ISBN: 978-93-24522-84-4

CHOICE OF SURGICAL APPROACH IN EMERGENCY CESAREAN SECTIONS

Authors:

B.B. NEGMAJANOV
Sh.N. VALIEV

Published by
Novateur Publication
466, Sadashiv Peth, M.S.India-411030
novateurpublication.org

B.B. NEGMAJANOV

Sh.N. VALIEV

ISBN: 978-93-24522-84-4

"CHOICE OF SURGICAL APPROACH IN EMERGENCY CESAREAN SECTIONS"

Samarkand – 2025

AUTHOR:

B.B. Negmajanov – DSc., professor, Head of department f the Department of Obstetrics and Gynecology No. 2, SamSMU

Sh.N. Valiev – Doctor of Philosophy in Medical Sciences (PhD), Assistant of the Department of Obstetrics and Gynecology No. 2, SamSMU

REVIEWERS:

Tuksanova D.I. – Doctor of Medical Sciences, Professor, Head of the Department of Obstetrics and Gynecology No. 2, BukhSMI

Rabbimova G.T. – Associate Professor of the Department of Obstetrics and Gynecology No. 2, SamSMU

UDC: 618.5-089.888.61

B.B. Negmajanov, Sh.N. Valiev. Choice of Surgical Approach in Emergency Cesarean Section (Monograph). – Samarkand, 2025. 122 pages.

REVIEWERS:

Tuksanova D.I. – Doctor of Medical Sciences, Professor, Head of the Department of Obstetrics and Gynecology No. 2, BukhSMI

Rabbimova G.T. – Associate Professor of the Department of Obstetrics and Gynecology No. 2, SamSMU

The monograph is dedicated to the problem of optimal choice of surgical approach in emergency cesarean sections. The book describes the advantages and disadvantages of various methods, with a focus on lower midline laparotomy. It presents data on the frequency of complications, methods of prevention and treatment, as well as author-developed algorithms to reduce the risk of intra- and postoperative complications (based on research over the past 10 years).

For obstetricians-gynecologists, surgeons, anesthesiologists-resuscitators, and other specialists.

LIST OF ABBREVIATIONS

ARD – Abnormal labor activity

VAS – Visual analog scale

WHO – World Health Organization

ART – Assisted reproductive technologies

SMC – Smooth muscle cells

GIT – Gastrointestinal tract

FGR – Fetal growth restriction

SLBW – Slow weight gain of the newborn

IIDs – Infectious-inflammatory diseases

STIs – Sexually transmitted infections

SEOGA – Severely exacerbated obstetric-gynecological history

LII – Leukocyte intoxication index

US – Urinary system

SDC – Small decidual cells

COH – Complicated obstetric history

COGA – Complicated obstetric-gynecological history

CS – Cesarean section

PAAPP – Premature abruption of a normally located placenta

PROM – Premature rupture of membranes

VDS – Vegetative dystonia syndrome

CVS – Cardiovascular system

FPN – Fetoplacental insufficiency

US – Ultrasound examination

CHAPTER I. INTRODUCTION

1.1. Relevance of the Topic

The determination of optimal delivery tactics for women with emergency obstetric conditions is beyond question. According to modern epidemiological studies, reducing morbidity and mortality rates among women in labor and newborns remains one of the primary objectives in many countries, including the Republic of Uzbekistan. These indicators ultimately determine the health status of future generations and directly impact demographic trends [Krasnopolsky V.I., Logutova L.S., 2014; Strizhakov A.N. et al., 2013].

Within the context of universally accepted standards developed by national and international organizations (WHO, FIGO, ACOG, etc.), operative delivery, including cesarean section (CS), continues to be an effective method of reducing perinatal risks, particularly in critical or pathological conditions during pregnancy and labor. In the course of healthcare reforms aimed at optimizing obstetric care, significant attention is paid to improving the quality of surgical interventions and implementing a multidisciplinary approach: from enhancing the technical skills of medical personnel to the rational use of anesthetic and antibacterial drugs [Burduuli G.M., Frolova O.G., 2017; Giguere R., 2020].

The Increase in Cesarean Sections and Its Impact on Outcomes

In recent decades, many countries have seen a steady increase in the number of cesarean section operations. According to the World Health Organization, approximately 18.5 million cesarean sections are performed annually worldwide, with the frequency exceeding 15% in half of the countries, and reaching 25-30% or more in some nations. In the Russian Federation, the proportion of abdominal deliveries has increased from 14.8% in 2001 to 27.1% in 2018 [Saveleva G.M. et al., 2019; Strizhakov A.N. et al., 2013].

This trend is largely due to changes in obstetric practices (enhanced fetal monitoring, expanded indications for maternal somatic pathology) and advances in reproductive technologies, which increase the number of high-risk pregnancies.

WHO experts point out that the optimal cesarean section frequency ranges between 10% and 15%. Exceeding this level does not always correlate with improved perinatal outcomes and often leads to an increase in purulent-septic complications and postpartum hemorrhages. Some data indicate that complications can be diagnosed in 20-75% of women who have undergone surgical delivery, underscoring the need for continuous improvement in CS techniques and postoperative complication prevention.

The Problem of Uterine Scarring and Repeat Abdominal Deliveries

An important consequence of the increased number of cesarean sections is the growing number of women with uterine scars. Subsequent pregnancies in these patients are accompanied by additional risks, such as potential scar insufficiency, increased likelihood of abnormal placental attachment, and possible uterine rupture during labor [Aimalazyan E.K., 2015; Krasnopolsky V.I., 2013].

While cesarean sections save lives in severe pathologies (eclampsia, bleeding, disproportion between pelvis and fetus, etc.), each subsequent operation carries a higher risk of complications (3.3–54.4% according to some authors), especially when surgical access is inadequate or the morphofunctional condition of the uterus is not fully considered [Krasnopolsky V.I., 2003].

Issues in Emergency Operative Delivery

In emergency obstetric conditions (placental abruption, bleeding, acute fetal hypoxia, severe preeclampsia), the priority is rapid delivery of the baby and preservation of the mother’s life. Choosing between longitudinal (midline) and transverse laparotomy in such situations is a critically important decision. Some specialists consider the longitudinal incision more convenient for rapid access and broader organ visualization, but it is associated with higher postoperative hernia rates and less favorable aesthetic outcomes. Advocates of transverse approaches highlight their advantages in terms of reduced trauma, but note prolonged surgery times and the risk of hematomas if performed incorrectly.

The 10-group Robson classification (2001), widely used in European countries, plays a significant role in systematizing indications for CS. It allows detailed

analysis of categories of pregnant women (primiparous, multiparous, multiple pregnancies, abnormal presentations, etc.) with particularly high CS rates and the targeted implementation of measures to reduce unnecessary surgical interventions [M.S. Robson, 2001]. However, even such a classification does not provide a definitive answer regarding the preferred choice of access in emergency obstetric situations.

According to several foreign and domestic sources (WHO, ACOG, RCOG), cesarean sections are associated with various intra- and postoperative complications: endometritis, peritonitis, sepsis, amniotic embolism, and pulmonary artery thromboembolism. WHO data (2015) indicate that complications increase by 56% compared to vaginal deliveries. Anesthetic risks, urinary tract infections, postoperative pain, and headaches also occur statistically more often.

Particular attention is drawn to studies evaluating the risk of uterine rupture in subsequent pregnancies (0.16–0.8%, depending on the type of scar and delivery management). The American College of Obstetricians and Gynecologists (ACOG) and the Society of Obstetricians and Gynaecologists of Canada (SOGC) strongly recommend antibiotic prophylaxis (administered 30–60 minutes before surgery), which reduces the incidence of purulent-septic complications. However, in addition to infection prevention, the choice of optimal surgical access remains crucial.

In Uzbekistan, large-scale steps are being taken to reform the healthcare system. Particular attention is paid to enhancing the qualifications of obstetricians and gynecologists and implementing national clinical protocols that meet international standards. Research by Uzbek scientists (F.M. Ayupova, 2017; M.K. Kattakhojaeva, 2018; U.M. Yusupova, 2019; M.T. Khamdamova, 2020; Negmadjanov B.B., 2022) has contributed to the improvement of diagnostics and prevention of CS complications. However, to date, there is insufficient data to formulate clear recommendations on the choice of access (longitudinal or transverse) specifically in emergency obstetric conditions.

The advantages and disadvantages of both methods in terms of trauma, surgery time, bleeding risk, purulent-septic complications, and subsequent scar formation

remain studied only fragmentarily. Moreover, there is no unified approach that considers the patient's individual condition (somatic status, body mass index, comorbidities), the presence of a uterine scar, the urgency level, estimated fetal weight, and other factors.

The relevance of choosing the optimal access for emergency cesarean sections is confirmed by numerous issues:

1. The increasing frequency of CS and repeat surgeries, which raises the risk of complications.

2. The insufficient study of laparotomy access choice in urgent conditions (longitudinal vs. transverse laparotomy), particularly in conjunction with infection prevention and bleeding.

3. The lack of unified clinical guidelines that take into account modern obstetric, anesthesiological, and surgical experience, as well as the specific features of the national healthcare system.

Solving these issues is a priority to improve the effectiveness of medical care for pregnant women, enhance maternal and neonatal mortality rates, and reduce the incidence of severe postoperative complications.

This underscores the need for an in-depth study of current surgical techniques, a comparative analysis of outcomes with various access methods, and the development of a decision-making algorithm for practicing obstetricians-gynecologists and surgeons. A comprehensive approach that includes evaluating obstetric and gynecological histories, applying modern imaging and diagnostic methods, assessing different abdominal wall incision and uterine suturing techniques, calculating maternal and perinatal outcomes, and analyzing long-term consequences (uterine scar condition, adhesion formation, prospects for subsequent pregnancies) will allow the development of unified practical recommendations to improve the quality of obstetric care and reduce the risk of severe complications during labor.

This has necessitated a comprehensive analysis that includes: studying the obstetric-gynecological history of patients, applying modern imaging and diagnostic

methods, assessing various techniques for incising the anterior abdominal wall and suturing the uterus, calculating maternal and perinatal outcomes, and analyzing long-term consequences (condition of the uterine scar, adhesion formation, prospects for subsequent pregnancies). This approach will allow the development of unified practical recommendations to improve the quality of obstetric care and reduce the risk of severe complications during labor.

1.2. Brief Literature Review

In recent years, there has been increased scientific interest in cesarean sections. Changes in obstetric practices, including the expansion of indications for cesarean section on the one hand, and the growing number of pregnant women with scars from prior abdominal deliveries on the other, require increased attention from medical personnel.

According to the World Health Organization (2015), exceeding the optimal cesarean section frequency (10-15%) does not proportionally improve perinatal outcomes and may negatively affect the health of both the mother and the newborn. Cesarean sections, with a frequency ranging from 11% to 29%, are associated with risks of numerous intra- and postoperative complications, including extensive bleeding, damage to adjacent organs, embolism, pulmonary artery thromboembolism, and anesthesiological issues. A prior cesarean section in the medical history is a leading risk factor for uterine rupture during spontaneous labor, with an incidence ranging from 0.1% to 0.5%. In women undergoing planned cesarean section for their first delivery, the risk of uterine rupture is 0.24%, during emergency interventions – 0.16%, and in cases with one uterine scar, this figure rises to 0.2%-0.8%.

Research on the consequences of various delivery approaches, including analyses of both early and late complications, has shown an increase in maternal morbidity associated with a growing number of cesarean sections, while a decrease in such operations has been accompanied by reduced morbidity during natural deliveries. Complications after cesarean sections significantly exceed those after

natural births: complications occur 56% more often in the early postoperative period, anesthesiology-related complications are 12 times more frequent, infections after childbirth and surgery are 2.98 times more frequent, urinary tract infections are 79% more frequent, pain syndrome is 2.4 times more frequent, and headaches are 6.2 times more frequent. After planned cesarean sections, the risk of bleeding increases (relative risk, OR=2.5), and during emergency interventions (OR=2.0), the risk of infections reaches (OR=2.6).

The risk of surgical site infections after cesarean section varies from 3% to 15%, increasing with the duration of surgery and length of hospital stay. The high incidence of endometritis after surgical delivery (15.0%, range 2%-54.3%) compared to 5.0% during natural deliveries underscores the importance of measures for the prevention of postpartum septic complications. The likelihood of infectious complications such as endometritis and subfebrile fever is more common in patients with a pronounced subcutaneous fat layer.

Recommendations from the American College of Obstetricians and Gynecologists (ACOG) and the Society of Obstetricians and Gynaecologists of Canada (SOGC) emphasize the mandatory use of antibiotics after cesarean sections, even in groups at higher risk for purulent-septic complications. They also insist on the necessity of intravenous antibiotic administration 60 minutes before planned surgeries or 30 minutes before emergency cesarean sections. Studies have shown no adverse effects on newborns from such measures.

An increase in indications for cesarean section has not only led to a rise in maternal mortality compared to natural deliveries but also created a special group of pregnant women with operated uteruses requiring a higher level of medical support. A history of prior cesarean sections increases the risk of placenta previa and accreta, the need for blood transfusions, hysterectomies, and overall worsening of the health of pregnant women.

The main strategy to reduce repeat abdominal deliveries lies in assessing the set of relative indications for surgery, performing it at the patient's request, and

considering pregnancy complications, prior cesarean sections, excessive weight, and complications during labor.

In many countries, including the USA, Canada, Italy, France, and Russia, the cesarean section rate has doubled over the past 15 years. In the last decade, 19% of 100 women delivering gave birth via cesarean section. This growth is related to the increasing medical indications for abdominal deliveries and the rise in the number of women with operated uteruses. In Russia, the cesarean section rate increases by 1% annually and currently stands at 18%-19%.

Over the past 20 years, fetal health has been a priority when determining indications for cesarean section. Perinatal mortality decreased from 12.08% in 2002 to 11.27% in 2006. Cesarean sections are now primarily performed in cases of premature labor risk, and only in the presence of indications is the operation conducted urgently. During this period, the fetal weight is around 1,500 grams, and the lower uterine segment is underdeveloped, requiring caution when selecting the uterine incision.

In recent decades, obstetric science has acquired the necessary instrumental tools for fetal condition diagnosis (MRI, ultrasound, CTG, Doppler studies, etc.). Over the years, new indications for abdominal deliveries have been introduced, with 10.6% of cases involving pregnancies conceived through ART.

Cesarean sections pose specific problems during the postoperative period. Today, advancements in cesarean section techniques ensure uncomplicated deliveries following prior operative deliveries, which account for 30%-60% according to various authors.

In many medical institutions that deal with comprehensive treatment of obstetric and extragenital pathology, the cesarean section rate exceeds 40%. The continued rise in cesarean section rates has not significantly reduced perinatal mortality, posing a serious threat to the health and lives of women, especially when contraindications to this type of surgery are underestimated.

The risk of complications in pregnant women resulting from abdominal deliveries increases tenfold or more, and maternal mortality risk rises 5-11 times. It

is worth noting that cesarean sections are often performed on women facing severe medical problems, pregnancy complications, or complications during labor.

Cesarean section is a commonly used, complex operation with a postoperative complication rate ranging from 3.3% to 54.4%, directly dependent on surgical technique. This procedure has become widespread in modern obstetrics and is used as an operative delivery method due to the deteriorating general health of the population and the prevention of complications that serve as indications for cesarean sections.

Modern obstetric practice increasingly favors delivery via cesarean section, which helps avoid prolonged and traumatic labor that previously required labor stimulation. This approach aims to reduce the use of delivery procedures such as breech extraction, vacuum extraction, and obstetric forceps, though completely eliminating the need for operative vaginal deliveries remains impossible.

Many experts note that expanding indications for cesarean section may lead to a decline in professionalism in managing natural deliveries, undermining physicians' skills in this area. According to studies and official documents in England and the USA, pregnant women have the right to choose their delivery method, including elective cesarean section, which does not contradict medical ethics.

WHO studies show that increasing cesarean sections among pregnant women due to somatic diseases does not reduce neonatal morbidity and mortality rates. An important reason for the rising frequency of cesarean sections is the consideration of fetal condition, and modern studies confirm that many women after cesarean sections successfully undergo natural deliveries.

Cesarean section is one of the most common forms of abdominal delivery, practically complex, and associated with numerous intra- and postoperative complications, the frequency of which ranges from 3.3% to 54.4%. These complications primarily arise due to surgical techniques, which vary depending on the choice of access, uterine incision techniques (transverse or longitudinal), and uterine wound closure.

Indications for Cesarean Section

Indications for cesarean sections in obstetric and gynecological practice occupy a central place. These indications are now fully developed and classified as absolute and relative. Absolute indications are based on the impossibility of natural childbirth. Relative indications allow for natural delivery but are considered extremely dangerous for the mother and fetus.

In emergency obstetric cases, the decision on transverse or longitudinal access for delivery is a key issue, and the choice of method directly depends on the condition of both mother and child. These conditions are categorized, and the operator selects the surgical technique accordingly.

ICD-10 Classification:

- O82.0 Elective cesarean section
- O82.1 Emergency cesarean section
- O82.2 Cesarean section with hysterectomy
- O82.8 Other single-fetus cesarean deliveries
- O82.9 Unspecified cesarean section

Currently, there are various modifications of cesarean sections, differing in the approach to the uterine cavity, abdominal wall incisions, and suturing techniques. The choice of technique for abdominal delivery is made by an experienced obstetrician-gynecologist based on their expertise and factors such as gestational age, fetal weight, fetal-to-pelvic proportion, presence and location of scars, and uterine pathology.

Choice of Abdominal Access

The choice of abdominal access plays a key role in ensuring a favorable postoperative course when cesarean section indications exist. Each surgical access method has its advantages and challenges.

It is advisable to pay attention to the anatomical and topographical features of the uterus in late pregnancy when selecting access for cesarean section. For example, during pregnancy, the uterine fundus is located near the lower edge of the liver and occupies the abdominal and pelvic areas. During this period, the uterus takes an oval

shape, with its left side closer to the anterior abdominal wall and the right edge closer to the posterior side. The uterine fundus is covered by the peritoneum and transverse colon, while the anterior part of the uterus and cervix are free of mesentery and in contact with the anterior abdominal wall.

Topography of the Lower Uterine Segment

The topography of the lower uterine segment changes depending on the gestational period. In the first trimester, it is located within the pelvic cavity, and by the second trimester, it rises to the level of the pelvic inlet. When performing cesarean sections, the operator must consider the location of the uterine body, the lower segment, the adjacent bladder, and the uterovesical fold, depending on the asymmetry of the uterus.

Types of Laparotomy in Obstetric Practice

Currently, five types of laparotomy are performed in obstetric practice:

- Lower midline longitudinal laparotomy
- Transverse incision by Pfannenstiel
- Cherney's inter-iliac incision
- Transverse incision by Joel-Cohen
- Paramedian longitudinal incision

For cesarean sections, transverse access by Pfannenstiel and Joel-Cohen is primarily used. Based on the practice of many researchers, some recommend Pfannenstiel access, while others prefer the Joel-Cohen incision technique.

Each type of surgery has specific indications, advantages, complications, and challenges. Studying and applying these cesarean section methods is considered a critical issue in obstetrics.

1.3. Methodological Foundations and Research Object

A comprehensive analysis of the impact of different surgical approaches in cesarean sections requires an integrated approach that combines clinical observation methods, statistical data processing, and critical review of specialized scientific publications. Utilizing research results conducted in various countries helps

eliminate fragmented information and form a complete understanding of how the choice of surgical access affects the postoperative course and the patient's overall condition.

General Characteristics of the Study

This monograph considers recommendations, practical developments, and the experience of leading obstetric schools, which allowed for structuring the study to encompass a wide range of clinical scenarios—from planned operative deliveries to emergency interventions in acute obstetric complications. Particular attention was paid to analyzing the frequency and nature of postoperative complications, as well as comparing immediate and long-term outcomes in women undergoing cesarean sections with longitudinal or transverse incisions.

Research Object

The sample comprised pregnant women aged 18 to 45 years who were scheduled for cesarean sections for various indications. To deeply study the specific features of surgical tactics, some patients were at high risk of complicated pregnancy progression, including premature placental abruption, severe preeclampsia, eclampsia, uterine scar presence, cardiovascular pathologies, and endocrine or other systemic disorders. This case selection allowed tracking how the chosen surgical approach influences the course and outcome of delivery in patients with varying obstetric histories and clinical characteristics.

Exclusions from the study included women with severe systemic diseases unrelated to pregnancy and requiring independent surgical intervention, as well as those whose cesarean sections were planned using minimally invasive technologies (e.g., laparoscopic or robotic techniques).

Methodological Principles

Systematic and Comprehensive Approach: This principle involved simultaneous examination of multiple factors influencing the woman’s condition before, during, and after surgical delivery. Individual assessments included the patient's general health indicators, obstetric history, results of laboratory and

instrumental tests, as well as the surgical technique and early postpartum management.

Evidence-Based Medicine: All decisions (regarding types of anesthesia, surgical techniques, and postoperative management strategies) were based on objectively assessing the risks and benefits of each method. Validated statistical criteria were applied to analyze intraoperative and postoperative complications, ensuring the most reliable conclusions.

Interdisciplinary Collaboration: To obtain a comprehensive picture, the study involved not only obstetricians and gynecologists but also specialists from other medical fields: anesthesiologists, endocrinologists, cardiologists, and neonatologists. This format allowed for adjusting intervention tactics according to each patient's individual characteristics and accurately assessing the impact of comorbidities on delivery outcomes.

Main Research Methods

Analytical Literature Review: Scientific publications on the choice of surgical access, features of planned and emergency cesarean sections, and methods of preventing purulent-septic complications were systematically studied. The review included monographs, scientific articles, obstetric guidelines, data from perinatal centers, and summaries of clinical practices from large medical institutions.

Clinical Observations: The study was conducted in several obstetric hospitals. Patients were divided into groups based on the planned surgical approach: longitudinal or transverse. In each group, various indicators were recorded, including the nature and volume of blood loss, duration of surgery, frequency and severity of intraoperative and postoperative complications, and features of the rehabilitation period.

Statistical Processing: Descriptive and comparative statistical methods were used to process the data. Mean values of indicators (e.g., blood loss, operation duration) were analyzed, standard deviation boundaries were determined, and relative risks of complications were calculated. In some cases, Student's t-tests,

nonparametric methods, or χ^2 tests were applied to identify significant differences between patient groups.

