topical preparations, such as povidone-iodine and chlorhexidine, are commonly used for abdominal skin preparation prior to cesarean delivery. While research comparing their efficacy is mixed, chlorhexidine may offer superior infection control compared to povidone-iodine [17]. Both options, however, are considered acceptable. Vaginal preparation is another consideration. A recent Cochrane review suggests that vaginal preparation can likely reduce the risk of endometritis following cesarean delivery. Both povidone-iodine and chlorhexidine are acceptable solutions for vaginal preparation [18].

Technique or Treatment

Cesarean section is a complex and delicate surgical procedure requiring meticulous attention to various technical factors to ensure optimal outcomes. Proper tissue handling, effective hemostasis, prevention of tissue ischemia, and infection control are fundamental for promoting wound healing and minimizing the formation of postoperative adhesions. The choice of surgical technique is influenced by multiple variables, including clinical indications, patient anatomy, and institutional practices. It is advisable for surgeons to base these decisions on sound evidence to enhance patient safety and procedural effectiveness. Among the several surgical methods available, four primary techniques are commonly employed: the Pfannenstiel-Kerr method, the Joel-Cohen method, the Misgav-Ladach method, and the modified Misgav-Ladach method. Preoperative preparation may include the removal of pubic hair, although its necessity remains debated. Proponents of hair removal suggest that it reduces the risk of surgical site contamination and infection; however, evidence from a Cochrane review does not support a significant reduction in infection rates with hair removal. Therefore, hair removal should only be performed when it improves the visibility of the surgical site. If necessary, clippers should be used instead of razors, as shaving with a razor can create microtears in the skin, potentially increasing the risk of surgical site infections [19].

The initial incision in cesarean delivery can be made using either a suprapubic transverse or midline vertical approach. A vertical midline incision offers rapid access to the abdominal cavity, typically disrupting fewer tissue layers and vessels, and is frequently recommended for emergency cesarean sections. This method is particularly advantageous for patients with severe adhesive disease, as it provides better exposure. In cases requiring a cesarean hysterectomy due to morbidly adherent placenta, a vertical incision may also facilitate easier access to critical vascular structures, such as the hypogastric arteries. However, the transverse incision, particularly the low-transverse variant, remains the most widely utilized approach, owing to its superior outcomes in terms of wound healing and patient comfort. Surgeons tend to favor this method even in emergency situations due to its established efficacy and the familiarity with the

technique. Though certain patient factors, such as obesity, may lead to variations in incision placement, a transverse incision placed higher on the abdomen is not universally supported by research, indicating a need for further exploration of its benefits [20]. The Pfannenstiel incision is slightly curved and positioned approximately 2–3 cm (or two fingerbreadths) above the symphysis pubis, with the midline of the incision lying within the hair-bearing region of the mons pubis. In contrast, the Joel-Cohen incision is characterized by its straight design and is situated about 3 cm below the line connecting the anterior superior iliac spines, positioning it more cephalad than the Pfannenstiel incision [19].

During the dissection of the subcutaneous tissue, which lies beneath the skin, care must be taken to avoid excessive blood loss, particularly since blood vessels traverse this layer. Dissection can be performed either bluntly or sharply, with sharp dissection typically limited to the midline until the fascia is reached, followed by lateral blunt dissection. The judicious use of cautery may also be employed to control hemorrhage if blood vessels are transected. Once the fascia is incised in the midline, it is typically extended laterally, either with sharp or blunt dissection. The fascia is then separated from the underlying rectus muscles using clamps, and the separation is achieved through a combination of blunt and sharp dissection, utilizing scissors or cautery. Care must be exercised to prevent injury to the rectus muscles, though in certain cases, deliberate division of the rectus muscles may be necessary to improve surgical access. A randomized controlled trial has explored the difference between dissection and nondissection of the fascia from the rectus muscles, indicating that nondissection is associated with a slower decline in postoperative hemoglobin levels and reduced pain, although surgical time and fetal delivery difficulty were not assessed. These findings may not provide sufficient evidence to alter standard surgical techniques [19].