Expert Assessment: To confirm the results and develop recommendations for selecting surgical access, a panel discussion was organized with the participation of experienced obstetricians-gynecologists in cesarean sections, as well as anesthesiology and intensive care specialists. This collegial approach ensured objectivity in interpreting the final data.

Scope of Collected Material and Data Quality Criteria

The study considered medical records of patients, operative protocols, and data from laboratory and instrumental diagnostic methods (ultrasound, cardiotocography, Doppler studies). For uniformity and accurate comparison, some patients who did not meet predefined criteria (e.g., oncological diseases or planned surgical correction of comorbid pathologies) were excluded from the sample. All patients meeting the formal criteria provided informed consent, adhering to bioethical principles.

Expansion of the Methodological Base

To obtain a clearer picture, it is advisable in some cases to use auxiliary studies and modern technological solutions. These include three-dimensional ultrasound techniques, which help accurately assess the condition of the uterine scar or estimate fetal size in cases of suspected large fetal weight. Additionally, implementing electromyography methods to evaluate the contractile ability of the myometrium can serve as an additional criterion when choosing a surgical approach.

1.4. Structure and Scope of the Work

This monograph consists of several logically interconnected chapters, each addressing a specific aspect of the cesarean section problem.

The first chapter provides a justification for the relevance of the topic under consideration, as well as an overview of the situation in obstetric-gynecological practice. This section defines the subject and object of the study and formulates the goals and objectives of the work.

The second chapter focuses on general information about cesarean sections and describes modern indications and contraindications for the procedure. It briefly outlines trends in the development of operative delivery, including the historical context and modern theoretical foundations.

The third chapter examines various surgical approaches, emphasizing the comparative characteristics of longitudinal and transverse incisions. Attention is given to intraoperative details and tactical decisions made during emergency and planned surgical interventions.

The fourth chapter is centered on complications that arise during and after cesarean sections, as well as on methods for their prevention and timely treatment. This section also proposes algorithms to reduce the incidence of purulent-septic processes, bleeding, and reproductive dysfunction in the long term.

The fifth chapter presents the results of the study: a description of the clinical material, statistical evaluation of the data obtained, and an analysis of factors influencing the choice of surgical access and subsequent outcomes for the mother and child. This section includes practical examples, featuring both successful cases and complicated scenarios, allowing for a comparison of different situations and providing an objective understanding of the most effective surgical intervention methods.

The final chapter contains practical recommendations for obstetricians-gynecologists and specialists from related fields, as well as conclusions that summarize the key results and propose ways to further improve surgical techniques in obstetrics.

In addition to the main chapters, the monograph includes appendices with illustrative material, tables, surgical protocols, and additional data, enabling a deeper understanding of the problem's specifics. The total volume of the work exceeds one hundred typewritten pages, reflecting the multifaceted nature of the study and providing a comprehensive analysis of surgical access choices during cesarean sections, as well as approaches to preventing and treating postoperative complications.

CHAPTER II. GENERAL INFORMATION ON CESAREAN SECTION

2.1. Indications and Contraindications for the Procedure

Surgical delivery, particularly cesarean section, is performed based on strict medical indications that point to the impossibility of safe vaginal delivery or a justified risk to the health of the mother and child. On the other hand, there are factors under which surgical intervention may be inappropriate or associated with excessively high risks.

Thus, a clear understanding of the indications and contraindications for the procedure forms the basis of competent obstetric management.

Indications for Cesarean Section

Absolute Obstetric Indications:

- Complete placenta previa, where placental tissue obstructs the internal cervical os, making vaginal delivery impossible.
- Premature detachment of a normally located placenta with signs of a life-threatening condition for the fetus or mother.
- Significant disproportion between the maternal pelvic dimensions and the estimated fetal head size, rendering vaginal delivery impossible.
- Transverse or oblique fetal presentation with no prospect of spontaneous conversion to a longitudinal presentation.

Absolute Extragenital Indications:

- Severe maternal cardiovascular conditions precluding the pushing phase (e.g., certain forms of heart defects or decompensated hypertension).
- Acute respiratory failure that prevents the woman from safely enduring prolonged labor.
- Advanced stage of diabetic angiopathy or other conditions sharply increasing the risk of complications during vaginal delivery.

Relative Indications:

- Umbilical cord prolapse following premature rupture of membranes and unfavorable conditions for rapid delivery of the baby.

- Multiple pregnancies with abnormal presentation of one or more fetuses.
- Severe forms of preeclampsia and eclampsia unresponsive to conservative therapy, posing a threat to the life of the mother or fetus.
- Uterine scar after a previous cesarean section with signs of scar insufficiency or other associated complications (although in many cases, under favorable conditions, vaginal delivery remains an option).

Indications Related to Fetal Condition:

- Severe intrauterine hypoxia and evidence of acute fetal distress requiring urgent delivery.
- Certain severe forms of intrauterine infections or congenital anomalies, where the risk of complications during vaginal delivery is high.

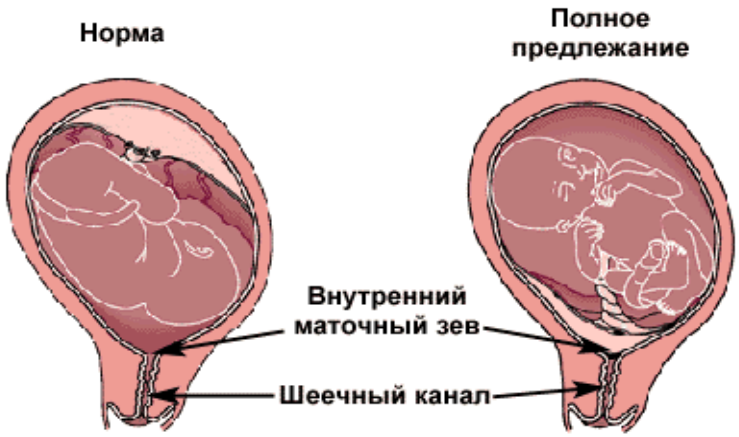

Figure 1: The image illustrates how placental tissue obstructs the cervical canal lumen, which serves as an absolute indication for emergency cesarean section.

Contraindications to Cesarean Section

While cesarean section is aimed at preserving the life and health of the mother and child, there are certain circumstances under which surgical intervention becomes either extremely dangerous or practically impossible:

- **Extremely severe general condition of the mother.** If the woman has terminal-stage multiple organ failure, where any surgery carries the risk of immediate decompensation, the decision for operative delivery is made

collectively and only when there is a realistic possibility of improving the outcome for the mother and child.

- **Uncontrolled coagulation disorders.** Severe forms of coagulopathies (uncorrectable with medical treatment) can be a barrier to open surgical procedures, as the risk of fatal bleeding in such situations is extremely high.
- **Diffuse purulent lesions of the abdominal cavity.** In the presence of extensive purulent infections in the proposed surgical field, cesarean section may lead to the spread of infection and the formation of new foci, resulting in complications.
- **Certain rare uterine pathologies.** Severe oncological lesions or significant traumatic damage to the uterus, where its anatomical structure is completely compromised, may negate the benefits of operative delivery.

Clinical Decision-Making

In practice, with relative indications for cesarean section, the dynamics of the mother and fetus's condition become the decisive factor. If dangerous symptoms (pain, bleeding, worsening fetal condition on cardiotocography) arise during pregnancy or labor, physicians may urgently opt for operative delivery, even if vaginal delivery was initially planned.

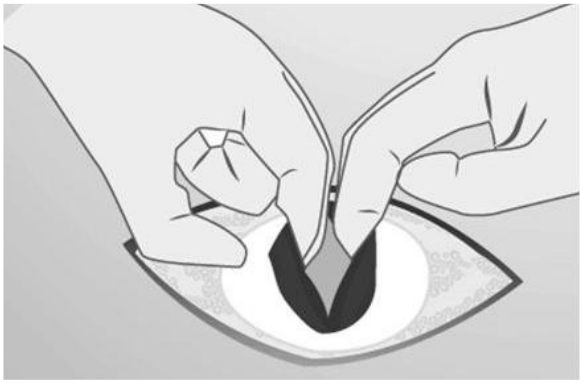

Figure 2: The photograph demonstrates how the surgeon gains access to the uterus.

The Importance of a Comprehensive Approach

Before performing a cesarean section, the medical team evaluates the patient’s history, obstetric factors, and ultrasound and CTG data. Careful planning and

accurate assessment of indications help minimize risks associated with the surgery, and if necessary, adjust the delivery strategy toward more conservative methods or, conversely, emergency measures.

2.2. Optimal Cesarean Section Frequency and Current Trends

The question of the optimal rate of operative deliveries remains one of the most debated in obstetric practice. The World Health Organization has long emphasized a target of 10–15 percent, based on years of observation that suggest this range achieves the best balance between benefit and risk: on the one hand, adequately covering women requiring emergency surgical intervention, and on the other, avoiding an excessive number of surgeries associated with postoperative complications and economic costs.

Global Statistics and Regional Contrasts

Modern analytical reviews show that the global average cesarean section rate is steadily increasing. While it fluctuated around 12–15 percent in the late 1990s, it has risen to approximately 21–23 percent in recent years. However, this figure represents a global average; in some regions, it may be significantly lower or much higher.

- **In economically disadvantaged countries**, the cesarean section rate still does not exceed 8–10 percent, partly due to a lack of qualified personnel and necessary equipment. In such conditions, any emergency surgery can be challenging, leading to a high risk for maternal and neonatal mortality.
- **In highly developed healthcare systems**, such as Brazil, Turkey, or Egypt, cesarean section rates have already surpassed 50–60 percent. In Brazil, nearly every second delivery reportedly ends with surgical intervention, according to various sources.
- **In certain European countries**, such as Sweden or the Netherlands, despite maintaining high-quality obstetric care, cesarean section rates remain at 15–20 percent. This is achieved through the widespread implementation of programs

promoting physiological childbirth, systematic audits, and continuous improvements in pregnancy management practices.

Factors Increasing the Rate of Operative Deliveries

- **Maternal age and complicated obstetric history.** More women are deciding to have children at the age of 35–40 years or older. Chronic conditions accumulated over a lifetime and pregnancy complications often compel medical professionals to opt for cesarean sections.
- **Increased number of repeat surgeries.** The higher the rate of primary cesarean sections, the greater the likelihood that subsequent pregnancies will also involve surgical deliveries, especially in cases of uterine scarring and concerns about its insufficiency during labor.
- **Social and psychological factors.** In countries where women have access to extensive medical information and the influence of private clinic advertising is significant, patients often insist on surgery, avoiding natural childbirth due to fear of pain or unpredictable complications.

When a High Cesarean Section Rate is Justified

Despite criticism of cesarean section rates exceeding 15 percent, there are situations where an increased frequency of surgical deliveries can be considered justified. These include regions or clinics where:

- **Complicated pregnancies** (e.g., multiple pregnancies or cases of severe extragenital pathologies such as diabetes, significant heart defects, or cancer) are managed, where the risks of vaginal delivery are significantly higher.
- **Assisted reproductive technologies (ART)** are actively used. Multiple pregnancies, especially triplets or more, often result in surgical delivery.
- **Demographically unfavorable conditions** are present, prompting physicians to prioritize saving the life of every newborn by any means.

However, critics of excessive numbers of surgeries remind us that each unnecessary abdominal operation increases the likelihood of postoperative purulent-septic complications, can lead to more challenging subsequent pregnancies, and imposes additional financial burdens on the healthcare system.

Prevention of Unjustified Cesarean Section Growth

To maintain cesarean section rates at a level that reduces maternal and perinatal mortality without becoming "on-demand surgeries," a set of measures is increasingly being employed:

- **Establishing clear criteria** to differentiate between absolute and relative indications for cesarean sections.
- **Mandatory clinical review** of all emergency operations in cases where the appropriateness of the intervention is in question.
- **Development of normal delivery support programs**, including the use of partner-assisted deliveries, pain relief, and various relaxation techniques, making the process less painful and intimidating.
- **Creating a continuous professional development system** for obstetricians-gynecologists with a focus on managing complex vaginal deliveries. The more confidently a physician handles obstetric care, the less likely they are to perform a cesarean section "just in case."
- **Actively informing expectant mothers** about the physiological processes of childbirth, modern analgesia options, and the benefits for the baby of passing through the natural birth canal (e.g., lung adaptation, bacterial colonization, etc.).

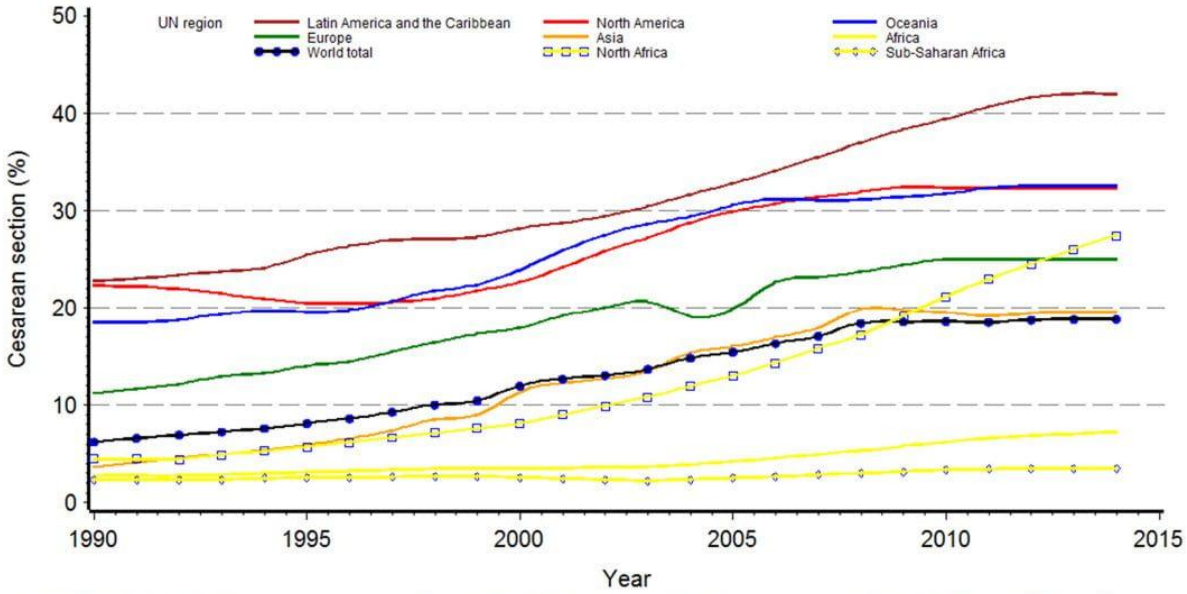

Fig 2. Global and regional trends in caesarean section, 1990–2014. Sub-Saharan Africa includes Eastern, Middle, Southern and Western Africa subregions. For the purpose of this graph, a linear interpolation between available data from 1990 and 2014 was calculated. When data for 2014 were not available, the CS rate for the latest year available was used also for all subsequent years up to 2014.

doi:10.1371/journal.pone.0148343.g002

Figure 3: The horizontal axis represents the years of observation, while the vertical axis indicates the average global percentage of cesarean sections, clearly illustrating the trend toward an increasing frequency of surgical deliveries.

Conclusions and Perspectives

Thus, the question of the "correct" percentage of cesarean sections cannot be considered strictly resolved, as each clinical situation is individual. Nevertheless, in most cases, efforts are made to adhere to recommendations that prevent a significant exceedance of the 15–20 percent threshold without objective justification. This approach allows for maintaining an optimal balance between the safety of the mother and child and the reasonable use of surgical resources. At the same time, it is essential that in cases where operative delivery is genuinely necessary, it is performed promptly and professionally, as the lives and health of both participants in the childbirth process directly depend on this.

Establishing a unified global standard is challenging due to differences in medical schools, cultural traditions, healthcare funding, and years of experience in childbirth management under various conditions. However, even with these disparities, medical professionals and the public increasingly understand that the sharp and uncontrolled rise in cesarean sections requires careful analysis and corrective measures—both at the national strategy level and within individual clinics and perinatal centers.

2.3. Obstetric and Perinatal Risks: Justification for Cesarean Sectio

The justification for the use of cesarean sections is largely determined by complications that threaten the life and health of the mother and child during pregnancy and childbirth. In certain situations, operative delivery is the only way to avoid severe consequences, including fatal outcomes. However, the question of when exactly to resort to intervention and when it is possible to wait for physiological labor requires a deep understanding of a wide range of obstetric and

perinatal risks. Modern medicine offers methods that help predict potential complications in advance and plan surgery in a timely manner.

Major Types of Obstetric Complications Leading to Cesarean Section

Premature Detachment of a Normally Positioned Placenta

One of the most acute conditions posing a direct threat to the life of the fetus and mother. With placental abruption, the fetus stops receiving the necessary oxygen and nutrients, and the mother may experience intense bleeding. The larger the area of detachment, the more severe the clinical picture: abdominal pain, uterine tension and tenderness, and a drop in blood pressure may occur.

- **Significance of Emergency Surgery**: Cesarean section in such cases allows for the rapid extraction of the baby and the cessation or reduction of maternal blood loss. Timeliness is critical, as even slight delays increase the risk of fetal hypoxia or intrauterine death, and the likelihood of hemorrhagic shock in the mother rises.
- **Statistical Data**: According to clinical observations, premature placental abruption occurs in approximately 0.4–1.5% of pregnancies. In severe cases, if surgery is not performed in time, the risk of fetal death and complications (DIC syndrome, hemorrhagic shock) in the mother can be extremely high.

Placenta Previa

With complete or marginal placenta previa, the placental tissue obstructs the internal cervical os, making safe vaginal delivery nearly impossible. As uterine contractions begin or the cervix dilates, bleeding intensifies due to partial or complete detachment of the placenta from its vascular bed in the lower uterine segment.

- **Need for Operative Delivery**: With complete placenta previa, cesarean section is usually performed electively, without waiting for spontaneous labor contractions. Otherwise, there is a risk of rapid blood loss, endangering the lives of both the mother and the baby.
- **Clinical Features**: Placenta previa often coincides with low placental location in multiple pregnancies or uterine scarring. This increases the likelihood of placental abnormalities (e.g., placenta accreta) and complicates surgical intervention.

Severe Forms of Toxicosis (Preeclampsia, Eclampsia)

Severe toxicosis affects multiple systems: significant edema develops, severe arterial hypertension is noted, and kidney and liver function may be impaired. Preeclampsia progresses to eclampsia if seizures occur, threatening life.

- **Critical Need for Cesarean Section**: In early stages, gestosis can still be managed with medication (reducing edema, lowering blood pressure). However, in severe forms that threaten the woman with stroke, kidney failure, pulmonary edema, and seizures, the most reliable treatment remains emergency operative delivery.
- **Perinatal Consequences**: The fetus in such conditions often develops hypotrophy (intrauterine growth restriction) or hypoxia, increasing the risk of neurological impairments after birth. Cesarean section in this situation minimizes trauma to the baby while alleviating the burden on the mother's body.

Threatened Uterine Rupture and Scar Insufficiency

Uterine rupture is one of the most severe and rapidly developing complications. It occurs with uncoordinated labor, large fetuses, lower uterine segment pathologies, or scarring from previous surgeries.

The Role of Emergency Surgery

At the slightest suspicion of a threatened uterine rupture (sharp pain, bleeding, fetal heartbeat irregularities, or changes in uterine shape upon external examination), immediate cesarean section is required. Even a short delay can result in fetal death and massive maternal bleeding, leading to shock.

The Problem of Uterine Scars

Following previous surgeries (not only cesarean sections but also myomectomies), the uterine scar may become thinned, with an incomplete structural integrity. During labor, such areas are subjected to increased stress. A timely operation prevents catastrophic outcomes, although it increases the number of repeat cesarean sections in statistics.

Perinatal Risks and Factors Affecting the Fetus

Acute Fetal Hypoxia

In cases of impaired placental blood flow or umbilical cord compression (e.g., umbilical cord prolapse, true knots), the fetus may receive insufficient oxygen. Cardiotocography records signs of distress (decreased heart rate, late or variable decelerations).

- **Emergency Measures**: If conservative methods (changing the mother's position, oxygen supply, intravenous infusions) fail, cesarean section remains the fastest way to save the baby. Otherwise, hypoxia may lead to irreversible CNS damage or stillbirth.

Post-Term Pregnancy and Macrosomia

After 42 weeks of gestation, placental structure and function begin to deteriorate, increasing the risk of placental "aging." Simultaneously, the fetus may gain substantial weight (up to 4–4.5 kg or more), complicating vaginal delivery.

- **Role of Surgical Tactics**: In such cases, operations are often planned, especially if the woman has a narrow pelvis, extragenital pathologies, or if signs of chronic fetal stress (e.g., reduced amniotic fluid, placental insufficiency) are observed before labor begins.
- **Macrosomia Risks**: A large fetus may face difficulties during delivery, such as shoulder dystocia or maternal cervical trauma. Cesarean section reduces the likelihood of such complications.

Intrauterine Infections

An infectious process in the uterine cavity (chorioamnionitis) or severe congenital pathologies in the fetus (detected via ultrasound and genetic studies) may compel medical professionals to perform surgery.

- **Protective Mechanism**: In confirmed infections, cesarean section prevents additional fetal infection during passage through the birth canal. Moreover, the surgical approach can be quicker, reducing pathogen exposure time.
- **Limitations**: Performing surgery in the presence of a pronounced infection requires strict adherence to asepsis and antisepsis protocols and the use of antibiotics, increasing the burden on both the mother and newborn.

Multifactorial Assessment and Cesarean Section Planning

In clinical practice, the decision to perform surgery is often made when several factors coexist: obstetric complications, a high likelihood of intrauterine hypoxia, and maternal somatic diseases. Each of these aspects increases the risk of adverse outcomes if attempting natural delivery. A combination of two or three unfavorable signs makes cesarean section a more preferable option, as it improves the chances of preserving the health or life of the mother and child.

Ultrasound and Cardiotocography Data Analysis

Ultrasound screenings at different pregnancy stages assess placental condition, fetal position, amniotic fluid volume, and signs of fetal distress. In cases of serious deviations (e.g., critical oligohydramnios, uterine scar rupture risks, suspected abnormal placental attachment), physicians gain additional justification for planning surgery.

Cardiotocographic monitoring during late pregnancy and labor reveals how the fetus responds to contractions and whether oxygen supply is adequate. Adverse changes (severe decelerations, loss of heart rate variability) indicate fetal distress.

Multidisciplinary Consultation

In uncertain clinical situations or severe maternal comorbidities (e.g., heart defects, kidney failure, multiple sclerosis), the optimal decision is often made by a collegial body: obstetrician-gynecologist, intensivist, neonatologist, and sometimes specialists from related fields (e.g., cardiologists, infectious disease specialists). This comprehensive assessment ensures the safest delivery strategy for the mother and child.

Connection Between Surgical Access and Risks

Although cesarean section is often a necessary measure to prevent obstetric and perinatal complications, the choice of surgical access—longitudinal or transverse—is also critical. In emergencies (e.g., severe fetal hypoxia, massive bleeding), a faster longitudinal incision is preferred for immediate uterine access. In planned interventions (e.g., complete placenta previa without bleeding, multiple uterine scars), transverse incisions are often chosen to reduce postoperative pain and improve cosmetic outcomes.

The Importance of Timely Prevention and Preparation

Many perinatal risks can be reduced through early measures: treatment and management of chronic maternal diseases, adequate therapy for gestosis or diabetes, necessary preventive vaccinations, weight control, and prevention of anemia. A high level of prenatal diagnostics (screening for genetic pathologies, Doppler studies, CTG) enables the detection of critical situations at a preclinical stage, allowing for the planning of safe surgical delivery.

Informing and Psychological Support

A lack of information among expectant mothers about signs of impending complications (e.g., unusual pain, bleeding, decreased fetal movements) is one of the reasons for delayed medical care. Regular consultations with an obstetrician-gynecologist and participation in "prenatal schools" help recognize dangerous symptoms in time and make decisions about cesarean sections without critical delays.

Preparation of the Surgical Team

Proper organization of work in a maternity hospital or perinatal center ensures that in an emergency (e.g., suspected uterine rupture or severe placental abruption), the surgical team can assemble promptly: anesthesiologist, operating room nurses, and neonatologist. Clear protocols and emergency response algorithms significantly reduce the time from diagnosis to surgery.

Final Remarks

Cesarean section is a vital tool in combating obstetric and perinatal complications, both planned and emergency. The number of risks is directly linked to the timeliness and justification of the decision for surgery. Perinatal risks (e.g., hypoxia, intracranial injuries, neonatal sepsis) are reduced when operative delivery is performed under adequate monitoring and a clear understanding of all factors threatening fetal well-being.

Simultaneously, proper intervention planning (choosing the optimal time, access technique, and anesthesia method) decreases the likelihood of maternal complications such as bleeding, septic processes, or injuries to adjacent organs.

Thus, a comprehensive approach considering obstetric, perinatal, and somatic factors enhances the safety of childbirth and preserves the health of both mother and child.

2.4. The Importance of the 10-Group Robson Classification (Brief Overview)

Developed over two decades ago by Professor Michael Robson at the National Maternity Hospital in Dublin, the 10-group cesarean section classification (often referred to as the Ten-Group Classification or TGC) has become one of the most effective tools for systematically analyzing cesarean section rates. Its main goal is to structurally compare cesarean section data across different clinics, regions, and even countries, identifying trends and possible reasons for elevated or insufficient rates.

The General Idea of Robson's Classification

The key principle of the TGC is dividing all pregnant women into ten groups based on several basic criteria directly related to the risk of cesarean section. The system is based on five parameters:

1. **Parity** (primiparous or multiparous).
2. **Presence or absence of a uterine scar** (prior cesarean section or other surgeries).
3. **Onset of labor** (spontaneous, induced, or planned delivery).
4. **Fetal presentation** (cephalic, breech, or transverse).
5. **Gestational age** (term or preterm, less than 37 weeks).

These criteria assign each pregnant woman to one of ten groups, each with similar characteristics and a corresponding risk level. This approach avoids fragmented and not always objective comparisons when entirely different clinical situations are analyzed in aggregate.

Composition and Characteristics of the Groups

For clarity, the main parameters of the groups can be briefly described, although details are often adapted to the specific features of a given institution:

- **Group 1**: Primiparous women with term pregnancies, cephalic presentation, spontaneous labor onset, and no uterine scar.
- **Group 2**: Primiparous women with the same parameters as Group 1 but with induced labor or labor requiring augmentation.
- **Group 3**: Multiparous women (without a uterine scar) with term pregnancies, cephalic presentation, and spontaneous labor onset.
- **Group 4**: Same as Group 3 but with induced labor or labor requiring augmentation.
- **Group 5**: Multiparous women with one or more uterine scars (typically after previous cesarean sections), term pregnancy, cephalic presentation.
- **Group 6**: Primiparous women with breech presentation.
- **Group 7**: Multiparous women with breech presentation (with or without uterine scars, depending on the version of the classification).
- **Group 8**: All multiple pregnancies (twins, triplets, etc.) with cephalic presentation of the first fetus.
- **Group 9**: Singleton pregnancies with transverse or oblique fetal position.
- **Group 10**: Preterm pregnancies (less than 37 weeks) with cephalic presentation, regardless of parity and uterine scar status.

Practical Benefits of the System

Standardized Analysis.

Thanks to clear criteria, different hospitals and countries gain the ability to compare "similar" patient groups. For instance, if the cesarean section rate among primiparous women with cephalic presentation and spontaneous labor onset (Group 1) is 8% in one hospital and 15% in another, this signals a need to analyze delivery management approaches and the effectiveness of applied methods.

Identifying Key Contributors to Overall Cesarean Rates.

The classification helps pinpoint which groups exhibit the highest rates of surgery. For example, if the most "problematic" group is women with uterine scars (Group 5) or breech presentation (Groups 6 and 7), maternity hospital management can focus on improving tactics for these cases, training physicians in methods for

safe vaginal delivery (where appropriate), and enhancing prenatal diagnostics and counseling quality.

Resource Optimization.

By identifying groups with frequent surgeries and complications, clinics can better allocate surgical, anesthesiological, and neonatal resources. For instance, organizing special monitoring for multiparous women with uterine scars can help promptly detect signs of scar dehiscence.

Objective Assessment of "Excessive" Surgeries.

With the Robson classification, administrators and researchers can identify where cesarean sections are performed too often in relatively safe clinical situations (e.g., Groups 2 or 4) and implement updated protocols for labor induction and management of the latent phase of labor.

Application in Real-Life Settings

In practice, the 10-group Robson classification is increasingly used—not only in large perinatal centers but also in district maternity hospitals. Correctly registering each pregnancy based on the criteria is critically important, as the accuracy of this information directly impacts subsequent analysis. With proper system implementation:

- **Medical staff gain clear guidelines** for evaluating each patient in the lead-up to delivery.
- **Deviations in statistics** can be promptly identified and analyzed for causes (e.g., whether the high surgery rate is due to objective indications, lack of medical expertise, or organizational issues).
- **Patients experience greater transparency.** When explaining to an expectant mother that she belongs to a specific Robson group, it becomes easier to clearly communicate the degree of risk and the necessity of particular measures during delivery.

Role in Reducing Unjustified Cesarean Sections

One of the primary goals of the Robson classification was to find a way to reasonably reduce cesarean section rates without worsening perinatal outcomes. The system allows:

- **Personalized delivery tactics.** In some groups (e.g., Group 2 — labor induction in primiparous women), there is significant room for choosing delivery methods: gentler induction, modern pharmacological agents, timely anesthesia. This reduces the rush to decide on an "immediate cesarean" and helps avoid unnecessary surgeries.
- **Optimized planned procedures.** In Group 5 (women with previous uterine scars), evaluating scar thickness beforehand, consulting with the patient about the possibility of vaginal delivery in the absence of additional contraindications, allows avoiding repeat cesareans and related complications.
- **Standardized statistics.** When all medical facilities apply a unified grouping system, results can be analyzed at higher levels (regional or national). This provides a basis for adjusting national maternal and child health programs.

Potential System Limitations

Despite its convenience and widespread use, the 10-group Robson classification does not account for some nuances:

- **Complex pathologies.** The classification does not distinguish in detail extragenital conditions (e.g., severe diabetes, cardiopathies, oncological states) that can significantly influence the decision for cesarean delivery.
- **Socio-cultural factors.** In some countries, women frequently choose cesarean sections without direct medical indications, complicating the interpretation of final statistics.
- **Clarifying factors.** Some clinics create additional subgroups (e.g., detailing Group 5 to separate women with one scar from those with multiple scars) or expand criteria for presentation and gestational age evaluation.

However, these limitations do not negate the usefulness of the Robson system. On the contrary, they encourage further refinement and adaptation of the classification to the specific conditions of individual institutions.

Perspectives and Conclusions

The 10-group Robson classification has become an international standard that not only reflects the "bare numbers" of cesarean section rates but also facilitates a deeper understanding of the nature of each case. Its value lies in its ability to focus efforts on the most problematic categories of pregnant women, where there are often opportunities for safely reducing surgical interventions.

For healthcare management, the Robson system offers opportunities to optimize budgets and implement the most effective staff training programs. For clinical specialists, it provides a tool to objectively evaluate their own delivery strategies, moving away from a "universal" approach toward more differentiated management for each group of pregnant women.

This comprehensive perspective on the issue of cesarean section rates helps achieve a balance between safety and the unjustified increase in surgical procedures. This is precisely where the practical significance of the 10-group Robson classification lies—helping physicians and perinatal centers make more accurate and evidence-based decisions, ultimately reducing maternal and perinatal morbidity and mortality.

Figure 4: A schematic table of the 10-group Robson classification, illustrating which categories of patients are more likely to require cesarean sections. The illustration provides a visual representation of how pregnant women are divided based on key criteria.

CHAPTER III. SURGICAL APPROACHES IN CESAREAN SECTION

3.1. § Longitudinal (Midline) Access

Advantages and Complications of Longitudinal Surgical Access

The history of cesarean sections has evolved significantly, transitioning from ancient myths and religious rituals to modern high-tech operations. Initially, the primary focus was on saving the child's life (often posthumously for the mother) and later shifted to achieving surgical survival for women. Starting in the 19th century, protocols for antisepsis and asepsis began to take shape, and anesthesia options (ether, chloroform) became available, gradually reducing mortality rates.

In the 20th century, with the advent of antibiotic therapy, improvements in anesthesia, and the implementation of evidence-based surgical techniques, cesarean sections became safer and less traumatic. Modern obstetric surgeries, including lower midline (longitudinal) laparotomy, rely on proven methods that allow the physician to minimize risks for both mother and child.

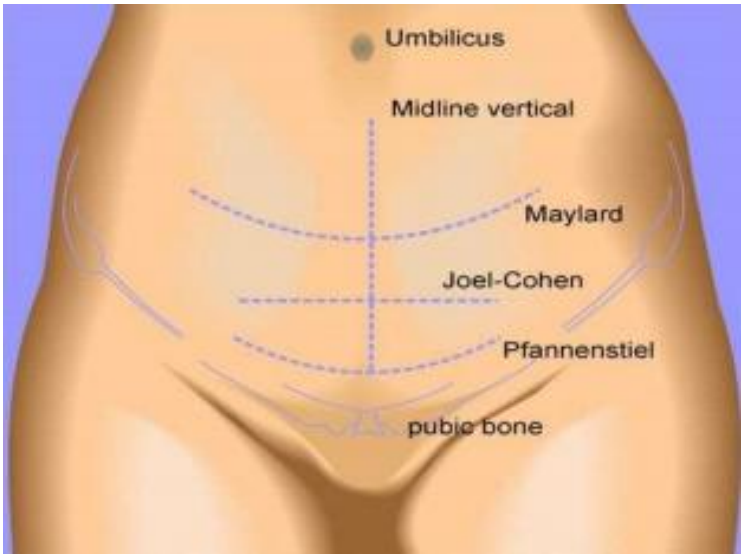

Figure 5: Types of incisions in the anterior abdominal wall for cesarean section.

Lower midline laparotomy (or vertical incision) for cesarean section is performed from the navel to the pubic symphysis along the linea alba of the abdomen.

This access provides quick and extensive exposure to the abdominal cavity and uterus, which is particularly important in emergency obstetric situations (e.g., massive bleeding, fetal distress syndrome, or when there is no time for alternative methods).

From an anatomical perspective, the linea alba (linea alba) represents the junction of the aponeuroses of the abdominal wall muscles. Since muscle fibers are practically absent here, incision in this zone can be performed relatively quickly, creating convenient access for the surgeon. However, the lack of significant muscular support around the incision explains why there is an increased risk of postoperative hernias and wound dehiscence.

Advantages of Lower Midline Laparotomy

- **Rapid Execution**: A vertical incision along the linea alba is typically faster to perform than transverse options (e.g., Pfannenstiel). This is critically important in emergencies, where every minute counts to save the mother and child. Quick opening of the abdominal cavity enables rapid hemorrhage control or fetal delivery in cases of acute hypoxia.
- **Complete Access**: The surgeon gains full access to all abdominal structures, can easily inspect internal organs, assess the uterus, its ligamentous apparatus, and check the integrity of adjacent tissues. If necessary, the incision can be easily extended upwards or downwards, significantly facilitating the surgeon’s actions in unforeseen complications (bleeding, abnormal placental attachment, or the need for abdominal cavity revision).
- **Minimal Blood Loss**: Since the linea alba contains no major vascular trunks or nerve branches, the likelihood of significant blood loss during a vertical incision is usually low. Hemostasis is simplified, as the surgeon can ligate or coagulate bleeding vessels under direct visualization.
- **Ease of Postoperative Care**: While the vertical incision may cause some pain, proper suturing often results in patients tolerating this access no worse than a transverse one. Some studies note easier scar care in the early postoperative period

compared to transverse incisions, as there are no "pockets" or folds where exudate might accumulate.

- **Reuse of Previous Incision**: If the patient has a history of operations with a vertical incision, performing a repeat cesarean section along the same "line" may sometimes simplify abdominal access. Using a scarred area reduces the risk of overlapping new and old incisions, which often occurs with different types of transverse accesses, potentially lowering tissue trauma or scar rupture risk.

Possible Complications and Drawbacks of Vertical Incision

- **Hernia Risk**: Due to the lack of muscular support, hernias may develop at the site of aponeurosis separation. The quality of the aponeurosis sutures and adherence to all strengthening steps are crucial. Hernia prevention includes using durable suturing materials, layered wound closure, and sometimes postoperative bandage use.
- **Less Aesthetic**: The vertical scar is often considered more noticeable and less "cosmetic" than the suprapubic transverse incision (e.g., Pfannenstiel). For some women, this can be a significant factor in access choice. Scar formation depends on genetic predisposition, suturing quality, and adherence to wound care recommendations.
- **Pain and Rehabilitation**: While vertical incisions reduce time to uterine access in emergencies, subsequent pain at the incision site and overall rehabilitation duration may vary individually compared to transverse incisions.
- **Adhesion Formation**: Any abdominal incision carries a risk of adhesions. With vertical incisions, the larger exposure area may increase adhesion likelihood during prolonged manipulations. Adhesions may subsequently lead to chronic pain syndromes, digestive issues (if intestinal loops are involved), and difficulties in repeat surgical interventions.
- **Rare Complications**: In rare cases, especially during complex surgeries or with organ anomalies, there is a risk of damaging the bladder, intestines, or major vessels. However, this complication is not unique to the vertical approach and depends on the surgeon's skill and specific anatomical situation.

Features of Longitudinal Access in Repeat Cesarean Sections

- **Avoiding Scar Overlap**: When the previous cesarean section was also performed using the vertical method, the surgeon can often follow the old scar, minimizing trauma to new tissue areas.
- **Reduced Risk of Scar Dehiscence**: For patients with a questionable uterine scar in the lower segment (e.g., after a transverse approach), lower midline laparotomy may sometimes be considered a more reliable option for a repeat surgery.

Figure. 6: Longitudinal incision of the anterior abdominal wall in a cesarean section

Lower midline laparotomy (or vertical incision) in cesarean section involves an incision from the navel to the pubic symphysis along the linea alba. This approach ensures rapid and extensive exposure of the abdominal and uterine structures, which is crucial in emergency obstetric situations (e.g., massive bleeding, fetal distress, or lack of time for alternative methods).

Anatomical Basis and Key Benefits

- The linea alba (linea alba) is the junction of the aponeuroses of the abdominal wall muscles, containing minimal muscle fibers, making it quick and convenient for surgical access. However, the lack of strong muscular support increases the risk of postoperative hernias and wound dehiscence.
- **Rapid Access**: Vertical incisions are generally quicker to perform than transverse alternatives (e.g., Pfannenstiel), which is critical in emergencies where every minute counts. This allows prompt bleeding control or fetal extraction in cases of acute hypoxia.
- **Comprehensive Visibility**: Surgeons gain full access to internal organs, making it easy to inspect the uterus, ligaments, and neighboring tissues. The incision can be extended vertically if complications arise, such as bleeding or abnormal placental attachment.

Comparison with Transverse Access (Pfannenstiel and Joel-Cohen Methods)

- **Pfannenstiel Incision**: Common in planned cesareans due to better cosmetic outcomes and reduced risk of postoperative hernias. However, it is slower to reach the uterus in emergencies and less flexible for extension.
- **Joel-Cohen Incision**: Positioned higher than the Pfannenstiel incision with fewer vessels crossed, offering quick abdominal entry and a satisfactory cosmetic result. Still, in complex cases (e.g., large fetus, severe adhesions), the vertical incision's advantages outweigh its counterparts.

Key Advantages of Lower Midline Laparotomy

- **Expedited Field Expansion**: Essential for emergencies requiring broader revision (e.g., suspected placenta accreta, scar rupture, severe bleeding).
- **Better Access for Revisions**: Surgeons can extend the incision easily for a thorough abdominal examination.
- **Low Risk of Vascular Damage**: Few major vessels in the linea alba reduce blood loss, easing hemostasis.
- **Ease of Reopening**: Repeat surgeries on the same scar minimize additional tissue trauma.

Potential Drawbacks and Complications

- **Hernia Formation**: Due to minimal muscular support, hernias are more likely. Preventive measures include durable sutures and poslayered closure.
- **Aesthetic Concerns**: The scar may appear less cosmetic than transverse options, depending on healing factors and proper care.
- **Increased Adhesion Risk**: Greater exposure area may promote adhesion formation, leading to long-term complications.

Preventive Measures and Recommendations

- **Layered Closure**: Properly close the aponeurosis, subcutaneous tissue, and skin to avoid seromas or hematomas.
- **Antibiotic Prophylaxis**: Particularly for emergencies, antibiotics minimize infection risks.
- **Early Mobilization**: Encouraging movement within the first 24 hours improves blood circulation and prevents complications like thrombosis.
- **Postoperative Bandage**: Supports the abdominal wall and aids tissue regeneration.

Innovations and Future Directions

Advancements such as ultrasonic scalpels, high-precision coagulators, and improved hemostatic instruments have significantly reduced tissue trauma, blood loss, and healing time. Moreover, research into optimizing vertical incisions for better cosmetic outcomes and minimizing hernia risks continues, including the potential use of mesh implants for weakened abdominal walls.

Conclusion

Lower midline laparotomy remains a vital, efficient, and safe method for emergency cesareans, particularly in complex obstetric scenarios. Despite its limitations, such as hernia risks and cosmetic drawbacks, its speed and effectiveness in emergencies ensure its ongoing relevance. The choice of access—vertical or transverse—should always align with the clinical situation, patient history, and maternal preferences, ensuring the best outcomes for both mother and baby.

3.2. § Transverse (Suprapubic) Access

Transverse access (laparotomy) in the suprapubic area is widely used in modern obstetric and gynecological practice. The key distinction from vertical (longitudinal) incisions is the parallel (or nearly parallel) orientation of the incision relative to skin folds and muscle fibers, often resulting in a more aesthetic postoperative scar.

In suprapubic access, there are several variations, including the Pfannenstiel incision, the Joel-Cohen incision, and their modifications (e.g., Stark technique, Pelosi method). While all these approaches are transverse incisions, they differ in terms of aponeurosis dissection depth, peritoneal handling, suturing techniques, and management of the vesicouterine fold.

Pfannenstiel Access: Pros and Cons

Advantages of Pfannenstiel Access

- The incision is located in the suprapubic area ("bikini line"), where it becomes less noticeable over time, which is especially important for patients concerned about the aesthetic outcome of the scar.
- Many experts note that properly performed transverse laparotomy in the lower abdomen is associated with less pronounced postoperative pain compared to vertical incisions, as the muscles of the anterior abdominal wall are separated along their fibers.
- Since the transverse access passes through an area with a more robust musculoaponeurotic structure (unlike the linea alba), the risk of hernia formation is generally lower.

Disadvantages of Pfannenstiel Access

- The transition of the rectus abdominis aponeurosis to surrounding tissues in the pubic area involves a relatively dense network of small blood vessels. Dissection and tissue separation can lead to hematoma formation.
- Pfannenstiel incisions may present technical challenges in quickly reaching the uterus, especially in emergencies (e.g., placenta previa, eclampsia, acute fetal hypoxia).

- Dissection and subsequent suturing of several abdominal wall layers may require more time.
- For large fetuses or broad shoulder girdles, the transverse suprapubic incision can be too narrow, complicating fetal extraction and increasing the risk of trauma to both the mother and baby.

Joel-Cohen Incision: Features and Benefits

The transverse Joel-Cohen incision was proposed in 1972 by S. Joel-Cohen and is positioned higher than the Pfannenstiel incision. This minimizes the crossing of blood vessels and muscle fibers, reducing blood loss and operation time.

Advantages of the Joel-Cohen Method

- The incision is made 2–3 cm above the traditional Pfannenstiel line, in an area with less dense vascular "bed," providing the surgeon with a cleaner operative field and reducing the risk of significant hematoma formation.
- The reduced need for extensive aponeurosis and muscle separation allows for faster uterine access, particularly valuable in emergency situations (approximately 1–2 minutes faster than the Pfannenstiel approach).
- Tissues are largely separated bluntly (manual dissection), leaving some blood vessels intact and reducing the risk of muscle and skin ischemia.