After the rectus muscles are separated, the peritoneum is opened, which can be done either bluntly or sharply. When sharp entry is employed, it is important to avoid injuring underlying structures, such as the bowel. Once peritoneal entry is achieved, the incision is typically extended bluntly. Extra caution is necessary to prevent injury to the bladder during this process. To enhance visualization of the lower uterine segment, a bladder blade is commonly used, though a self-retaining retractor can also serve this purpose. In some cases, a bladder flap is created, wherein the peritoneum overlying the bladder and lower uterine segment is grasped and incised, allowing the bladder to be dissected off the uterus. This step is intended to minimize the risk of bladder injury during the repair of the uterine incision. However, research suggests that omitting the bladder flap may reduce operative time without increasing complications such as hematuria, pain, or urinary tract infections. The incidence of bladder injury remains low, and studies examining the omission of bladder flaps have been underpowered to conclusively determine its impact on injury rates. In clinical scenarios where there is a high risk of inferior hysterotomy extension, such as during cesarean delivery in a fully dilated patient, the creation of a bladder flap may still be warranted despite not being a routine practice [21].

Following appropriate visualization, the uterine incision can be made, regardless of whether a bladder flap has been created. The incision can be either transverse or vertical (classical), with a low transverse incision being the preferred option in most cesarean deliveries. Compared to a classical incision, a low transverse incision minimizes blood loss, simplifies repair, and reduces the likelihood of adhesion formation [22]. However, certain clinical situations may necessitate a classical incision, such as when a fetus presents in a transverse lie with the fetal back down. Additionally, if the lower uterine segment is underdeveloped and insufficient for a transverse incision, a classical hysterotomy may be required to ensure a safe and atraumatic delivery. Such scenarios are more likely to occur in early preterm gestations. In cases of severe adhesive disease, when access to the lower uterine segment is restricted, the surgeon may need to adapt the approach. A low vertical hysterotomy is an alternative when difficult fetal extraction is anticipated, especially in the case of a breech presentation. A low transverse incision can also be extended vertically to form a “T,” “U,” or “J” incision, providing additional space for delivery. A patient who has undergone a transverse or low vertical uterine incision may be considered for a trial of labor in subsequent pregnancies, whereas a prior classical or “T” incision typically indicates the need for a repeat cesarean delivery [2].

Before performing the hysterotomy, it is essential to palpate the uterus to detect any lateral rotation. A midline incision is generally preferred over a lateral one to avoid damage to the uterine vessels, particularly when making a transverse incision. The incision is typically made with shallow scalpel strokes, sometimes assisted by blunt dissection, ensuring the fetus is not harmed. If the patient has been pushing, positioning the incision high within the surgical field minimizes the risk of extending into lateral vessels, the lower uterus, or the cervix. Upon uterine entry, the incision can be extended laterally, either bluntly with fingers or sharply with bandage scissors. Blunt extension is favored as it is associated with less maternal morbidity and blood loss. In particular, a blunt cephalad-caudad extension is preferred over a transverse extension, as it minimizes unintentional extensions and reduces blood loss [19]. If the myometrium is thick, such as in earlier gestations or a classical hysterotomy, bandage scissors may be required. An inadequate hysterotomy increases the risk of difficult fetal extraction, potentially leading to greater neonatal morbidity or mortality. The ultimate goal is to ensure the safe delivery of the fetus, irrespective of the specific technique used.

For vertex presentations, delivery is achieved by manually elevating the fetal head into the incision. If the head cannot be lifted, an assistant may apply additional elevation from below. In some cases, a vacuum cup or single forceps blade may be used to assist with the fetal head elevation. After positioning the head, the bladder blade is removed, and fundal pressure is applied to expel the fetus. The surgeon guides the head, with the surgical assistant often providing the majority of the fundal pressure. In cases where fundal pressure is inadequate, such as in significant maternal obesity, a vacuum cup can be used to assist the delivery, with forceps also an option. Standard protocols apply when utilizing vacuum or forceps in cesarean deliveries. In breech presentations, the clinician first assesses the fetal lie via palpation. Several techniques are available for delivering a breech fetus, including grasping the feet or hips to facilitate delivery into the incision. The fetus is gently delivered to the level of the shoulders, often assisted by a surgical towel. Sequentially, the arms are delivered, followed by fundal pressure to help flex and deliver the fetal head. The Mauriceau-Smellie-Veit maneuver, which involves manipulating the fetal head to facilitate delivery, can be used if necessary. In rare cases, the application of Piper forceps may be needed to assist with head delivery.