Possible Drawbacks of the Joel-Cohen Method

- The Joel-Cohen incision requires careful blunt tissue separation; improper handling increases the risk of organ or vessel injury.
- Incomplete layer alignment and poor wound drainage can result in seromas—accumulations of interstitial fluid that may require puncture or drainage.
- Some women may find the scar, located higher than the bikini line, more noticeable. However, compared to vertical laparotomy, the Joel-Cohen method still provides an acceptable cosmetic result.

Stark Modification: Speed and Reduced Complications

Essence of the Technique

The variation proposed by M. Stark represents an improved version of the Joel-Cohen technique. During the procedure:

- The vesicouterine fold is not routinely mobilized.
- The uterine incision is closed with a single-layer continuous suture.
- The visceral and parietal peritoneum, as well as the rectus muscles, are not sutured unless indicated.
- Subcutaneous tissue and skin are closed with 3–4 interrupted stitches or a cosmetic suture.

Advantages of the Stark Modification

- The time from laparotomy to fetal extraction can be as short as 1–1.5 minutes. The overall duration of surgery and anesthesia is reduced by 1.3–1.4 times compared to traditional techniques.
- Postoperative complications, such as endometritis, wound infections, and other infections, are reduced from 16–23% to 4–7%.
- Avoiding routine peritoneal suturing decreases the likelihood of dense adhesion formation and subsequent pain syndromes. Adhesions in the abdominal cavity using Stark's technique occur 2–3 times less frequently than with traditional suturing.
- Rapid maneuvers, reduced incision area, and optimized hemostasis lower intraoperative blood loss, particularly beneficial for weakened patients or women with anemia.

Possible Limitations of the Stark Modification

Performing the Stark method requires a clear understanding of anatomy and confident skills. Less experienced specialists may encounter difficulties with not suturing the peritoneum and applying a single-layer uterine suture.

Traditionally, obstetric surgery has involved closure (peritonization) of peritoneal defects. The Stark method deviates from this principle, which is why some physicians are cautious about the potential risk of adhesion formation in the future. However, numerous studies demonstrate the opposite—reduced adhesions and faster recovery.

Among modern transverse incision techniques, the Pelosi method is also noted. It involves a simplified but sufficiently wide incision in the lower abdomen

with modified uterine sutures. According to some data, this technique can reduce blood loss and shorten the procedure duration to about 45 minutes. Moreover, the frequency of postoperative fever decreases, and the likelihood of endometritis is reduced.

Modern approaches (Pfannenstiel, Joel-Cohen, Stark, Pelosi) often use primarily blunt tissue separation, which decreases the likelihood of deep muscle and fascial injuries. Due to less muscle and subcutaneous tissue trauma, patients generally experience less pain, mobilize faster, and, in many cases, shorten hospitalization duration.

When performed skillfully, the duration of general anesthesia or regional anesthesia (spinal, epidural) decreases, reducing the pharmacological load on the woman and the fetus.

Potential Complications of Transverse Access

Extracting a baby with excessive weight or a large head/shoulder girdle may be challenging in the limited surgical field of a transverse incision, increasing the risk of injury to the mother and child. In some cases, the restricted visualization area may complicate control over intestinal loops, the bladder, or vascular structures. Incorrect movements with a scalpel or clamps risk inadvertent injuries.

If significant bleeding occurs during a cesarean section or urgent access expansion is required (e.g., in placenta accreta), a transverse incision often needs to be extended or converted to a T-shaped uterine incision, complicating the procedure.

The "classic" Pfannenstiel, Joel-Cohen, or Stark techniques require well-coordinated teamwork and knowledge of nuances. Inexperienced teams may see higher complication rates, such as hematoma formation.

One important question is the possibility of vaginal delivery after cesarean section (VBAC). With a transverse uterine incision, the risk of scar rupture during labor is generally lower than with a vertical one. However, this does not mean that vaginal delivery is recommended universally. The decision depends on scar thickness, previous suture location, the woman's overall health, and obstetric circumstances (e.g., fetal size, anticipated complications).

Comparison of Transverse and Longitudinal Access in Emergency Cesarean Sections

- **Access Time:** In emergencies, a vertical incision provides quicker access to the uterus, while a transverse incision (Pfannenstiel or Joel-Cohen) may take slightly longer to open the abdominal wall.
- **Visualization:** Longitudinal laparotomy offers a broader view and immediate access expansion, which can be critical in acute complications (e.g., massive hemorrhage, uterine rupture).
- **Rehabilitation:** Data suggest that transverse scars often involve less pain and faster recovery (if complications are absent). Vertical access may leave a less satisfactory cosmetic scar.

Transverse access remains the "gold standard" in many planned situations where the surgeon has the time and opportunity to ensure adequate anesthesia, choose the optimal technique, consider the patient's cosmetic preferences, and avoid unnecessary trauma to the anterior abdominal wall muscles.

The Pfannenstiel incision, despite good cosmetic results, is often associated with the risk of hematoma formation. Following hemostasis principles, careful aponeurosis suturing, and layer-by-layer tissue restoration can prevent complications.

The Joel-Cohen method allows faster uterine exposure and reduces blood loss but requires careful blunt tissue separation. In skilled hands, this approach significantly accelerates the procedure and reduces postoperative pain.

The Stark modification offers several advantages (notably in reducing intervention duration, endometritis risk, and adhesion frequency) but demands high surgical expertise and strict adherence to the technique (specifically, not suturing the peritoneum and using a continuous uterine suture).

Pelosi techniques are also used, helping to shorten operating time and blood loss, though they are less commonly a routine standard.

Emergency surgeries (e.g., bleeding, placental abruption, severe fetal distress) are often performed through longitudinal laparotomy because access time and visualization breadth can be decisive factors for saving the mother and child.

Subsequent pregnancies and deliveries depend on the type of uterine suture. With a transverse lower segment incision, VBAC is more often allowed, provided there are no other contraindications and the scar is deemed competent.

Concluding Notes

Transverse access methods in cesarean section (Pfannenstiel, Joel-Cohen, Stark, Pelosi, etc.) offer several significant advantages, including a more aesthetically pleasing scar, reduced pain, lower hernia risk, and potentially faster recovery. However, it is essential to consider risks like hematoma formation, challenges in extracting a large fetus, and technical difficulties during emergency surgeries.

Each type of transverse access should be selected based on the specific obstetric situation, the patient's condition, estimated fetal weight, the surgical team's expertise, and their experience with a particular method. Adhering to evidence-based principles, advancing surgical technologies, and taking an individualized approach for each patient significantly enhance the safety and effectiveness of cesarean sections, minimizing complications and improving long-term outcomes for both mother and child.

3.3. § Choice of Surgical Approach in Emergency Situations

The choice of surgical access during an emergency cesarean section is one of the key factors determining the outcome of the operation for both the mother and the child. In such situations, every minute is critical, and doctors base their decision on the time factor, the degree of blood loss, the condition of the scar (if the woman has undergone previous operative deliveries), the location and suspected pathologies of the placenta, as well as the overall condition of the patient and the presence of additional complications. In cases of rapidly progressing bleeding, suspected uterine rupture, or severe fetal distress, a vertical (midline) incision is traditionally

preferred. It is performed faster, provides surgeons with extensive visibility, and allows immediate resolution of the danger.

A vertical laparotomy along the linea alba is the classical method for critical situations, as the incision can be easily extended if revision of the upper abdominal regions or addressing accompanying pathologies (e.g., placental accreta, uterine rupture extending to adjacent structures, or diffuse bleeding) becomes necessary.

If the condition of the woman and fetus allows for slightly more time, and the surgeon is skilled in "quick" transverse laparotomy, a suprapubic access (e.g., Pfannenstiel, Joel-Cohen, or their modifications) may be used. This option is justified when the patient's hemodynamics are relatively stable, and a comprehensive abdominal revision is not required.

Transverse access provides better cosmetic healing, reduces the risk of postoperative hernias, and may be less painful during rehabilitation. However, its downside is the potentially longer time to access the uterus and its limited flexibility in expanding the operative field. In emergency situations requiring rapid revision of the liver or intestines, a transverse incision may need to be converted into a T-shaped or combined incision, complicating the procedure. Additionally, in some patients, adhesions, scars from previous surgeries, or pronounced subcutaneous fat in the suprapubic area make transverse access more traumatic and less convenient for the surgeon.

The experience of the surgical team and the organizational capabilities of the specific facility play a crucial role in choosing the surgical access. In clinics with extensive practice in "lightning-fast" Pfannenstiel incisions, and when the patient's condition is not so critical as to require immediate fetal extraction, transverse access may be preferred. Conversely, if the surgeon is uncertain about their ability to promptly control bleeding with a transverse incision or needs to inspect the upper uterine segments and adjacent organs, a vertical laparotomy becomes the obvious choice.

Each emergency obstetric situation is unique and must consider the patient's body mass index, the nature of the suspected damage (e.g., a questionable uterine

scar, the threat of rupture in the lower segment, or tissues closer to the uterine fundus).

Prevention of Complications in Emergency Surgery

Preventive measures are as essential in emergency surgery as in elective procedures. When time permits, antibiotics are administered to the patient to reduce the risk of infectious and septic complications, and the surgical team is alerted in advance to prepare the necessary tools for rapid hemostasis (e.g., electrocautery, clamps, aspirators, blood substitutes).

When selecting the incision site, surgeons aim to avoid areas with significant vascularization and dense adhesions. After completing the operation, surgeons must thoroughly check the reliability of the sutures on both the uterus and the abdominal wall, as haste can lead to minor oversights that may result in postoperative bleeding, seromas, infectious and septic complications, or hernias.

Rehabilitation Period

Postoperative rehabilitation involves quickly stabilizing the patient, compensating for blood loss, and mobilizing her as soon as possible. Early mobility improves circulation, reduces the risk of thromboembolism, and minimizes adhesion formation.

Modern Perspectives and Conclusions

Advances in anesthesia and the development of minimally invasive methods have not eliminated the need for classical incisions in extreme situations. Research continues into new technologies (e.g., precision electrocautery, ultrasonic scalpels) to reduce intervention time and tissue trauma. However, emergency cesarean sections remain an area where the human factor—experience and quick reactions of the surgeon, team coordination, and the ability to rapidly assess the situation—plays a dominant role.

The vertical incision often prevails due to its universality and immediate access to the uterus, while suprapubic access is justified only when time permits and the immediate threat to the life of the child or mother is less urgent. Ultimately, the choice of surgical access in emergencies will always depend on balancing the need

for immediate intervention with the aim of minimizing postoperative complications—this balance is the benchmark of professionalism for a physician deciding on the type of laparotomy.

CHAPTER IV. OWN RESEARCH AND RESULTS

4.1. § Materials and Methods

We studied delivery records involving emergency cesarean sections from 2019 to 2023. The total number of deliveries during this period was 27,940. Among them, 10,200 deliveries (36.5%) resulted in cesarean sections. It is important to note that the majority of these operations were emergency cesarean sections—7,893 cases (or 77.4%), while planned cesarean sections accounted for 2,307 operations (22.6%). When examining the annual dynamics, in 2019, there were 4,564 deliveries, of which 1,444 (31.6%) resulted in cesarean sections. Of these, emergency cesarean sections constituted 87.2% (1,259 cases), while planned cesareans accounted for only 12.8% (185 cases). In 2020, out of 3,523 deliveries, 1,119 (31.7%) were cesarean sections, with the share of emergency operations decreasing to 66% (738 cases), while planned cesareans comprised 34% (381 cases).

In 2021, the number of deliveries increased to 4,704, and 1,703 (36.2%) of them were completed via cesarean section. Emergency operations constituted a significant proportion—86.1% (1,466 cases), while planned procedures accounted for 13.9% (237 cases). In 2022, there was a further increase in deliveries to 6,725, with the number of cesarean sections reaching 2,711 (40.3%), of which 74.9% (2,028 cases) were emergency and 25.1% (683 cases) were planned.

The final year of analysis, 2023, showed even greater growth—8,424 deliveries, of which 3,223 (38.2%) were cesarean sections. Emergency procedures accounted for 74.6% (2,402 cases), while planned procedures accounted for 25.4% (821 cases).

Thus, from 2019 to 2023, there was an increase in the number of deliveries and cesarean sections, with emergency operations comprising the majority of surgical interventions.

Table 1

Risk Factors for Postoperative Complications in Emergency Cesarean Section

Risk Factor	Description	Complication Frequency	AUC (ROC Analysis)**
Delayed hospitalization	Late referral of patients to the hospital due to inadequate routing or lack of transport resources	40%	0.72
Delayed decision-making	Delay in initiating surgery due to lack of resources or diagnostic data	35%	0.68
Massive blood loss in history	Lack of planning for emergency blood volume replacement in regional hospitals	27%	0.74
Placenta previa	Central or low placental attachment complicating surgical intervention	30%	0.77
Previous cesarean sections	Presence of uterine scar accompanied by complications	25%	0.71

Table 1 outlines the main clinical and organizational risk factors influencing the development of postoperative complications during emergency cesarean sections, along with their significance confirmed by ROC analysis. Delayed hospitalization, caused by insufficient patient routing or a lack of transportation resources, is associated with hyperthermia lasting more than three days in 40% of patients (AUC 0.72). Delays in deciding to initiate surgery, due to unprepared diagnostics or resource shortages, result in subaponeurotic hematomas in 35% of patients (AUC 0.68).

Massive blood loss in the medical history, coupled with inadequate planning for blood volume restoration, increases the risk of intestinal paresis lasting more than three days in 27% of patients (AUC 0.74). Placenta previa, as a risk factor, has the highest predictive value (AUC 0.77) and is associated with subaponeurotic hematomas in 30% of patients. Previous cesarean sections are complicated by pain syndrome and intestinal paresis lasting more than three days in 25% of cases (AUC 0.71). Patient misrouting, involving incorrect referrals between healthcare levels, increases surgery duration and the risk of hyperthermia in 33% of patients (AUC 0.70).

These data emphasize the need to improve organizational approaches to diagnostics and treatment to reduce the frequency of severe complications.

General Characteristics of the Examined Women

Among the 258 women who underwent surgery, 30 patients (25%) aged 18–19 years had a lower midline laparotomy, and 27 (20.2%) underwent a transverse approach by Joel-Cohen, totaling 57 individuals (22%). In the age group 20–29 years, 61 patients (50.8%) underwent a lower midline approach, and 76 (55%) had a transverse approach, totaling 137 individuals (53.1%).

In the age group 30–34 years, 18 women (15%) underwent a lower midline laparotomy, and 24 (17.3%) underwent a transverse laparotomy, totaling 42 patients (16.2%). In the 35–45 years group, 11 women (9.2%) underwent a lower midline laparotomy and the same number (7.5%) underwent a transverse laparotomy, totaling 22 individuals (8.7%).

Thus, 120 surgeries (46.5%) were performed using a lower midline laparotomy, and 138 (53.5%) employed the transverse Joel-Cohen approach, accounting for 100% of all cases.

Among the 258 women who underwent surgery, 213 (82.5%) were rural residents, while 45 (17.5%) were urban residents. Regarding social status, the majority of patients (204 or 79%) were housewives, 41 (15.8%) worked in state institutions, and 13 (5.2%) were employed in rural enterprises.

The presented structure of residence and social status provides important insights into the demographic and social characteristics of the patients.

Among the 258 patients, 68 (26.3%) were primigravidas, and 190 (73.7%) were multigravidas. Primiparous women accounted for 77 (29.8%), while 181 (70.2%) were multiparous. Women who had delivered four or more times accounted for 5.8% (15 individuals), evenly distributed between the two laparotomy types.

These data highlight the diversity of reproductive experiences among patients undergoing different types of cesarean sections and may indicate the need for an individualized approach to selecting surgical access based on obstetric history and current clinical indications.

Research Phases

A three-stage analysis was conducted to study the frequency and effectiveness of cesarean section surgeries in women with emergency obstetric indications:

Phase I involves studying the frequency of surgical interventions performed using emergency cesarean sections. At this stage, data analysis is conducted to identify the prevalence of this operation among patients with obstetric indications. Studying the frequency helps determine the baseline need for emergency surgical interventions in maternity care institutions.

Phase II focuses on assessing the effectiveness of various surgical access methods during emergency cesarean sections. During this phase, patients were divided into two main groups based on the type of access:

- **Group I:** 120 pregnant women who underwent lower midline laparotomy (longitudinal access).
- **Group II:** 138 pregnant women who underwent transverse laparotomy by the Joel-Cohen method.

Each group was further divided into subgroups: Group IA and IIA for patients undergoing cesarean sections for the first time and Group IB and IIB for patients undergoing repeat cesarean sections. These divisions allow for a detailed analysis of the effectiveness of each type of surgical access depending on whether the operation was primary or repeat.

Phase III is dedicated to developing an algorithm for selecting the optimal method of emergency cesarean section for pregnant women with complicated obstetric conditions. This phase synthesizes data obtained during the first two phases to create clinically justified recommendations that contribute to reducing complication rates and improving outcomes for mothers and newborns.

Thus, through this study, we identified the most optimal surgical access methods, which were reflected in the developed algorithm for managing patients with emergency obstetric conditions.

Each stage of the study plays a key role in developing improved treatment protocols and can serve as a basis for further prospective research in obstetrics. The obtained results contribute to a scientifically grounded choice of surgical method, reducing risks and improving outcomes for pregnant women.

The age of the patients ranged from 18 to 45 years on average. The study period covered 5 years, from 2019 to 2023.

In our study, we identified the basic principles of surgical care for pregnant women with emergency obstetric conditions requiring immediate cesarean section:

1. Optimal access providing full exposure to the gravid uterus with the possibility of extending the operation.
2. Optimal restoration of the anterior abdominal wall muscles in case of injury.
3. Prevention of postoperative subfascial hematomas by ligating the inferior epigastric artery (*a. epigastrica inferior*).
4. Favorable progression of both the early and late postoperative periods.

The study involved a retrospective analysis of the childbirth histories of women operated on for emergency obstetric indications (tasks, point 1). Based on the retrospective analysis, a table of risk factors for intra- and postoperative complications was created, and indications for longitudinal and transverse surgical access were developed (tasks, point 2). An analysis of the outcomes of surgical access used in our patients from groups I and II was conducted (tasks, point 3). An algorithm for managing pregnant women considering the urgency or planned nature of abdominal deliveries was developed (tasks, point 4).

Inclusion criteria for the study:

1. Age from 18 to 45 years.
2. Pregnant women with emergency conditions requiring urgent cesarean section surgery.
3. Singleton pregnancy.
4. Absence of severe chronic diseases or oncological tumors.
5. No other contraindications to abdominal delivery.
6. Presence of mandatory written informed consent from the patient and her relatives.

Exclusion criteria for the study groups:

1. Congenital and diagnosed fetal abnormalities.
2. Malignant tumors of the uterus and uterine appendages.
3. Disorders related to the blood coagulation system (laboratory findings and anesthesiologist's notes).

For all participants, including patients and their relatives, informed consent was obtained for participation and subsequent publication of results in open scientific journals. This confirms adherence to ethical norms and confidentiality rules during the study.

The effectiveness of patient treatment was assessed before and after the operation, as well as in the immediate postoperative period. The assessment was based on both objective and subjective criteria. The main parameters considered during the study included:

1. **Patient complaints** – analysis of symptoms such as pain, duration of fever, and other potential postoperative complications.
2. **Patient evaluation of treatment quality and effectiveness** – subjective perception of the treatment and surgical outcomes.
3. **Patient examination** – included examination of the surgical wound, assessment of the postoperative suture condition, ultrasound examination (US), and, if necessary, magnetic resonance imaging (MRI) or multislice computed tomography (MSCT).

4. **General laboratory tests** – analyses conducted to assess the patient's general condition and identify possible complications.

Treatment effectiveness was evaluated using a three-point scale:

- A **good result** was characterized by a stable normal body temperature for three days, absence of pain complaints, and primary wound healing without complications or infiltrates. This indicated a favorable surgical outcome and quick recovery.
- **Satisfactory results** included cases where patients experienced prolonged fever for more than three days and continued pain for over three days. These cases required additional observation and therapy but did not always result in significant complications.
- **Unsatisfactory results** included cases where patients developed complications such as hematomas or wound suppuration requiring serious medical intervention and potentially repeat surgeries. Such outcomes were considered unfavorable, requiring active measures to correct the patient's condition.

All 258 pregnant women were in moderate condition before surgical intervention. For all patients, a multidisciplinary team was convened to determine the scope of the operation and the type of surgical access.

After the emergency cesarean section, rigorous postoperative monitoring was conducted to assess maternal recovery and neonatal adaptation. This included monitoring vital signs, visual and palpatory examination of the incision area to detect signs of infection or healing defects. Instrumental methods, such as ultrasound diagnostics, were used to identify postoperative complications, including intra-abdominal bleeding or infiltrate formation.

To assess the condition of the newborn, the Apgar score was applied, with additional methods such as ultrasonography performed if necessary to rule out neurological abnormalities.

It should be emphasized that comprehensive preoperative obstetric assessment and continuous postoperative monitoring are key aspects of ensuring the safety of

the mother and child. These allow for timely evaluation and adjustment of clinical tactics, minimizing risks and promoting favorable outcomes for both the surgery and the mother's recovery process.

Surgical Opportunities for Optimizing Cesarean Section Operations in Pregnant Women with Emergency Indications

The successful outcome of surgery in emergency indications depends on several key aspects. First and foremost, the choice of the optimal surgical approach is crucial for reducing trauma to uterine tissues and subsequent complications.

The second important factor is the careful extraction of the fetus, which minimizes the risk of fetal distress and determines the initial parameters of neonatal health. Fetal extraction techniques should be as gentle as possible to reduce the likelihood of mechanical injuries while ensuring a quick and effective operation.

The third critical element is the restoration of the lower uterine segment, which ensures proper tissue regeneration and the formation of a quality scar. The use of modern synthetic absorbable suture materials contributes to optimizing healing processes and reducing the risk of scarring defects. Based on literature reviews and clinical experience, a significant portion of researchers favor cesarean section through the lower uterine segment using a transverse incision. This method is noted as preferable due to its lower invasiveness and better cosmetic outcomes compared to vertical incisions.

At the same time, the issue of excising the postoperative scar remains a matter of debate among surgeons. There are differing approaches to restoring the wound in the lower uterine segment: some surgeons adhere to the single-layer suture method, while others prefer double-layer restoration, which potentially provides a stronger closure.

Our proposals for optimizing cesarean section techniques aim to improve perinatal outcomes. We have developed several new methods focused on reducing the frequency of postoperative complications, strengthening uterine sutures, and improving the overall condition of the mother and newborn. These innovations are the result of a comprehensive analysis of current clinical practices and existing

recommendations in obstetric surgery. The consistent implementation of these methods in practice may reduce the negative impact of surgical intervention on the mother and child while stimulating the recovery of women's reproductive health after delivery via abdominal access.

Research Methods

The analysis of clinical indicators, including the time from the start of surgery to fetal extraction, operation duration, and blood loss volume, served as the basis for assessing the effectiveness of surgical techniques and analyzing postoperative dynamics. Particular attention in postoperative management was given to monitoring the condition of newborns during the early neonatal period. This included evaluating fever states, the degree of pain, the need for analgesia, and observing the process of uterine involution, which is critically important for timely adaptation and adjustment of treatment measures.

The clinical picture was supplemented by hemoglobin data obtained using the cyanmethemoglobin method, hematocrit values refined using a microcentrifuge, and platelet counts. The gravimetric method was used to accurately estimate blood loss volume, excluding the influence of premature placental abruption.

To determine hemostatic system disorders, we conducted a bedside test, which is relevant given the urgency of cesarean section operations. The bedside coagulation test, also known as the Lee-White test, is a simple and rapid method for assessing hemostatic system function directly at the patient’s bedside.

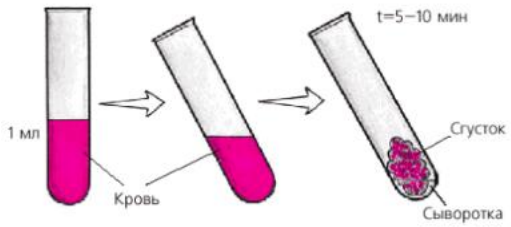

Figure 7: Bedside Coagulation Test

To perform this test, a venous blood sample is drawn from the patient and placed into two test tubes, which are then positioned vertically. The tubes must be

prewarmed to body temperature to prevent premature cooling of the blood, which could distort the results.

The blood is left undisturbed, and the time from sample collection to fibrin clot formation is measured with a stopwatch. The normal coagulation time using the Lee-White method ranges from 5 to 10 minutes. Prolongation of coagulation time may indicate coagulation system disorders, such as clotting factor deficiencies, platelet dysfunction, or the effects of anticoagulants.

Interpretation of the results involves assessing not only the time to clot formation but also its quality. A dense, well-formed clot indicates normal coagulation function. A soft or easily disrupted clot may signal potential issues in the coagulation cascade or inadequate fibrinogen quantity or function.

This test is valuable for emergency diagnostics in settings where rapid coagulation assessment is required, such as preoperative evaluations, intensive care, or anticoagulant therapy management. Despite its simplicity, it provides critical information that can be vital for determining a patient's treatment strategy.

Assessment of Cesarean Section Outcomes and Postoperative Uterine Involution

Ultrasound studies were conducted to dynamically monitor uterine condition and the postoperative uterine scar following emergency cesarean sections. Hysterometry using the Mindray DC-7 ultrasound machine was performed on the 3rd and 6th days postoperatively, allowing evaluation of the recovery process's effectiveness.

The health of newborns was assessed using the Silverman-Anderson and Apgar scales, which provided insights into the quality of the neonatal adaptation period.

Postoperative Monitoring of Patients

Traditional clinical monitoring included regular blood tests to measure hemoglobin, leukocytes, leukocyte differential counts, color index, red blood cells, and biochemical parameters. These tests aimed to evaluate the overall recovery and identify potential complications.

As a tool for assessing systemic intoxication and the severity of pathological processes, the leukocyte intoxication index (LII) was utilized. This objective measure supported clinical conclusions and optimized recovery treatment approaches.

Leukocyte Intoxication Index (LII): Calculation and Interpretation

The LII is a critical laboratory parameter used to evaluate the degree of intoxication, particularly in infectious and inflammatory conditions. Its calculation involves a formula that considers the ratio of different leukocyte forms in peripheral blood, including segmented, banded neutrophils, lymphocytes, and monocytes.

LII Formula: LII = (banded + juvenile + myelocytes) / (segmented + lymphocytes + monocytes)

Normal LII values range from 1.5 to 3. Higher values indicate increased levels of immature neutrophils, suggesting an active inflammatory or infectious process requiring additional clinical attention and possible treatment.

Clinical Context and LII Results

Interpretation of LII results depends on the clinical situation. High values suggest sepsis or severe infections requiring immediate intervention. In chronic inflammatory conditions, LII may remain slightly elevated even in stable clinical conditions.

The LII is a valuable diagnostic and monitoring tool for infectious and inflammatory diseases, providing essential data on the body's response to infection and the effectiveness of therapeutic interventions.

Data Processing and Statistical Analysis

The data collected during the study were statistically analyzed on a Pentium-IV personal computer using Microsoft Office Excel 2016. This included applying the software's built-in statistical functions.

Both parametric and nonparametric methods of variation statistics were used, enabling calculation of the arithmetic mean (M), standard deviation (σ), standard error of the mean (m), and relative values (percent frequency). Statistical significance of the results when comparing mean values was assessed using the

Student's t-test, and error probabilities (P) in normality checks were evaluated using the kurtosis test. Changes were considered statistically significant at $p<0.05$.

4.2. § Main Results

This chapter presents a comparative assessment of two primary surgical approaches for emergency cesarean sections: transverse (Joel-Cohen) and longitudinal (lower midline). Both operative techniques are widely used in obstetric practice and have specific features that influence maternal and fetal outcomes.

The analysis focuses on the advantages and disadvantages of each type of access, such as the risk of intraoperative complications, blood loss volume, operation duration, postoperative recovery, and the frequency of infectious complications. Particular attention was also given to women with uterine scars from previous cesarean sections, as this significantly increases risks during repeat procedures.

This chapter aims to identify the safest and most effective method of surgical access in emergency surgical care, which is especially critical in severe obstetric complications.

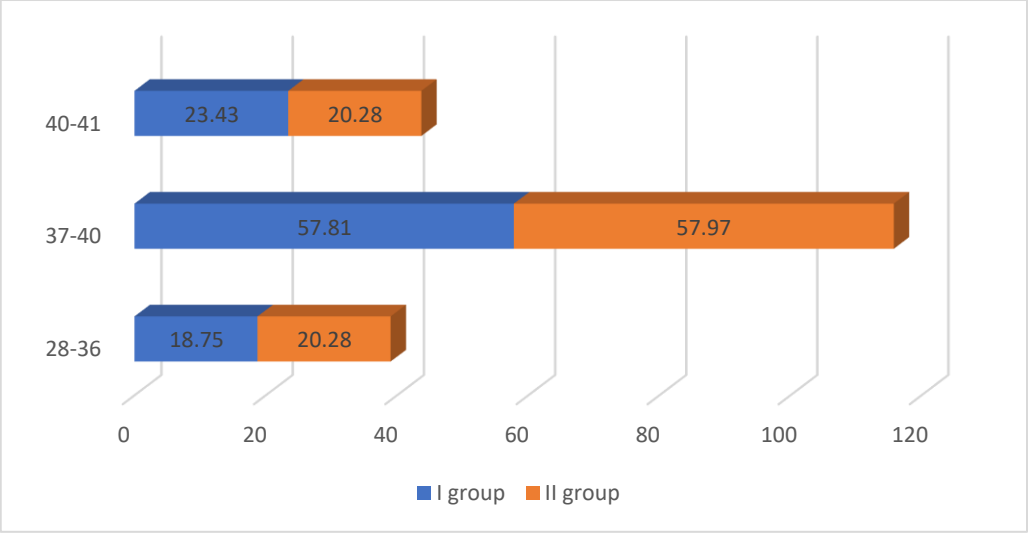

Figure 8: Gestational age at the time of abdominal delivery in the study groups (%).

By the time of delivery, the mean gestational age in Group I and Group II was 36.0±0.3 weeks and 36.4±0.2 weeks, respectively (Figure 8).

Features of the Intraoperative and Postoperative Periods with Different Surgical Accesses in Emergency Cesarean Section

The results of clinical studies demonstrate several advantages of using the lower midline access during emergency cesarean sections. This surgical technique, due to its efficiency and safety, optimizes the surgical process and minimizes the time to the initiation of the intervention, which is critically important in emergency situations. Direct access to the uterus through the lower midline incision allows for faster and more controlled delivery, reducing the likelihood of surgical complications and shortening the duration of the procedure itself. These aspects, supported by clinical data, highlight the importance of selecting the optimal surgical access method in cases requiring immediate intervention.

Total Duration of Emergency Cesarean Section Surgery and Its Individual Stages with Different Accesses

Analysis of the cesarean section duration showed that the longest procedure times were observed when transverse laparotomy (Group II) was used in emergency situations. The mean duration of surgery in this group was 54.6±0.25 minutes, ranging from 40 to 130 minutes (coefficient of variation ±0.25). The increase in surgery duration was influenced by the expanded scope of the procedure and the presence of a uterine scar from previous cesarean sections ($p<0.05$).

In contrast, the analysis of cesarean section duration with lower midline laparotomy showed an average time of 48.1±4.0 minutes ($p<0.05$), with a range of 30 to 110 minutes (coefficient of variation ±0.25). It is noteworthy that the lower midline laparotomy significantly reduced the operation time, primarily due to the wider surgical access, particularly when the procedure was expanded to include hysterectomy and/or ligation of the iliac arteries.

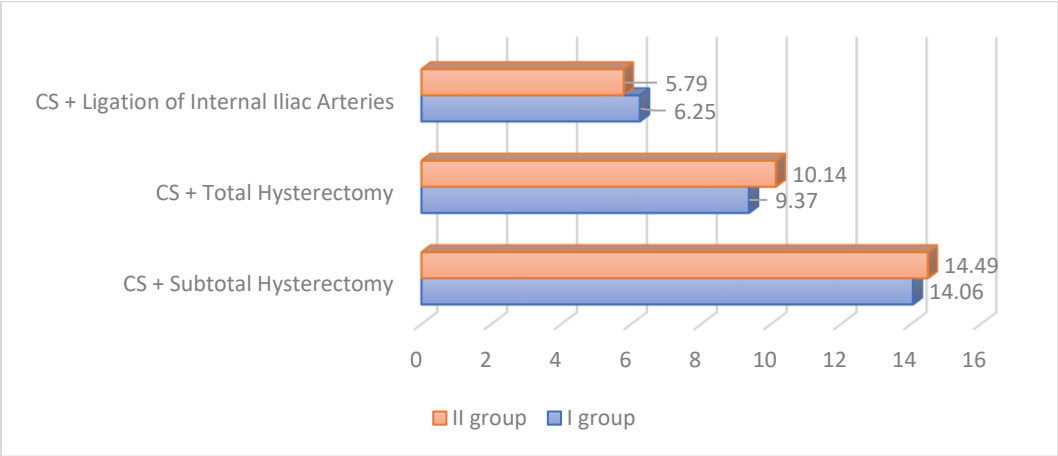

Figure 9: The volume of surgery for emergency obstetric indications in the main group and the comparison group (%)

The figure illustrates the distribution of surgical interventions during cesarean sections, reflecting the proportion of procedures involving internal iliac artery ligation, which accounted for 5.79% in comparative Group II and slightly higher at 6.25% in primary Group I.

The next parameter is total hysterectomy, which was necessary in 9.37% of cases in Group I and 10.14% in Group II. Subtotal hysterectomies were required in 14.06% of cases among patients in Group I and 14.49% in Group II.

These indicators reflect a trend toward choosing radical surgical methods in cases where standard approaches to delivery are associated with increased risks to the life and health of the mother. The results are presented as percentages and emphasize the necessity of an individualized approach to determining the scale of surgical intervention during cesarean sections.

Table 2

Duration of individual stages of the cesarean section operation in the main group and the comparison group (minutes)

Stage of Operation	Group I	Group II
Time of fetal extraction	4.1	8.1

Stage of Operation	Group I	Group II
Uterine suturing	14.8	16.8
Pelvic organ revision	2.7	5.8
Aponeurosis suturing	14.5	14.6
Skin suturing	7.6	7.6

In obstetric practice, emergency cesarean sections are critical interventions aimed at the immediate conclusion of delivery when the life of the mother or fetus is at risk. The duration of each stage of surgical intervention is crucial and must be minimized to optimize outcomes. The analyzed timeframes of cesarean section surgeries proved particularly informative.

The time required for fetal extraction in Group I averaged 4.1 minutes, which is significantly shorter compared to Group II, where this process took 8.1 minutes, with a statistically. This underscores the faster operative speed in Group I at this stage. The uterine suturing stage lasted 14.8 minutes in Group I compared to 16.8 minutes in Group II, showing relatively similar timeframes for both groups. However, pelvic organ revision was faster in Group I, taking 2.7 minutes, as opposed to 5.8 minutes in Group II, with a statistically significant difference. Suturing of the aponeurosis and skin showed minimal differences between the groups, respectively 14.5 minutes versus 14.6 and 7.6 minutes in both. These data indicate that the primary differences in the duration of cesarean sections between the groups are found in the earlier stages of surgical intervention.

Thus, the study highlights key aspects that require attention to optimize the cesarean section process, particularly in reducing the time for fetal extraction and pelvic organ revision, which may contribute to improved overall outcomes and reduced time spent in the operating room. For Joel-Cohen laparotomy, the operation's duration primarily depended on the presence of a postoperative scar. At the same time, the duration of the surgery was significantly shorter in Group I.

One of the most critical stages of the operation is uterine suturing. The longest duration for this stage was observed in Group II, which was 1.1 times longer than in Group I. The duration of this stage was determined not only by the features of uterine suturing techniques but also by the high frequency of additional hemostatic sutures required. In women with previous cesarean section scars in Group II B (44.92%), the total operation duration increased by 7.5±0.21 minutes.

Intraoperative Blood Loss Volume Across Different Abdominal Access Methods During Emergency Cesarean Section

The analysis of intraoperative blood loss volume in emergency obstetric cases revealed a clear dependence on the duration of the surgery and the surgical method used. As shown in Fig. 10, blood loss using lower midline access averaged 900.03 ± 135 ml. The highest blood loss during surgery was observed in Group II B, amounting to 1200 ± 117 ml.

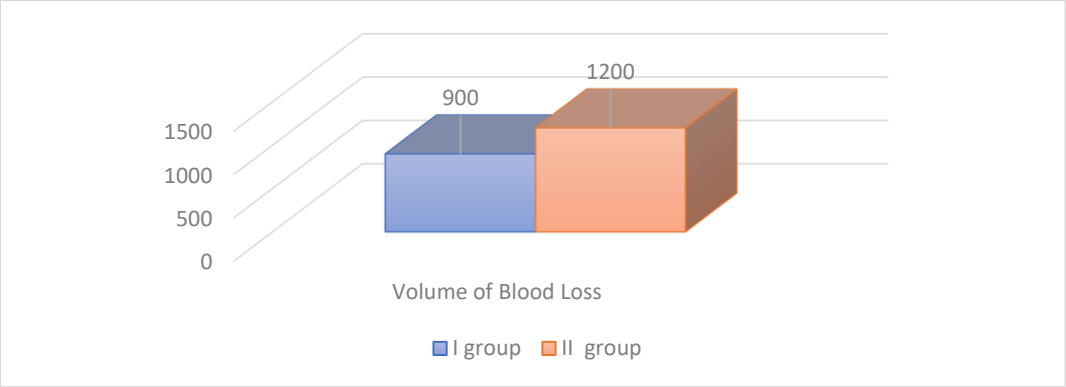

Figure 10: Volume of blood loss during cesarean section in women from the prospective study group (ml)

In lower midline laparotomy, the reduction in blood loss is primarily due to the shorter duration of the surgery, as well as reduced bleeding in the suture area and less need for additional hemostasis.

Table 3

Key blood parameters in women before and after emergency cesarean section

Indicator/Days	Group I (n=120)	Group II (n=138)
Erythrocytes, x10^{12}/L		
Before surgery	3.18±0.44	3.19±0.58
Day 1	3.09±0.54	3.02±0.41
Day 3	3.15±0.62	3.10±0.41
Day 6	3.20±0.41	3.17±0.32
Hemoglobin, g/L		
Before surgery	79.5±9.1	78.3±11.7
Day 1	74.4±10.1	70.2±9.1
Day 3	73.3±13.6	68.1±10.2
Day 6	74.3±9.1	71.2±14.1
Leukocytes, x10^{9}/L		
Before surgery	12.2±1.24	12.2±1.14
Day 1	11.2±1.14	11.6±2.11
Day 3	10.1±0.89	10.6±1.14
Day 6	7.9±0.91	8.8±1.10
ESR, mm/h		
Before surgery	35.3±7.65	35.3±7.65
Day 1	35.0±4.34	35.5±8.61
Day 3	32.3±7.65	32.0±11.91
Day 6	30.5±7.83	29.5±13.12

The analysis of hematological data before the start of surgical intervention shows no statistically significant differences in the average hemogram values between the studied groups. The study presents data on the main hematological parameters of women in two groups - Group I (n=120) and Group II (n=138) - before

and after cesarean section. The analysis includes indicators such as erythrocyte count, hemoglobin level, leukocyte count, and ESR, allowing assessment of the impact of surgery on the hematological status of the patients.

In Group I, the erythrocyte count before surgery was 3.18±0.44, changing sequentially to 3.09±0.54 on the first day after surgery, 3.15±0.62 on the third day, and 3.20±0.41 by the sixth day. In Group II, the indicators were similar, starting at 3.19±0.58 before surgery and changing to 3.02±0.41 on the first day, 3.10±0.41 on the third day, and 3.17±0.32 on the sixth day.

The hemoglobin level in Group I before surgery was 79.5±9.1 g/L, decreasing to 74.4±10.1 g/L on the first day, 73.3±13.6 g/L on the third day, and recovering to 74.3±9.1 g/L on the sixth day. In Group II, the hemoglobin level showed a more noticeable decrease from 78.3±11.7 g/L to 70.2±9.1 g/L on the first day, 68.1±10.2 g/L on the third day, and recovered to 71.2±14.1 g/L on the sixth day, which was statistically significant.

Leukocyte levels in Group I were initially 12.2±1.24 x10^9/L, then decreased to 11.2±1.14 on the first day, 10.1±0.89 on the third day, and 7.9±0.91 on the sixth day. In Group II, the initial level of 12.2±1.14 x10^9/L decreased less steadily: 11.6±2.11 on the first day, 10.6±1.14 on the third day, and 8.8±1.10 on the sixth day, with statistically significant changes.

ESR in both groups started at 35.3±7.65 mm/h and showed a decrease as recovery progressed: in Group I, it was 35.0±4.34 on the first day, 32.3±7.65 on the third day, and 30.5±7.83 on the sixth day. In Group II, the initial ESR slightly increased to 35.5±8.61 on the first day, then decreased to 32.0±11.91 on the third day and 29.5±13.12 on the sixth day.

Table 4

Dynamics of Hemostasis Indicators in Patients with Different Types of Surgical Access Before and After Surgery

Parameter	Group	Preoperative (Mean ± SD)	Postoperative (Mean ± SD)
Prothrombin Time (sec)	I	12.1 ± 1.1	13.4 ± 1.3
	II	12.5 ± 1.2	15.2 ± 1.5
Fibrinogen (g/L)	I	3.8 ± 0.5	3.2 ± 0.6
	II	4.0 ± 0.6	2.9 ± 0.7
D-dimers (ng/mL)	I	470 ± 110	680 ± 150
	II	520 ± 130	950 ± 200
APTT (sec)	I	30.4 ± 2.5	32.5 ± 2.7
	II	30.0 ± 2.9	36.8 ± 3.5
Platelets (10^9/L)	I	210 ± 20	190 ± 25
	II	220 ± 30	170 ± 40
Antithrombin III (%)	I	92.0 ± 4.8	89.5 ± 4.2
	II	220 ± 30	170 ± 40

Table 4 demonstrates the dynamics of changes in hemostasis parameters in two groups of patients depending on the type of surgical access: lower midline laparotomy (Group 1) and transverse laparotomy (Group 2). The obtained data indicate more pronounced coagulation system disorders in Group 2.

In Group 1, a moderate prolongation of prothrombin time was noted, from 12.1 ± 1.1 to 13.4 ± 1.3 seconds, indicating minimal changes in coagulation processes. In Group 2, the prothrombin time increased significantly more, from 12.5 ± 1.2 to 15.2 ± 1.5 seconds, reflecting hypocoagulation development and an increased risk of bleeding.

Fibrinogen levels also decreased in both groups, but the changes were more pronounced in Group 2: from 4.0 ± 0.6 to 2.9 ± 0.7 g/L compared to 3.8 ± 0.5 to 3.2

± 0.6 g/L in Group 1. This fibrinogen reduction confirms insufficient coagulation system activity, particularly pronounced in transverse laparotomy cases.

An increase in D-dimer levels indicates active thrombus breakdown and coagulation imbalance. In Group 1, this indicator rose from 470 ± 110 to 680 ± 150 ng/mL, whereas in Group 2, the increase was more significant — from 520 ± 130 to 950 ± 200 ng/mL. These changes correlate with increased bleeding and the formation of subaponeurotic hematomas.

Activated partial thromboplastin time (APTT) increased in both groups, but the rise was more pronounced in Group 2: from 30.0 ± 2.9 to 36.8 ± 3.5 seconds compared to 30.4 ± 2.5 to 32.5 ± 2.7 seconds in Group 1. APTT prolongation indicates reduced coagulation system activity.

The platelet count in Group 2 also decreased significantly more (from 220 ± 30 to 170 ± 40 × 10^9/L) compared to Group 1 (from 210 ± 20 to 190 ± 25 × 10^9/L), further confirming hypocoagulation. A decrease in antithrombin III levels was also more significant in Group 2, from 91.0 ± 5.3 to 82.0 ± 4.8%, compared to 92.0 ± 4.8 to 89.5 ± 4.2% in Group 1.