After the fetus is delivered, the umbilical cord is doubly clamped and cut. If the maternal and fetal conditions permit, cord clamping may be delayed, allowing the surgeon to optimize the delivery. A systematic review of delayed umbilical cord clamping in preterm infants found a reduction in in-hospital mortality and a decrease in the incidence of low Apgar scores at 1 minute, though no significant change was observed at 5 minutes. Additionally, no difference was found in other clinical outcomes, but there was a potential risk for induced polycythemia and hyperbilirubinemia [23]. A randomized controlled trial on delayed cord clamping in elective cesarean deliveries revealed that it increased neonatal hematocrit levels without raising the need for phototherapy [24]. After cutting the umbilical cord, cord blood can be collected as needed. The placenta is then delivered, either manually or through spontaneous delivery via cord traction and fundal massage. Spontaneous placental delivery is preferred if clinical conditions allow, as it is associated with reduced blood loss and a lower risk of infection [25][26]. Following placental delivery, the uterine cavity is wiped with moist laparotomy sponges.

For hysterotomy repair, the uterus can either be exteriorized or left in situ. Studies have shown that both techniques result in similar rates of febrile complications and surgical time, making the choice dependent on clinician preference [19]. The repair is typically performed using a delayed absorbable suture in a running technique, carefully incorporating the corners of the incision while avoiding damage to lateral vessels. A running closure tends to reduce operating time and blood loss compared to an interrupted closure. The impact of single-layer versus two-layer closure of the hysterotomy has been studied. No significant differences in short-term outcomes, including infectious morbidity, pain, blood transfusions, and hospital readmission, were observed between the two techniques [27]. However, evidence suggests that a two-layer closure may improve residual myometrial thickness and scar healing, as well as reduce the risk of uterine rupture in subsequent pregnancies [19][28][29]. A non-locked closure technique may be preferable to a locked one [28][29]. Additionally, recent research suggests that endometrium-free uterine closure may reduce the occurrence of placental abnormalities, such as placenta accreta, in future

pregnancies [30]. Ongoing research continues to explore the implications of these techniques in cesarean delivery.

Once the uterus is closed and hemostasis is confirmed, the posterior cul-de-sac is cleared of blood and clots using laparotomy sponges or suction. If the uterus is not exteriorized, this step may be omitted. The abdomen is then cleared of blood and clots, with retractors used to expose the paracolic gutters. Intrabdominal irrigation before closure has been linked to increased nausea and has not been shown to improve gastrointestinal recovery or reduce infection rates. Following the reinserted bladder blade, the hysterotomy repair is reassessed to ensure hemostasis, and the bladder blade is removed. Peritoneal closure, though adding operative time, may increase postoperative fever and hospital stay. The decision to close the peritoneum is based on the surgeon's evaluation of whether it reduces adhesion formation, though evidence on this is mixed [19]. Before closing the fascia, the rectus muscles and subfascial tissues are inspected for hemostasis, and the muscles may be reapproximated prior to fascia closure. Some clinicians believe suturing the muscles reduces the risk of diastasis recti and intra-abdominal adhesions, although this technique can increase postoperative pain [31]. Given time, patients may be involved in shared decision-making regarding this approach.

Fascial closure is performed using a delayed-absorbable suture in a running, non-locking fashion. While some techniques previously used interrupted sutures, this method is now less common. Monofilament sutures, rather than braided ones, may reduce the risk of infection, particularly in patients at higher risk for complications [32], and may also lower the risk of hernia formation [33]. The use of one versus two sutures for fascia closure remains debated, with no definitive evidence to support one over the other [21]. Subcutaneous tissues are irrigated, with hemostasis confirmed. While wound irrigation does not reduce infection rates, it aids in identifying areas requiring cautery. Subcutaneous space closure is recommended for thicknesses greater than 2 cm, as it reduces the risk of hematoma, seroma, wound infection, and separation [19][21]. Drain placement is not recommended for the subcutaneous space [19]. Skin closure can be performed using staples, subcuticular sutures, or adhesive glues. Research suggests no significant difference between staples and sutures regarding cosmesis, though subcuticular sutures have shown advantages over staples in terms of wound separation and infection rates [19][21]. Monofilament sutures may also offer reduced infection risks compared to braided sutures.

Complications of Cesarean Delivery

The maternal mortality rate associated with cesarean deliveries in the United States stands at approximately 2.2 per 100,000 procedures. While this figure remains low in comparison to other health risks, it is notably higher than the maternal mortality rate for vaginal deliveries, which is approximately 0.2 per 100,000 [34]. As with any surgical procedure, cesarean section carries inherent risks, including excessive bleeding during and after the operation. Obstetric hemorrhage remains the primary cause of severe maternal morbidity in the U.S. [35]. Factors such as prolonged labor, fetal macrosomia, or polyhydramnios—conditions that may precede a cesarean section—can elevate the risk of uterine atony, which in turn increases the likelihood of hemorrhage. Intraoperative complications, including the necessity for extensive adhesiolysis or the lateral extension of the hysterotomy incision into the uterine vessels, may also contribute to significant blood loss. This hemorrhage can necessitate blood transfusions, which carry additional risks of complications. It is estimated that approximately 10% of maternal mortality in the U.S. is attributable to obstetric hemorrhage [35], with Sheehan syndrome recognized as a possible consequence of severe hemorrhage during delivery [35].