Table 5

Values of Leukocyte Intoxication Index (LII) in Women Undergoing Abdominal Delivery

Time Period	Group I	Group II
Before delivery	1.82±0.55	1.78±0.35
3rd day	2.06±0.22	3.12±0.30
6th day	1.32±0.24	1.79±0.14

Leukocyte Intoxication Index (LII), a marker of overall infectious load and inflammation degree, was studied dynamically, showing an initial norm exceedance in 54.5% of Group I patients and 48.0% of Group II patients. A normalization trend of this indicator was noted on the third postoperative day, with levels ranging

between 2.06 and 2.20. By the sixth postoperative day, the LII showed a statistically significant decrease in Group I to 1.32±0.24 compared to 1.79±0.19 in Group II. These data highlight the importance of careful hematological monitoring when evaluating postoperative recovery and can serve as an indicator for adjusting therapeutic strategies.

Urinalysis Results

The analysis of urinalysis results before operative delivery showed moderate leukocyturia (8–15 leukocytes in the field of view) in 13.0% of Group I patients and 12.0% of Group II patients. Cases with the active phase of pyelonephritis were excluded in Group II. In the postoperative period, the proportion of patients with leukocyturia increased to 17.3% in Group I and 32.0% in Group II, regardless of the indications for surgery. Clinically significant dysuric symptoms, accompanied by an increase in the number of leukocytes in urine to 20 or more in the field of view, were observed in 4.3% of cases in Group I and 8.0% in Group II.

Overall, these data confirm the advantages of lower midline laparotomy, making it the preferred surgical access method for emergency cesarean sections, as it minimizes intraoperative blood loss and promotes faster postoperative recovery.

Postoperative Period Features Depending on Laparotomy Access

An analysis of the postoperative period showed that most women in Group II (81.3%) became active 12–14 hours after surgery, with only 18.7% becoming active after 5–6 hours. It should be noted that only a few of these women (14.5%) were able to care not only for themselves but also for their babies. The majority (56%) required narcotic analgesics on the first postoperative day. During the following two days, 90.1% of them took non-narcotic analgesics. Within the first postoperative day, only one-third of the women limited themselves to 1–2 injections of Promedol, while on the second day, only 12 (8.8%) refused all types of anesthesia. Consequently, only one-quarter of the women (28.2%) initiated breastfeeding on the day of surgery, 22% on the first postoperative day, and half (50.5%) on the second day or later.

In Group I, the majority of patients (87.8%) were active 5–6 hours after surgery and, by the next day, were able to care for both themselves and their children. Almost all women who underwent repeat cesarean section reported feeling better after the operation. None of the women required narcotic anesthesia in the postoperative period. Moreover, most of them (93.9%) refused non-narcotic anesthesia by the second day. Accordingly, 30.8% of women initiated breastfeeding within 3–5 hours after surgery, 26.9% on the following day, and only 19.2% on the second or third day.

Table 6

Postoperative Complications Depending on Laparotomy Access (%)

(Insert data for Table 6 here based on the study results.)

Complication	Group I (n=120)		Group II (n=138)	
	n	%	n	%
Uterine subinvolution	25	20.8%	33	23.9%
Lochiometra	25	20.8%	31	22.4%
Endometritis	25	20.8%	32	23.1%
Thrombophlebitis	4	3.3%	5	3.6%
Urinary tract infection	22	18.3%	28	20.2%
Intestinal paresis (within 3 days)	28	23.3%	38	27.5%
Hyperthermia (more than 3 days)	27	22.5%	40	28.9%
Wound seroma	18	15%	30	21.7%
Therapeutic use of antibiotics (%)	43	35.8%	52	37.6%
Subfascial hematoma	2	1.6%	21	15.2%

Depending on the laparotomy approach, postoperative complications varied significantly between the groups. In Group I, consisting of 120 patients, uterine subinvolution was observed in 25 (20.8%) women, whereas in Group II (n=138), this complication was noted in 33 (23.9%) patients. Lochiometra occurred in 25 (20.8%) patients in Group I and 31 (22.4%) in Group II, with significant differences. The frequency of endometritis was also higher in Group II — 32 cases (23.1%) compared to 25 (20.8%) in Group I ($p<0.05$). Urinary tract infections were reported in 22 (18.3%) patients in Group I and 28 (20.2%) in Group II, which was also statistically significant.

Intestinal paresis lasting three days was observed in 28 (23.3%) women in Group I and 38 (27.5%) in Group II, with significant differences. Hyperthermia exceeding three days was recorded in 27 (22.5%) patients in Group I and 40 (28.9%) in Group II. Seroma of the incision was also more common in Group II — 30 cases (21.7%) versus 18 (15%) in Group I.

Antibiotics were required for 43 (35.8%) women in Group I and 52 (37.6%) in Group II. The most significant differences were identified in the frequency of subfascial hematomas: in Group I, such cases accounted for 1.6% (2 women), while in Group II, this indicator was significantly higher — 21 cases (15.2%).

These data demonstrate that with the use of transverse access via the Joel-Cohen method, postoperative complications such as uterine subinvolution, endometritis, intestinal paresis, hyperthermia, and subfascial hematomas occur significantly more often compared to the lower midline longitudinal approach.

The average postoperative hospital stay was 9.1±0.5 days and 12.85±0.7 days in Groups I and II, respectively (Fig. 11).

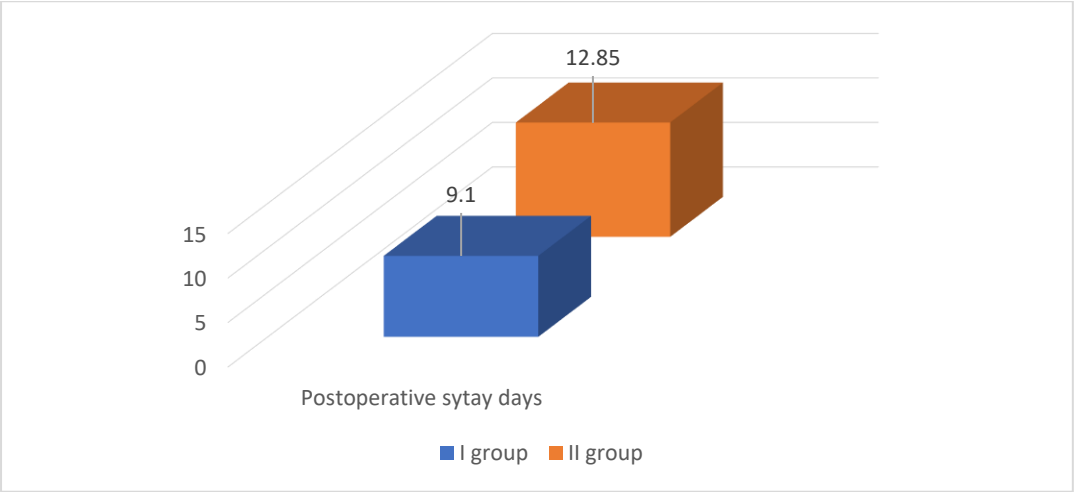

Figure 11: Duration of hospital stay after surgery (bed-day)

Ultrasound examination of the uterus in the postoperative period. Assessment of the postoperative period and monitoring the condition of the uterus in postpartum women from both study groups were conducted using ultrasound examination. The results of postoperative ultrasound hysterometry are presented in Table 5.5.

Table 7

Ultrasound parameters of uterine examination in the postoperative period

Ultrasound Parameters	Group I (n=120)	Group II (n=138)
Hysterometry Measurements		
Length (mm)		
Day 3	129.8 ± 5.2	132.2 ± 4.8
Day 6	119.1 ± 4.4	123.2 ± 3.4
Width (mm)		
Day 3	103.7 ± 5.6	110.56 ± 5.7
Day 6	94.2 ± 4.8	99.7 ± 5.1
Anteroposterior Size (mm)		

Ultrasound Parameters	Group I (n=120)	Group II (n=138)
Day 3	87.7 ± 4.1	98.1 ± 3.7
Day 6	71.4 ± 5.1	72.1 ± 4.2
Edema at the Suture Area on the Uterus (%)		
Day 3	11.59	14.49
Day 6	4.68	5.79
Heterogeneous Myometrial Structure at the Suture with Predominance of Areas of Increased Echogenicity (%)		
Day 3	9.37	14.49
Day 6	4.68	10.14
Uterine Cavity Expansion with Fluid and Blood Clots >1.5 cm (%)		
Day 3	14.06	14.49
Day 6	4.68	5.79
Uterine Cavity Containing Moderate Amount of Anechoic Structures (%)		
Day 3	20.31	20.28
Day 6	12.5	14.49
Small Hematoma under Vesicouterine Fold (<2 cm) (%)		
Day 3	4.68	5.79
Day 6	-	-
Subaponeurotic Hematoma (Clinically Undetectable, Small Size) (%)		
Day 3	-	5.79*

Ultrasound Parameters	Group I (n=120)	Group II (n=138)
Day 6	-	-
Large Subaponeurotic Hematoma (>10 cm) (%)		
Day 3	-	4.34
Day 6	-	2.89
Small Subcutaneous Echonegative Formations (<2 cm) (%)		
Day 3	9.37	8.69
Day 6	4.68	4.34

In Table 7, ultrasound parameters of hysterometry in the postoperative period are presented for women from the two study groups.

According to the table, the uterine length on the 3rd day after surgery was comparable in both groups—129.8±5.2 mm in Group I and 132.2±4.8 mm in Group II. However, by the 6th day, the uterine length remained greater in Group II—123.2±3.4 mm versus 119.1±4.4 mm in Group I.

Uterine width was also greater in the group with transverse access: on the 3rd day—110.56±5.7 mm versus 103.7±5.6 mm in the main group, and on the 6th day—99.7±5.1 mm compared to 94.2±4.8 mm.

The anteroposterior size of the uterus was larger in Group II on the 3rd day (98.1±3.7 mm versus 87.7±4.1 mm); however, by the 6th day, the indicators in both groups leveled out.

Edema and fluid on the fresh wound of the lower uterine segment were observed on the 3rd day in 14.49% of women in Group II, significantly higher compared to the main group (11.59%). However, by the 6th day, the difference was less pronounced.

Heterogeneity in the myometrium structure at the suture site, characterized by areas of increased echogenicity, was observed in 14.49% of patients in Group II on the 3rd day, higher than in the main group (9.37%).

Expansion of the uterine cavity with liquid blood and clots exceeding 1.5 cm occurred equally often in both groups on the 3rd day (14.49% and 14.06%), but by the 6th day, the difference became insignificant.

Differences were also noted in other ultrasound parameters, such as the presence of hematomas under the aponeurosis and in the subcutaneous tissue, with higher rates in Group II.

These findings indicate that transverse access is associated with a higher frequency of complications such as suture edema, myometrial heterogeneity, and hematoma formation.

Repeated Surgical Interventions

Repeat surgical procedures increase the likelihood of dense adhesions between scar tissue, muscles, and the aponeurosis, making separation particularly traumatic. During dissection, damage to blood vessels often occurs, leading to significant bleeding. Successful surgery and reduced complication risks require surgeons to meticulously control hemostatic procedures at each stage.

Additionally, women with uterine scars often experience pronounced changes in muscle layers, requiring extra attention during uterine access. Dense adhesions in the area of a previous scar may complicate access, further increasing the risk of vascular and muscle damage. In such cases, utmost caution and precision are essential to minimize blood loss and prevent damage to adjacent structures.

The incidence of subaponeurotic hematomas in this group was 15.2% (n=21).

Subaponeurotic Hematoma Characteristics

Subaponeurotic hematomas can develop rapidly and grow to significant sizes, sometimes leading to hypovolemic shock, especially when the hematoma extends into the abdominal cavity or Retzius' retroperitoneal space. In most cases, however, the hematoma forms gradually, and the pressure it exerts on open blood vessels often facilitates self-tamponade with blood. The clinical presentation of a hematoma depends on its size and location, with postoperative subaponeurotic hematomas being the most common.

Table 8

Volume of Relaparotomy Procedures in Women with Subaponeurotic Hematoma in the Postoperative Period

Type of Surgery	Abs.	%
Relaparotomy, removal of hematoma, ligation of a. epigastrica profundus inferior	3	2.17%
Relaparotomy, removal of hematoma	4	2.8%
Relaparotomy, removal of hematoma, total hysterectomy	2	1.4%
Total	**9**	**6.5%**

In 12 cases, patients underwent conservative treatment involving hemostatic therapy (tranexamic acid 10 ml + 250 ml sodium chloride intravenously, 2 times/day) with mandatory daily ultrasound monitoring of hematoma size. To diagnose the size and location of the hematoma, some patients in the retrospective group underwent CT and ultrasound examinations.

In Group II (n=138), women with subaponeurotic hematomas in the postoperative period underwent varying degrees of re-laparotomy. Re-laparotomy with hematoma removal and ligation of the inferior epigastric artery (a. epigastrica profunda inferior) was performed in 3 patients, accounting for 2.17%. In 4 cases (2.8%), re-laparotomy was performed with hematoma removal only. In 2 cases (1.4%), re-laparotomy was required with hematoma removal and total hysterectomy. Overall, re-laparotomy was performed in 9 patients, representing 6.5% of the total group.

These data emphasize the importance of timely identification and appropriate treatment of postoperative complications such as subaponeurotic hematoma to prevent serious consequences, including the need for hysterectomy.

The following surgical steps were performed to address the hematoma:

Figure 12: Subaponeurotic hematoma of the anterior abdominal wall. DIC syndrome. ARF in the anuric stage.

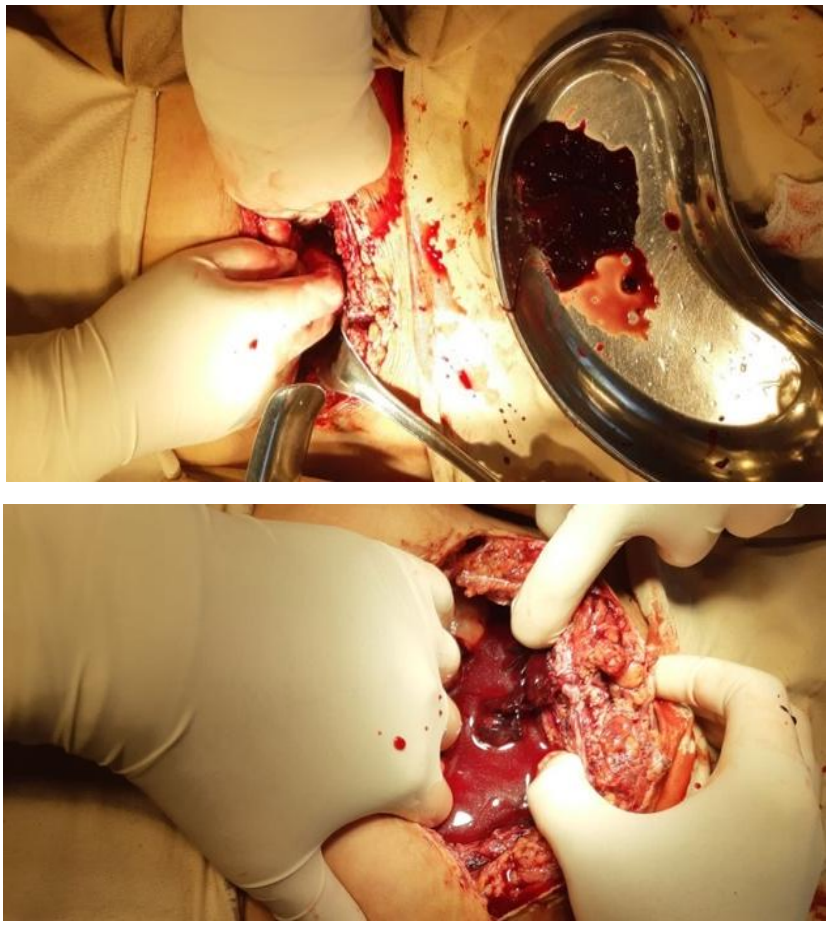

Figure 13: Evacuation of hematoma contents.

1. Stage: Revision of abdominal and pelvic organs.

2. Stage: Sanitation of the abdominal cavity.
3. Stage: Control hemostasis and drainage of the pelvic cavity.

In 4 cases, considering the size of the hematomas and their spread into the vaginal muscles of the anterior abdominal wall, the transverse incision was supplemented with a longitudinal one for thorough hemostasis and removal of residual hematoma.

Figure 14: Subaponeurotic hematoma of the anterior abdominal wall muscles, disseminated intravascular coagulation (DIC) syndrome in the hypocoagulation stage, and acute renal failure (ARF) in the anuria stage.

Case Study No. 1

Patient: K. S., 28 years old, 2020. Second pregnancy, desired. History: one prior cesarean section due to severe preeclampsia. **Admission Diagnosis**: 37 weeks of pregnancy, second delivery, uterine scar after cesarean section, eclampsia, moderate anemia. **Procedure**: Joel-Cohen laparotomy, cesarean section in the lower uterine segment, pelvic drainage. **Neonatal Outcome**: Male infant, Apgar score 3-4.

Postoperative Course:

- **Day 2**: Hemoglobin 78 g/L, leukocytes 12.3 × 10⁹/L, ESR 34 mm/h, ultrasound: hematometra.
- **Day 6**: Complaints of swelling and pain in the wound area; bluish discoloration and edema noted.
  - **Clinical Parameters**: Hemoglobin 58 g/L, leukocytes 10.3 × 10⁹/L, ESR 36 mm/h, ultrasound: subaponeurotic hematoma.
  - **Diagnosis**: Subaponeurotic hematoma, DIC syndrome (hypocoagulation), acute renal failure (oliguria).
  - **Blood Loss**: Before reopening abdominal cavity - 700 mL, after reopening - 800 mL.

Surgery: Relaparotomy, hematoma evacuation, ligation of the inferior epigastric artery, total hysterectomy, internal iliac artery ligation. **Outcome**: On the 7th day, the patient was transferred for dialysis.

Case Study No. 2

Patient: M. Z., 30 years old, 2021. **Admission Diagnosis**: 37 weeks of pregnancy, fourth delivery, three uterine scars after cesarean sections, placenta previa, severe anemia. **Procedure**: Joel-Cohen laparotomy, cesarean section in the lower uterine segment, total hysterectomy, pelvic drainage. **Neonatal Outcome**: Male infant, Apgar score 5-6.

Postoperative Course:

- **Day 2**: Hemoglobin 58 g/L, leukocytes 9.3 × 10⁹/L, ESR 28 mm/h, ultrasound: postoperative state after hysterectomy.
- **Day 8**: Complaints of swelling and pain in the postoperative wound area; bluish discoloration and edema noted.
  - **Clinical Parameters**: Hemoglobin 52 g/L, leukocytes 15.3 × 10⁹/L, ESR 36 mm/h, ultrasound: subaponeurotic hematoma.
  - **Diagnosis**: Subaponeurotic hematoma, DIC syndrome (hypocoagulation), acute renal failure (oliguria).
  - **Blood Loss**: Before reopening abdominal cavity - 750 mL, after reopening - 900 mL.

Surgery: Relaparotomy, hematoma evacuation, ligation of the inferior epigastric artery, internal iliac artery ligation, pelvic drainage. **Outcome**: On the 10th day, the patient was transferred for dialysis due to anuria.

Analysis of Postoperative Outcomes

Postoperative outcomes of emergency cesarean sections indicate the advantages of lower midline laparotomy. This surgical approach is associated with faster uterine involution and fewer postoperative complications, such as subfascial hematomas, and promotes quicker rehabilitation and recovery for patients.

Conclusion: Lower midline laparotomy can be considered an optimal choice for reducing the frequency and severity of complications during emergency deliveries.

Perinatal Outcomes in Examined Groups

Table 9

Perinatal outcomes in groups following emergency cesarean section.

Indicator	**Group I**	**Group II**
Apgar score (1 minute)	7.5 ± 1.2	6.0 ± 1.4
Apgar score (5 minutes)	8.5 ± 1.0	7.2 ± 1.3
Hospitalization in intensive care unit (%)	22% (n = 21)	54% (n = 60)
Neonatal mortality (%)	2.0% (n = 3)	10.0% (n = 15)

Indicator	Group I	Group II
Frequency of respiratory disorders (%)	14% (n = 17)	20% (n = 25)
Cerebrovascular disorders (%)	6% (n = 7)	12% (n = 15)
Need for resuscitation measures (%)	10% (n = 12)	32% (n = 35)

The Apgar scores at 1 and 5 minutes were significantly higher in Group I (7.5 ± 1.2 and 8.5 ± 1.0, respectively) compared to Group II (6.0 ± 1.4 and 7.2 ± 1.3). Hospitalization of newborns in the intensive care unit was required in 54% of cases in Group II, significantly exceeding the rate in Group I (22%). Neonatal mortality was higher in Group II (10.0% vs. 2.0%), as was the need for resuscitation measures (32% vs. 10%). The frequency of respiratory disorders in Group I was 14%, whereas in Group II this indicator reached 20%. Cerebral circulation disorders were more frequently observed in Group II (12% vs. 6%), although the differences did not reach statistical significance. These data confirm the advantages of lower midline laparotomy in improving neonatal outcomes and reducing the frequency of severe perinatal complications.

Effectiveness of Cesarean Section Operations Depending on Surgical Access in Emergency Situations

This subsection examines the effectiveness of cesarean sections performed in emergency situations using a three-point evaluation scale. The evaluation is based on clinical outcomes categorized into good, satisfactory, and unsatisfactory results, allowing an objective comparison of the effectiveness of various surgical access methods. The presented data provide insight into the frequency of complications and the need for additional measures to optimize surgical intervention and postoperative care.

Table 9

Effectiveness of Cesarean Sections Depending on Surgical Access in Emergency Situations

Groups	Good Results	Satisfactory	Unsatisfactory	Total
Group I	107 (89.1%)	11 (9.3%)	2 (1.6%)	120 (100%)
Group II	91 (65.9%)	26 (18.8%)	21 (15.2%)	138 (100%)
Total	198 (76.7%)	37 (14.3%)	23 (8.9%)	258 (100%)

Effectiveness of Cesarean Sections Depending on the Surgical Approach in Emergency Situations

The effectiveness of cesarean sections in emergency situations was assessed using a three-point system, allowing for a more comprehensive understanding of how the choice of surgical approach impacts treatment outcomes.

In Group I, which included 120 patients, 89.1% (107 patients) achieved good outcomes, 9.3% (11 patients) had satisfactory outcomes, and only 1.6% (2 patients) experienced unsatisfactory outcomes. These results indicate a high level of effectiveness for this approach.

In Group II, which consisted of 138 women, good outcomes were observed in 65.9% (91 patients), significantly lower compared to Group I. Satisfactory outcomes were recorded in 18.8% (26 patients), while unsatisfactory outcomes occurred in 15.2% (21 patients), reflecting a higher frequency of complications.

Overall, out of 258 patients, good outcomes were achieved in 76.7% (198 patients), satisfactory outcomes in 14.3% (37 patients), and unsatisfactory outcomes in 8.9% (23 patients).

These data demonstrate that the choice of surgical approach significantly impacts the outcomes of emergency cesarean sections. The higher percentage of good outcomes in Group I highlights the potential advantages of this method, particularly in urgent obstetric situations where the quality and speed of surgical intervention are critical to achieving successful outcomes.

The analysis of the collected data enabled the development of an evaluation scale designed to predict the risk of postoperative complications during emergency cesarean sections (Table 5.9). An important aspect of this model is the inclusion of

the surgical approach parameter, which has clinical significance in determining the surgical strategy.

4.3. § Discussion of the Data Obtained

Over recent decades, there has been a significant increase in the number of cesarean sections (CS) performed worldwide, raising concerns about the growing number of complications in both the immediate and long-term postpartum periods. According to the World Health Organization, the average rate of abdominal deliveries in developed countries exceeds 25% of all births, far surpassing the recommended rate of 15%. It should also be noted that spontaneous vaginal births in women with uterine scars after CS reduce the risk of postoperative complications, perinatal mortality, and morbidity while preserving reproductive health. Nevertheless, the rate of planned repeat cesarean sections among women who prefer this mode of delivery remains high.

Strategies for choosing a delivery method vary significantly, ranging from a selective approach to evaluating uterine scar integrity during labor. Conflicting data exist regarding short- and long-term complications and the potential benefits of various delivery methods for maternal and neonatal health. Risks associated with repeat cesarean sections include uterine rupture, intraoperative complications, and an increased likelihood of perinatal and neonatal mortality. Repeat cesarean sections are also associated with a higher risk of maternal mortality (OR=3.1), postpartum infectious complications (OR=2.8), and hemorrhages (OR=0.5). There is a high likelihood of bladder or intestinal injury, deep vein thrombosis, and adhesion formation, though the risk of adverse outcomes for women with low perinatal risk is significantly lower.

Emergency cesarean sections often require blood transfusions and can lead to postpartum septic complications and surgical injuries. Other possible complications after cesarean section include abscess formation, wound infections, dehiscence of sutures, uterine rupture, and pelvic vein thrombophlebitis.

Moreover, women with scars from previous cesarean sections have an increased risk of uterine scar pregnancies or placenta accreta. The danger of hypoxic brain damage in newborns due to uterine scar rupture during spontaneous labor is one reason many women choose repeat abdominal deliveries.

Improvement of surgical methods, anesthesia, and postoperative rehabilitation in recent years has led to a significant reduction in maternal mortality and morbidity rates following cesarean sections (CS). Advances in neonatal services and the development of intensive care have also positively impacted newborn survival rates. Studies indicate that improving surgical techniques, including the use of lower midline laparotomy, can reduce hospitalization time by up to 1.5 days due to decreased invasiveness and accelerated recovery. Comprehensive measures, including early catheter removal and antibiotic prophylaxis, have proven effective in reducing postoperative complications. Ultrasonography (US) has also demonstrated its reliability as a diagnostic method for identifying postoperative complications associated with suboptimal surgical access.

The benefits of the Joel-Cohen laparotomy in emergency obstetric situations remain questionable. Studies do not confirm that this method significantly reduces the risk of postoperative hemorrhage, nor do they provide convincing evidence of its advantages over alternative approaches. It is important to note that the choice of surgical access method may be associated with the risk of hemorrhage, as supported by correlation studies.

The increase in the number of cesarean sections may be attributed to various factors, including clinical decision-making by physicians and a growing trend toward legal risk aversion. However, this rise poses significant challenges. Cesarean sections are associated with a higher risk of maternal complications compared to vaginal deliveries, such as infections, prolonged recovery, hemorrhage, and potential neonatal complications. Additionally, they place a burden on healthcare systems due to extended hospital stays and the need for additional resources.

These concerns underscore the importance of developing strategies to manage and optimize indications for cesarean sections, including improving obstetric care and supporting vaginal deliveries when clinically justified.

The study was implemented in several stages, including an analytical review and clinical observations, which allowed for extrapolation of the results to the selected sample. A comparative analysis of various surgical techniques was conducted.

During the analytical stage, a comparative analysis of indications for cesarean sections and postoperative complications was carried out among women (n=258) who underwent deliveries between 2019 and 2023. The study identified potential opportunities for enhancing cesarean section safety, including improved monitoring of high-risk pregnancies and revising management strategies for preeclampsia.

Perinatal outcomes analysis revealed that in the longitudinal access group (n=120), neonatal survival rates were 86.84%, significantly higher than in the transverse access group (Group II, n=138), where this rate was 74.88%. These data suggest that longitudinal access may provide more favorable conditions for surgical intervention, resulting in better clinical outcomes for newborns.

Additionally, the longitudinal access group recorded fewer cases of antenatal fetal death: 6.57% versus 11.01% (n=50) in the transverse access group. Postnatal mortality was also lower: 6.57% compared to 14.09%. These findings support the hypothesis that longitudinal access may reduce the risk of fetal compression during surgery, minimizing the likelihood of hypoxic episodes, which is critical for preventing antenatal fetal death and postnatal mortality.

Postoperative complications were also analyzed based on the type of surgical access. Uterine subinvolution was significantly less common in the longitudinal access group (18.42%) compared to the transverse group (26.43%). A similar trend was observed in cases of hyperthermia lasting more than three days (18.42% versus 28.85%), which may indicate lower trauma and invasiveness of longitudinal access, contributing to faster recovery after surgery.

Subfascial hematoma, a notable postoperative complication, was significantly more frequent in the transverse group (10.13%) compared to the longitudinal group (1.31%). This may reflect greater tissue trauma with transverse access, increasing the risk of postoperative hemorrhage and necessitating more intensive postoperative monitoring and potential corrective measures.

The study confirms that longitudinal access in emergency cesarean sections offers significant advantages in improving perinatal outcomes and reducing postoperative complications, including a substantial decrease in the risk of subfascial hematomas. This underscores the need for a more in-depth analysis and potential revision of clinical guidelines for choosing surgical access methods in emergency situations. The results of this study may improve obstetric care practices, particularly when planning surgeries for patients at high risk of perinatal complications.

According to the data presented, Group I showed a decrease in red blood cell count after surgery from 3.18 to 3.20 x10^12/L and hemoglobin levels from 79.5 to 72.3 g/L, characteristic of blood loss during cesarean section. In Group II, these parameters also decreased, but hemoglobin levels dropped more significantly—from 78.3 to 72.2 g/L—indicating greater blood loss with transverse access.

The total leukocyte count decreased in both groups by the sixth day postoperatively, suggesting a reduced inflammatory response. The erythrocyte sedimentation rate (ESR) decreased in both groups without significant differences, indicating comparable inflammatory effects of the surgical interventions.

When analyzing postoperative complications, uterine subinvolution, characterized by delayed involution processes, was more common in Group II (18.84%) compared to Group I (15.62%), suggesting more effective recovery with lower midline laparotomy. Complications such as lochiometra, endometritis, and urinary tract infections were also higher in Group II, highlighting the advantages of Group I. Thrombophlebitis of the lower limbs occurred with approximately equal frequency in both groups, whereas intestinal paresis was significantly more common in Group II (17.39% versus 14.06%).

Ultrasound hysterometry parameters in the postoperative period also reflected better recovery in Group I. Faster reduction in uterine size was observed, indicating quicker involution in Group I. Additionally, there were fewer subfascial hematomas in Group I compared to Group II (4.34%), suggesting a lower risk of postoperative inflammatory processes and improved overall postoperative outcomes.

In the prospective sample, the frequency of postoperative complications decreased 2.5 times, which is significantly lower compared to the high levels of general postpartum morbidity (16.5–17.0%) [89; pp. 1366–1376, 153; pp. 571–583]. This reduction in infectious-inflammatory complications, including a twofold decrease in postpartum endometritis, can be attributed to improved therapeutic and organizational strategies. Special attention should be given to purulent-septic complications often associated with infectious factors. However, iatrogenic aspects related to laparotomy techniques, which may influence the occurrence of complications, should also be considered. Key surgical technique factors affecting postoperative complications include inadequate selection of surgical access and frequent damage to the anterior abdominal wall muscles, insufficient restoration of which may lead to various complications.

Reducing postoperative complications requires careful selection of optimal surgical access, meticulous tissue dissection, thorough hemostasis, and precise suturing of the inferior epigastric artery in cases of muscle avulsion.

During the postoperative period, all patients exhibited typical hematological changes, including a leftward shift in the leukocyte formula (neutrophilia), an increase in ESR, and a decrease in mean values of key red blood components, such as red blood cell count and hemoglobin levels. These changes reflect the body's normal response to surgical intervention and underscore the need for careful postoperative monitoring.

The analysis of postoperative complications revealed that the frequency of hematoma formation was twice as high in the group of patients undergoing Joel-Cohen laparotomy compared to other surgical methods. This indicates potential risks associated with this technique and emphasizes the importance of selecting the

surgical approach. Furthermore, the incidence of endometritis was comparable across the groups, suggesting its relatively minor impact on reparative processes, provided adequate anti-inflammatory therapy is administered. This highlights the importance of a comprehensive approach to managing the postoperative period, including optimizing anti-inflammatory treatment to minimize complications and accelerate recovery.

CHAPTER V. RECOMMENDATIONS AND CONCLUSIONS

5.1. § Algorithm for Choosing Surgical Access

Risk Assessment for Emergency Cesarean Section

During the study, an in-depth analysis of delivery histories was conducted for patients who underwent emergency cesarean sections for various indications. Based on the collected clinical data and the results of a comparative analysis of surgical interventions in groups with different types of complications, a comprehensive risk assessment scale was developed (Table 11).

Table 11

Risk Assessment for Intra- and Postoperative Complications in Emergency Cesarean Section

Evaluated Factor	Presence of Factor	Points
Eclampsia, severe preeclampsia unresponsive to medical therapy, threatening or completed uterine rupture	Yes	12
	No	-1
Premature placental abruption	Yes	9
	No	0
Placenta previa	Yes	8
	No	0
Pathological changes in the thrombocytic and/or coagulopathic components of the hemostasis system	Yes	6
	No	0
Repeated surgical interventions on pelvic organs	Yes	6
	No	-1
Anemia of grades II-III	Yes	6

	No	0
Abnormal labor activity	Yes	5
	No	-3
Absence or minimal weight gain during pregnancy	Yes	4
	No	-1

Its purpose is to help the obstetrician-gynecologist quickly and objectively identify patients at the highest risk of adverse outcomes and take adequate measures to reduce the likelihood of complications.

Principles of Scale Development

1. **Minimum Necessary Factors**

To create a practically applicable tool, the table includes only those parameters that, based on statistical calculations, demonstrated the highest prognostic significance. These include severe forms of preeclampsia, uterine rupture/threat, placenta previa or abruption, coagulopathy, anemia, medical history features (multiple surgeries, varicose veins, lipid metabolism disorders), as well as the patient's age and weight gain characteristics during pregnancy.

2. **Scoring System and Relative Risk (RR)**

Each factor is assigned a specific score. Positive scores (+) indicate the presence of an unfavorable factor and an increased risk of complications. Negative scores (-) may be assigned if the factor is absent or exerts a protective effect (e.g., the absence of a specific pathology). Additionally, each factor has a calculated relative risk (RR). The higher the RR, the more significant the influence of the parameter on the frequency of intra- and postoperative complications.

3. **Classification by Total Score**

- Total score of +13 or higher: high risk of complications.
- Total score between -13 and +13: moderate risk.
- Total score of -13 or less: low risk.

This classification simplifies evaluation and allows the physician to quickly understand the expected number of complications in a

particular case. The more unfavorable factors present, the more thoroughly the surgical team should be prepared, the more active the management strategy (including the choice of surgical access), and the stricter the postoperative monitoring.

Practical Significance of Table 10

1. **Individualized Management**

The scoring system allows for a personalized approach to each patient. The physician does not just list indications for emergency cesarean section but calculates a total score. If the score is significantly positive (severe preeclampsia, bleeding, multiple surgeries), the patient is automatically categorized as high risk. This makes it possible to anticipate enhanced measures for hemostasis, involve additional specialists (anesthesiologist, hematologist), and plan for potential radical interventions (hysterectomy, etc.).

2. **Choice of Surgical Access**

The "choice of surgical access" parameter is included in this model as part of the tactical decision. In emergencies with high scores, physicians often prefer longitudinal (midline) laparotomy, as it provides faster access to the uterus and better visualization of the abdominal organs in cases of massive bleeding. When the total risk is assessed as moderate or low, transverse access can be considered, provided it aligns with the clinical situation.

3. **Planning Resuscitation Measures**

In cases with a high total score, the obstetric team can preemptively reserve blood components, prepare transfusion solutions, establish continuous hemodynamic monitoring, ensure access for massive infusions, and plan corrective actions in case of sudden deterioration in the condition of the mother or fetus.

Reliability and Accuracy of the Evaluation Model

To assess the effectiveness of the developed tool, indicators such as sensitivity (Se) and specificity (Sp) were calculated. High sensitivity means that the test effectively "captures" the presence of complications, minimizing false negatives

(where a risk factor exists but the scale does not detect it). Specificity reflects how accurately the model identifies the absence of complications in patients with a genuinely low risk, thereby reducing false-positive results.

Sensitivity (Se): Determined using the formula Se = (Ps / S) × 100%, where Ps is the number of true positive results (patients identified as high-risk for complications, and complications actually occur), and S is the total number of patients examined. The closer the sensitivity value is to 100%, the more reliably the method detects complications.

Specificity (Sp): Calculated as (NH / S) × 100%, where NH is the number of true negative results (cases where the model predicts low or moderate risk, and complications do not occur), and S is the total number of patients examined. High specificity ensures that patients are not unnecessarily labeled as "high-risk" or subjected to aggressive preventive measures.

The cumulative analysis demonstrated that the sensitivity and specificity of the developed scale are at a sufficiently high level, allowing its confident inclusion in the clinical toolkit for planning emergency abdominal deliveries.

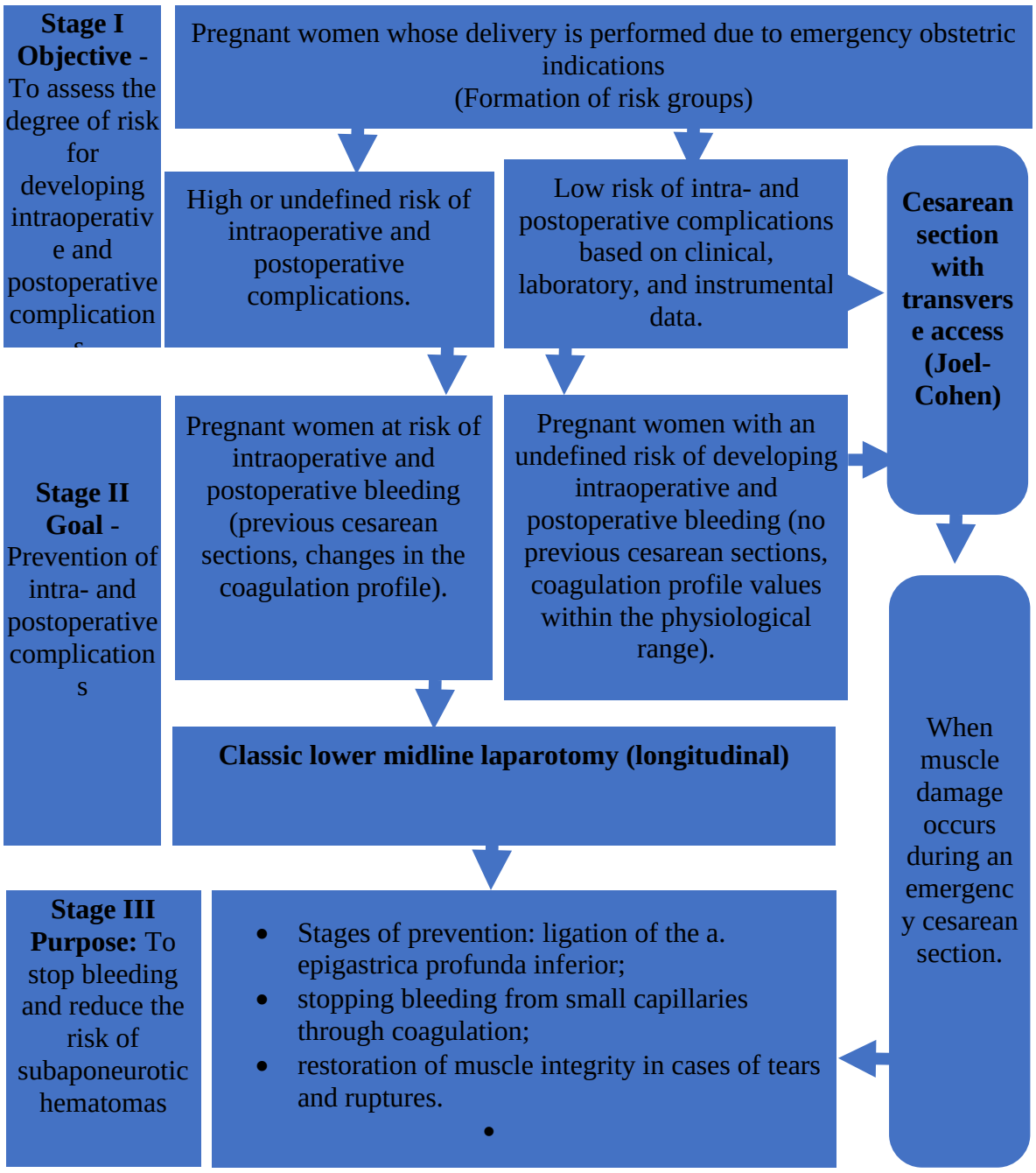

Figure 15: Algorithm for choosing the surgical approach in emergency obstetric situations

In addition to the developed table, a step-by-step algorithm (Figure 13) was created based on statistical analysis of the study materials to simplify decision-making in emergency obstetric situations. This algorithm involves a sequential assessment of all adverse factors: blood loss volume, hemostasis condition, patient history (presence of uterine scars or previous surgeries), and current monitoring data (CTG, ultrasound signs of uterine rupture or progressing placental abruption).

1. **Step 1:** Assess the clinical condition of the mother and fetus using the risk scale (Table 10). If the total score falls into the high-risk range, the team immediately prepares for the most "aggressive" approach (longitudinal incision, advanced hemostasis, reserving blood products).
2. **Step 2:** Clarify the volume and progression rate of blood loss. In cases of massive bleeding (arterial hypotension, tachycardia, hemoglobin drop, DIC syndrome), surgeons often choose longitudinal access, which allows for rapid opening of the abdominal cavity and bleeding control.
3. **Step 3:** Consider anatomical and physiological features. If there is no uterine scar in the history and the situation is not critically dangerous (though requiring urgent intervention), a transverse incision may be used. However, in case of uncertainty or insufficient preparedness of the surgical team (where extra steps increase time), a vertical approach is still preferred.
4. **Step 4:** Integrate input from the anesthesiologist and neonatologist. Sometimes the choice of access correlates with the anticipated need for broader abdominal cavity revision (e.g., suspected combined pathology), fetal condition, or severe maternal comorbidities (cardiac or respiratory issues). These factors are recorded in the algorithm, allowing for immediate plan adjustments.

Applying this algorithm not only ensures adherence to a clear logic but also systematically accounts for multiple factor groups (obstetric, hemostatic, anesthetic, and surgical), reducing the likelihood of subjective errors. In time-critical decision-making scenarios, the algorithmic approach enhances safety and improves outcomes for both mother and child.

Conclusions on the Developed Model

The risk assessment tool, supplemented by the surgical approach selection algorithm, provides several key advantages:

1. **Enhanced Prognostication:** Physicians can anticipate complications and make informed decisions on anesthesia methods, involving additional

specialists (hematologist, surgeon), and postoperative management (frequent hemodynamic monitoring, infection prevention).

2. **Personalization:** The scale and algorithm allow for individualized care—if a patient has multiple adverse factors, the team can choose the optimal approach and prepare blood transfusion resources, broad-spectrum antibiotics, and additional intensive care equipment in advance.
3. **Time Optimization:** The clear algorithm (Figure 13) eliminates delays caused by discussions or doubts, establishing a unified action plan understood by all team members. This is especially relevant in emergency deliveries where delays can have serious consequences.
4. **Systematic and Reproducible Approach:** Implementing this model in daily practice ensures comparability of results across different facilities and regions. It enables tracking complication dynamics and identifying factors that critically increase scores and require additional preventive measures.

Thus, the risk table (Table 10), which reflects the cumulative influence of key obstetric, surgical, and somatic parameters, combined with the surgical approach selection algorithm (Figure 13), forms a comprehensive decision-making system for emergency cesarean sections. This approach ensures rational resource utilization, reduces intra- and postoperative complications, and enhances the safety and quality of obstetric care.

5.2. § Practical Recommendations for Prevention and Management of Complications

Ensuring patient safety during cesarean sections and reducing the incidence of complications depends on various factors, starting from preoperative assessment to follow-up in the long term. One critical aspect is the correct choice of surgical access, which directly impacts the risk of subaponeurotic hematoma formation and its associated consequences. Below are the main preventive measures and tactical approaches aimed at reducing the likelihood of intraoperative and postoperative

complications, including hematomas and muscle tears requiring hemostasis and suturing.

The Importance of Access Choice in Reducing Subaponeurotic Hematoma Risk

Accurate assessment of the clinical situation and the cumulative risk of complications (using evaluation scales or the overall clinical picture) allows for determining the safest method for abdominal entry during a cesarean section. In emergencies, physicians often prefer a longitudinal incision for the fastest access and comprehensive organ revision. However, vertical incisions increase the likelihood of trauma to the muscles and vessels of the anterior abdominal wall (particularly branches of the inferior epigastric artery), which, if hemostasis is insufficient, can lead to subaponeurotic hematoma formation.