Infections present a major risk following cesarean deliveries. Apart from postpartum hemorrhage, common complications include wound infections and endometritis. Studies examining various preventive measures highlight their efficacy in reducing infection rates. For instance, a study investigating vaginal cleansing demonstrated a reduction in postoperative endometritis from 8.7% to 3.8% [18]. Similarly, research into the use of adjunctive azithromycin revealed a significant reduction in wound infections, decreasing from 6.6% to 2.4%, while serious adverse events fell from 2.9% to 1.5% [16]. Despite these findings, the sheer volume of cesarean deliveries—over a million annually—means that these percentages

still translate into a substantial number of women experiencing infectious complications. Data from 2010 further revealed that the risk of infectious morbidity in elective repeat cesarean deliveries was 3.2%, compared to 4.6% in women undergoing a trial of labor. The same study indicated that elective repeat cesareans had a blood transfusion rate of 0.46%, a surgical injury rate ranging from 0.3% to 0.6%, and a hysterectomy rate of 0.16% [2]. Additional risks include thromboembolism and complications arising from anesthesia administration.

While cesarean delivery generally presents fewer risks to the fetus compared to vaginal delivery, fetal trauma remains a concern, with a reported incidence of approximately 1%. This includes injuries such as skin lacerations, fractures (clavicle or skull), nerve damage to the brachial plexus or facial nerves, and cephalohematoma [36]. These risks are lower than those associated with vaginal deliveries. From a neonatal perspective, cesarean section carries an elevated risk of respiratory complications, as well as an increased incidence of asthma and allergies when compared to vaginal births [2][37]. In 2010, transient tachypnea of the newborn was reported in 4.2% of elective repeat cesarean deliveries, and 2.5% of neonates required bag-and-mask ventilation [2].

Beyond immediate surgical risks, cesarean delivery also poses long-term health risks for the patient, as well as potential complications in subsequent pregnancies. A vertical uterine incision necessitates cesarean deliveries for any future pregnancies. As the number of cesarean procedures increases, so do the associated surgical risks. The formation of adhesions complicates subsequent cesarean deliveries, raising the likelihood of inadvertent injury. Additionally, the risk of abnormal placentation escalates with each successive cesarean delivery. For a woman with one prior cesarean section, the risk of placenta accreta is 0.3%. However, this risk increases significantly to 6.74% after five or more cesarean deliveries [38]. Placenta accreta, a condition characterized by abnormal placental attachment, carries the potential for severe hemorrhage and, in some cases, may necessitate a hysterectomy, which could result in the loss of fertility [39].

Role of Nurses:

Nurses play a pivotal role in the care of patients undergoing cesarean delivery, both during the procedure and in the postoperative period. Their responsibilities begin in the preoperative phase, where they assess the patient's health status, monitor for any contraindications to surgery, and educate the patient about the procedure, potential complications, and recovery process. Nurses are integral in preparing the patient emotionally and physically, ensuring that necessary lab tests are completed, and that consent is obtained for the surgery. During the cesarean section, nurses collaborate with the surgical team, assisting with sterile techniques, preparing the operating room, and providing emotional support to the patient. They monitor the patient's vital signs, administer medications as prescribed, and ensure that all necessary equipment is available and functioning properly. Nurses also provide immediate care to the newborn, including suctioning, providing warmth, and ensuring that the infant is transferred safely to the neonatal team for further evaluation. In the postoperative period, nurses are responsible for monitoring the patient's recovery, focusing on managing pain, preventing infection, and observing for any signs of complications such as hemorrhage, thromboembolism, or surgical site infection. They provide wound care, support lactation, and help patients with mobility and respiratory exercises to promote recovery. Nurses also educate patients on signs of potential complications, such as fever or heavy bleeding, and provide guidance on caring for themselves and their newborn in the early postpartum period. Their role is vital in ensuring the physical and emotional well-being of both mother and baby following cesarean delivery.

Conclusion:

Cesarean section (C-section) remains a vital procedure in modern obstetrics, representing the safest option for many women facing complications during labor. The increase in cesarean rates has been attributed to various factors, such as higher maternal age, advancements in medical technologies, and changes in obstetric practices. However, reducing the cesarean rate has become an important goal, as it is associated with higher risks for both the mother and the newborn, including infection, blood loss, and

complications in future pregnancies. In terms of maternal health, cesarean delivery is often indicated in cases of previous cesarean section, maternal request, pelvic deformities, and certain medical conditions such as infections or systemic diseases. For fetal health, indications include malpresentation, fetal distress, multiple gestations, and other risk factors like macrosomia or congenital anomalies. The decision to perform a cesarean should always consider both maternal and fetal health, weighing the risks and benefits for each case. Surgical techniques have evolved, with improvements in anesthesia, surgical tools, and overall care leading to better outcomes. However, cesarean sections carry inherent risks, especially for women with previous cesareans, and efforts to minimize unnecessary cesareans are essential. Practices such as encouraging vaginal birth after cesarean (VBAC) when clinically appropriate, and improving the management of labor complications, are strategies to reduce unnecessary cesarean deliveries. Post-operative care is crucial for ensuring optimal recovery, with monitoring complications like infection, hemorrhage, and thrombosis. Nurses and healthcare providers play an integral role in the preoperative, intraoperative, and post-operative stages, ensuring patient safety and comfort. In conclusion, while cesarean sections are indispensable in certain obstetric cases, reducing their prevalence requires comprehensive efforts involving better patient selection, improved clinical practices, and greater awareness of the risks and benefits. Ongoing research and guidelines will continue to shape evidence-based practices, ultimately leading to safer delivery methods and improved maternal and fetal health outcomes. The role of healthcare professionals, particularly obstetric nurses, in managing these cases remains critical to improving surgical outcomes and ensuring patient well-being.

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عملية القيصرية: الممارسات القائمة على الأدلة في التمريض والتوليد - مراجعة محدثة

الملخص :

الخلفية: تعد العملية القيصرية (C-section) إجراء جراحيًا شائعًا يتضمن ولادة الجنين من خلال شق في جدار البطن والرحم. لقد تطورت بشكل كبير منذ بداياتها في عام 1020 ميلادي، وأصبحت أكثر الجراحات إجراءً في الولايات المتحدة. على مر السنين، زادت انتشارها لتصل إلى 31.9% في عام 2016. ورغم أن هذه الزيادة مدفوعة بعوامل مثل تقدم سن الأمهات والتقنيات الطبية، إلا أن الجهود المبذولة لتقليل معدلات الولادة القيصرية لم تحقق نجاحًا كبيرًا. تظل العمليات القيصرية ضرورية للنساء اللاتي يواجهن مخاطر معينة أثناء المخاض.

الهدف: تهدف هذه المراجعة إلى دراسة الممارسات القائمة على الأدلة في التمريض والتوليد المتعلقة بالعمليات القيصرية، مع التركيز على المؤشرات وتقنيات الإجراء والمضاعفات، بهدف تقديم رؤى محدثة حول الممارسة ونتائجها.

المنهجية: تم إجراء مراجعة شاملة للأدبيات الحديثة حول الولادة القيصرية، حيث تم تقييم تقنيات الجراحة، المؤشرات للأم والجنين، المخاطر، والرعاية ما بعد الجراحة. شملت المراجعة الدراسات والإرشادات وآراء الخبراء من أطباء التوليد، وأطباء التخدير، والممرضين.

النتائج: تعد العمليات القيصرية ضرورية في بعض الحالات السريرية، بما في ذلك الوضع غير الطبيعي للجنين، حالات الأم، أو المضاعفات الناتجة عن الجراحات السابقة. يتضمن الإجراء تشريحًا دقيقًا عبر عدة طبقات، ويمكن أن تشمل المضاعفات العدوى، والنزيف، والمخاطر طويلة المدى مثل تمزق الرحم. تركز الممارسات القائمة على الأدلة على تقليل المخاطر من خلال تقنيات جراحية سليمة، واختيار المرضى المناسبين، والرعاية ما بعد الجراحة.

الخاتمة: تظل العملية القيصرية تدخلًا حاسمًا في حالات الحمل عالية المخاطر، رغم أن تقليل العمليات القيصرية غير الضرورية يعد هدفًا رئيسيًا في التوليد الحديث. يمكن أن تحسن الممارسات القائمة على الأدلة واتخاذ القرارات بعناية نتائج المرضى.

ل

الكلمات المفتاحية: العملية القيصرية، التوليد، الممارسات القائمة على الأدلة، صحة الأم، صحة الجنين، التقنيات الجراحية، الرعاية ما بعد الجراحة، المضاعفات.