Choosing a transverse (suprapubic) incision in planned and some moderately urgent cases helps reduce the risk of hematoma since muscular structures are less likely to be crossed. Nevertheless, vessel damage is still possible with suprapubic incisions (especially in cases of atypical vascular positioning).

Preoperative Preparation and Prevention

1. **Evaluation of the Coagulation System.**
   Before a cesarean section, it is essential to identify and correct platelet and coagulation disorders (coagulogram analysis, platelet and fibrinogen levels, and aggregation function tests). Any hidden coagulopathy during surgery can significantly increase the risk of bleeding and hematoma formation.
2. **Clarification of Anatomical Features.**
   If there is suspicion of scars or adhesions in the lower anterior abdominal wall or significant changes in the vascular network (e.g., in varicose veins), it is advisable to plan in advance which areas pose a higher risk of bleeding.
3. **Timely Hemostasis.**
   For patients with comorbidities (e.g., severe preeclampsia, cardiovascular pathologies), a consensus among the anesthesiologist, obstetrician-

gynecologist, and, if necessary, a hematologist helps determine the optimal approach to surgery and blood loss prevention.

Intraoperative Techniques for Reducing Hematoma Risk

1. **Minimal Tissue Trauma.**
   When making an incision, care should be taken to minimize damage to vessels and muscle fibers. Tissues in potentially risky areas should be gently separated or dissected bluntly. If muscle tears occur, hemostasis via coagulation of the tear site is often sufficient to prevent bleeding.
2. **Management of Muscle Tears.**
   If a muscle fiber tear occurs during surgery and deeper vascular damage is detected, coagulation alone may not suffice. In such cases, coagulation and subsequent ligation of the inferior epigastric artery (a. epigastrica profunda inferior) are recommended. This step reliably stops bleeding and prevents the formation of large subaponeurotic hematomas.
3. **Suturing in Muscle Detachments.**
   When part of a muscle detaches from its attachment site during the procedure, in addition to ligating the inferior epigastric artery, muscle suturing is performed to restore its integrity. This technique minimizes the cavity where blood could accumulate and improves the patient's postoperative recovery.

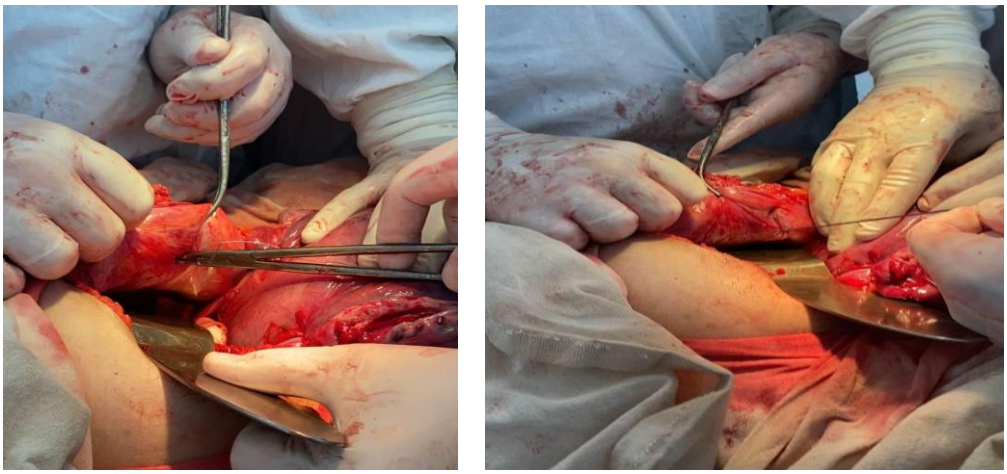

Figure 16: Ligation of the a. epigastrica profundus inferior during a rupture of the muscular tissue of the anterior abdominal wall.

Layer-by-layer suturing and sealing of the aponeurosis. Reliable sutures on the aponeurosis reduce the risk of blood penetration into the subaponeurotic space. The use of modern suture materials (mono- or polyfilament threads) and a well-thought-out technique of knot or continuous sutures, combined with coagulation of small vessels, significantly lowers the likelihood of hematomas.

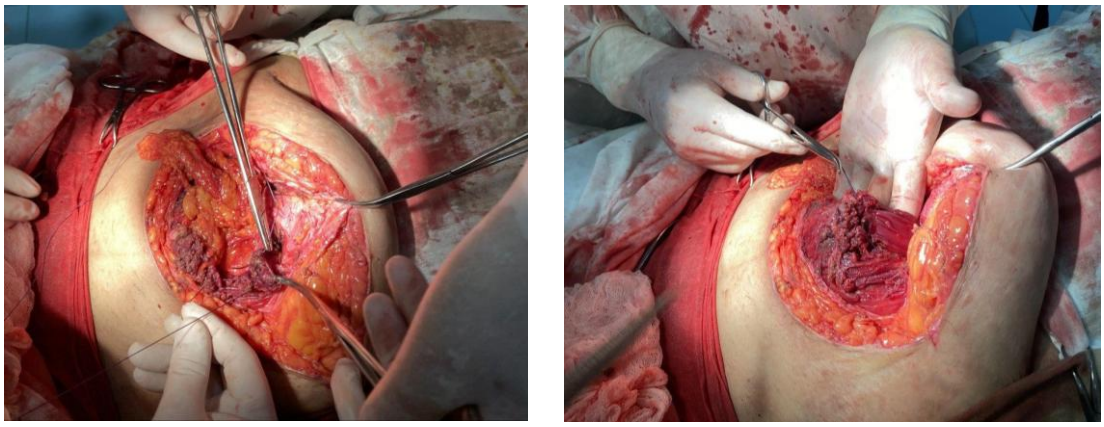

Figure 18: Suturing of muscles to restore their anatomical continuity after detachment

Postoperative Management: Early Diagnosis and Treatment of Hematomas

- **Regular Examination and Palpation of the Suture Area.** During the first day after a cesarean section, frequent examinations of the anterior abdominal wall are recommended to detect painful indurations or signs of fluctuation (fluid accumulation). If such symptoms are found, an ultrasound of the soft tissues is performed to confirm or exclude the presence of a subaponeurotic hematoma.
- **Puncture and Drainage.** If diagnostics reveal a hematoma in the anterior abdominal wall, small blood accumulations may sometimes be removed through puncture and aspiration. For larger hematomas, ongoing or recurring bleeding may require a revision of the wound, removal of clots, and placement of a drain to ensure the outflow of fluid and blood.
- **Antibacterial Therapy.** Blood accumulation provides a favorable environment for bacterial growth and abscess formation. To prevent hematoma infection, it is crucial to continue or adjust antibiotic prophylaxis promptly, taking

into account risk factors (including bacteriological analysis of the hematoma's contents if drained).

- **Monitoring Hemoglobin and Coagulation System.** Any significant blood loss, even with a relatively small hematoma, can lead to hemoglobin reduction and a decrease in platelet levels. In such cases, the obstetrician-gynecologist collaborates with a hematologist to select blood replacement solutions, iron supplements, or adjust doses of LMWH (low-molecular-weight heparins) or anticoagulants if previously administered.

Additional Organizational Measures

- **Enhancing Staff Skills.** Regular training in soft tissue suturing and hemostasis reduces the incidence of errors leading to hematoma formation. Surgical teams should practice skills for quickly identifying and coagulating bleeding sources, ligating the inferior epigastric artery, and suturing muscle tears.
- **Algorithm Implementation.** Some clinics have developed protocols for "bleeding control in muscle and vessel injuries of the anterior abdominal wall," covering cases of tears, ruptures, and muscle detachments. Such algorithms ensure coordinated actions upon detecting defects.
- **Patient Education.** If the hematoma risk is assessed as high (e.g., obesity, coagulation disorders, repeated surgeries), the patient is informed in advance about potential complications (sharp pain, induration, swelling) and the importance of early medical consultation if such symptoms occur.

A rational choice of surgical access for cesarean section and meticulously executed hemostasis technique are two key factors in minimizing the likelihood of subaponeurotic hematomas. It is essential to consider not only obstetric indications and the woman's general condition but also to carefully evaluate potential risk areas: muscles prone to tears, vessels (particularly the inferior epigastric artery) requiring ligation in case of rupture. Intraoperative bleeding control through coagulation and timely ligation of major vessels, as well as suturing muscle tears, help prevent hematoma formation.

Even if a postoperative hematoma forms, its early detection, puncture or drainage, proper antibacterial support, and dynamic monitoring of the coagulation system can prevent more severe complications, including infections and massive blood loss. Ultimately, coordinated teamwork among physicians, adherence to aseptic principles, proper incision and suturing techniques, and an individualized approach to each patient ensure high safety and effectiveness in cesarean sections, reducing the overall complication rate and improving outcomes for both the mother and child.

5.3. § Organizational and Methodological Aspects: The Role of Perinatal Centers

In the modern healthcare system, one of the key approaches to reducing maternal and perinatal morbidity, including complications during cesarean sections, is the development of specialized perinatal centers. These facilities provide patients with a continuous range of medical services—from prenatal monitoring and timely diagnosis of complications to high-tech assistance during childbirth and the postpartum period. Simultaneously, perinatal centers perform a methodological function, setting standards for obstetric and neonatal care across their service areas. Perinatal centers are especially significant in managing emergency obstetric situations that require immediate decision-making and the mobilization of extensive resources. Such conditions demand not only obstetricians but also an entire team of specialists—anesthesiologists, resuscitators, neonatologists, transfusiologists, cardiologists, endocrinologists, and, if necessary, surgeons from related fields. The concentration of multidisciplinary specialists under one "roof" enables the rapid formation of multidisciplinary teams and the conduction of operational consultations, which is particularly crucial in cases of severe eclampsia, massive hemorrhages, complex uterine scars, or severe somatic pathologies in pregnant women. The more effectively coordinated the internal operations of a perinatal center, the lower the risk of fatal outcomes and serious complications.

The methodological activities of such institutions are equally important. Perinatal centers, with their highly qualified staff and technical equipment, develop unified local protocols for managing pregnant women with specific pathologies. These protocols include schemes for the prevention, diagnosis, and treatment of complications. Essentially, they serve as foundational scientific-practical platforms where the latest childbirth and resuscitation technologies are implemented and tested. The results of these efforts are disseminated to other regional hospitals, contributing to the standardization of care quality and reducing overall maternal and neonatal mortality rates.

A critical component of the work of perinatal centers is the training and professional development of staff. These institutions conduct seminars, masterclasses, and training sessions on managing severe cases of cesarean sections, preventing obstetric hemorrhages, and applying modern methods of anesthesia and neonatal intensive care. Close collaboration with universities and research institutes forms a basis for integrating innovative approaches into clinical practice, such as minimally invasive surgery, regional blocks, improved hemostasis technologies, and others.

Additionally, the organization of care in a perinatal center involves close interaction with follow-up and rehabilitation systems. After discharge from the maternity hospital, high-risk patients (e.g., those who have experienced severe cesarean section complications) continue to be monitored by consulting physicians, including, if necessary, specialists in psychological and pedagogical profiles. This allows early detection of any signs of adverse consequences—recurrent infections, scar dehiscence, lactation issues, or stress disorders in the woman—and provides correction at early stages. Such a systemic approach improves the overall health of both the mother and child, ensuring a more favorable postpartum period and enhancing the family's quality of life.

The logistical aspect should not be overlooked, especially in cases of emergency childbirth in women with severe pathology or pregnancy complications. In some cases, transporting the patient to a perinatal center presents a significant

challenge, as any delay can worsen the condition of both mother and fetus. Therefore, at the regional healthcare level, patient routing systems are usually developed to clearly define which hospitals must refer pregnant women to the center in specific situations and which can independently provide high-tech care. The better this mechanism is established, the lower the risk of critically ill patients ending up in unprepared facilities lacking specialists and necessary equipment.

Organizational and methodological aspects related to electronic databases and teleconsultations also play a vital role. With the help of electronic registries, perinatal center physicians can dynamically monitor the most complex patients, receiving updated information from district or city maternity hospitals about the course of pregnancy, additional examination results, and identified risks. Consultants can remotely adjust prescribed treatments or recommend urgent hospitalization at the perinatal center. This interaction strategy forms the basis for continuous monitoring of high-risk pregnancies, reducing the rate of late complication diagnoses.

Thus, the role of perinatal centers in preventing and managing complications during cesarean sections cannot be overstated. These institutions become hubs for professional expertise, innovative technologies, and resource allocation. They set the direction for the development of obstetric science and practice, act as methodological centers for training specialists, and serve as the foundation for implementing the principle of "pregnancy and childbirth under the vigilant supervision of a competent team." Ultimately, this approach ensures a higher level of safety for both mother and child, reduces perinatal morbidity and mortality rates, and increases the overall efficiency of the maternity care system.

5.4. § Conclusions and Prospects for Further Research

Conclusions

The analysis of data presented in the previous chapters demonstrates that cesarean section, despite its widespread prevalence, remains one of the most complex and critical operations in obstetric practice. Many factors—from the

individual characteristics of the woman and the nature of the obstetric situation to the organizational readiness of the hospital—directly influence the frequency of complications and outcomes for both mother and newborn. A well-chosen surgical approach, timely risk prevention, and a multidisciplinary approach to managing pregnancies significantly reduce adverse events and improve the quality of care.

Key Points

- **Significance of Surgical Approach Selection**: The study confirms that the choice between longitudinal and transverse surgical access is crucial for the outcomes of emergency and elective cesarean sections. In emergencies requiring immediate response, longitudinal access is more appropriate, providing rapid entry into the abdominal cavity and maximum visualization. In elective surgeries, when there is sufficient time and the risks are less critical, transverse techniques are often preferred due to better cosmetic results and reduced risk of hernias if wide abdominal cavity revisions are not anticipated.
- **Comprehensive Risk Factor Assessment**: Systematizing key risk factors (placenta previa, abruption, severe preeclampsia, multiple prior surgeries, etc.) allows for identifying high-risk groups among pregnant women. The developed risk assessment scale (Table 5.9) facilitates the timely identification of such patients, the creation of individualized delivery plans, and the improvement of preventive measures—from expanded antibiotic prophylaxis to involving additional specialists in the surgical team.
- **Critical Role of Perinatal Centers**: High-tech facilities with qualified staff, unified methodological protocols, and multidisciplinary support are fundamental for reducing maternal and neonatal morbidity. Perinatal centers set the standards for managing pregnancies and deliveries, accumulate the latest scientific developments, and share them with other hospitals, thereby enhancing overall safety in cesarean sections.
- **Importance of Early Rehabilitation and Follow-Up**: The principles of complication prevention and treatment do not end with wound closure. The success of the surgery largely depends on how effectively the early days after the cesarean

section are managed (early mobilization, adequate pain relief, wound monitoring, thrombosis prevention). High-risk patients require systematic follow-up for several weeks after discharge to prevent infections, hernias, and scar dehiscence.

- **Personalization and Evidence-Based Approach**: Every obstetric situation is unique. Comorbidities, obstetric complications, reproductive history, and body type all influence the choice of delivery strategy. Universal protocols provide a solid foundation, but real-world practice demands flexibility and the ability to adapt guidelines to individual circumstances. This emphasizes the key role of evidence-based medicine and accumulating statistical data for further treatment optimization.

Prospects for Further Research

- **Refinement of Criteria for Choosing Surgical Access**: Despite existing recommendations, certain contentious situations remain (e.g., questionable uterine scars or combinations of several moderate risk factors). Prospective multicenter studies are needed to develop more nuanced algorithms for access selection, considering not only speed and convenience but also long-term health outcomes for women.

- **Expansion of Minimally Invasive Techniques**: Although laparoscopic and robotic interventions in cesarean sections have not yet become routine, interest in them is growing. Research into minimally invasive technologies that reduce surgical trauma, including for repeat surgeries, holds promise. The question remains whether these techniques can be safely applied in obstetrics during complex conditions and emergencies.

- **Improvement in Hemorrhage Prevention and Management**: Obstetric hemorrhage remains one of the leading causes of maternal mortality. New hemostatic agents, modern ligature and suture materials, selective vessel embolization, and improved uterine compression techniques require deeper investigation and implementation into practice.

- **Focused Work with High-Risk Groups**: Pregnant women with severe comorbidities (diabetes, heart defects, coagulation disorders) require the development of specialized recommendations that incorporate a multidisciplinary

approach (therapy, endocrinology, rheumatology). This is an important field for future research projects where clinical observations and statistical methods will help create more advanced predictors of complications.

- **Study of Psychological Factors and Quality of Life**: The psychological adaptation of patients undergoing emergency or planned cesarean sections remains insufficiently explored. Long-term studies on quality of life, postpartum depression, anxiety disorders, and satisfaction with the surgery and its outcomes can lead to a more comprehensive understanding of rehabilitation and provide better emotional support for patients.
- **Adaptation of High-Tech Solutions for Developing Regions**: Many countries still face high maternal and perinatal mortality rates. Existing approaches need to be tested and adapted to resource-limited settings. Field research aimed at simplifying and reducing the cost of certain diagnostic and treatment stages could be key to lowering maternal mortality and disseminating advanced ideas globally.

Conclusion

Achieving good outcomes in cesarean section is an ongoing process of seeking and implementing best practices based on accumulated clinical experience and scientific evidence. The effectiveness and safety of this procedure ultimately determine not only the health and lives of the mother and newborn but also the overall demographic indicator reflecting societal well-being. The prospects for further research outlined above indicate that the field of obstetric surgery will continue to evolve actively, improving delivery tactics, increasing the accessibility and quality of medicine across all social strata, and pursuing a targeted fight against complications inevitably associated with surgical intervention.

References:

1. Айламазян Э.К., Серова В.Н., Радзинский В.Е., Савельева Г.М. Акушерство. // Национальное руководство. Краткое издание под руководством М.: ГЭОТАР – Медиа; 2015. – 608 с.

2. Коган О.М., Войтенко Н.Б., Зосимова Е.А. и соавт. Алгоритм ведения пациенток с несостоятельностью послеоперационного рубца на матке после кесарева сечения // Клиническая практика. – 2018. – Т. 3.– № 9. – С. 38 – 43.

3. Сухих Г.Т., Ушкалова Е.А., Шифман Е.М., Хилькевич Е.Г. Антибиотикопрофилактика при операции кесарево сечение // Врач. – 2011. – Т.1. – С.1–3.

4. Апресян С.В., Димитрова В.И., Слюсарева О.А. Диагностика и лечение послеродовых гнойно-септических заболеваний // ДокторРу. – 2018. – Т.6. – № 150.– С. 17 – 24.

5. Аргунов В.А., Павлова Т.Ю., Филиппова Р.Д. Оценка полноценности рубца на матке после кесарева сечения: морфологические аспекты // Якутский медицинский журнал. – 2007. – Т. 2. – С.18 – 20.

6. Баев О.Р., Шмаков Р.Г., Приходько А.М. Современная техника операции кесарева сечения в доказательной медицине // Акушерство и гинекология. – 2013. – №2. – С. 127 – 135.

7. Боровиков И.О., Галустян М.В., Куличенко М.Н. Оценка эффективности абдоминального родоразрешения в краснодарских перинатальных центрах // Современные проблемы науки и образования. – 2017. – Т.5. – С. 193.

8. Буданов П.В., Регул С.В. Современная структура и распространенность осложнений абдоминального родоразрешения // Журнал научных статей «Здоровье и образование в XXI веке» – 2018. – Т. 20. – №3. – С. 32 – 4.108

9. Буянова С.Н., Пучкова Н.В. Несостоятельный рубец на матке после кесарева сечения: диагностика, тактика ведения, репродуктивный прогноз // Российский вестник акушера-гинеколога. – 2011. – Т.4. – С. 36 – 8.

10. Буянова С.Н., Щукина Н.А., Пучкова Н.В. Особенности клинического течения эндомиометрита после кесарева сечения и его исходы // Российский вестник акушера-гинеколога. – 2012. – Т.12. – №5. – С. 84 – 8.

11. Гуляева Л.С., Капустина Е.Р., Лобачевская О.С., Никитина Е.В. Ведение родов у женщин с оперированной маткой в анамнезе через естественные родовые пути // Репродуктивное здоровье. Восточная Европа. – 2017. – № 2. – С. 148 – 155.

12. Приходько А.М., Баев О.Р., Луньков С.С. и соавт. Возможности методов оценки состояния стенки матки после операции кесарева сечения // Акушерство и гинекология. – 2013. – Т. 10. – С. 12 – 6.

13. Боженков К.А., Густоварова Т.А., Виноградов В.Л., Иванян А.Н. Возможности применения эпидуральной аналгезии у пациенток с рубцом на матке при вагинальных родах // Научные ведомости Белгородского государственного университета. – Серия «Медицина. Фармация». – 2015. – Т.10. – № 207. – С. 69 –74.

14. Игнатко И.В., Лебедев В.А., Е.А. Швырева и соавт. Возможности проведения самопроизвольных родов у женщин с рубцом на матке // Трудный пациент. – 2018. – Т. 16. – № 2. – С. 28 –31.

15. Вуколова В.А., Енькова Е.В. Оценка состояния послеоперационного рубца на матке после кесарева сечения при различных методиках зашивания // Вестник экспериментальной и клинической хирургии. – 2017. – Т.10.– № 3. – С. 241 – 245.

16. Кан Н.Е., Тютюнник В.Л., Кесова М.И., Балушкина А.А. Выбор способа родоразрешения после операции кесарева сечения // Акушерство и гинекология. – 2014. – № 6. – С. 20 – 26.

17. Габидуллина Р.И., Шамсутдинова Л.Г. К вопросу о применении простагландина Е2 у беременных с рубцом на матке после кесарева сечения // Российский вестник акушера-гинеколога. – 2013. – Т. 2. – С. 48 – 52.

18. Галимова И.Р., Габидуллина Р.И. Оценка локального кровотока в области шва на матке при операции кесарева сечения // Актуальные вопросы акушерства и гинекологии. – 2002. – Т.1. – С. 14 – 15.

19. Девятова И.Н., Малахова О.М., Харкевич О.Н. Сравнительная характеристика течения беременности и родов у пациенток с рубцом на матке // Российский медико-биологический вестник им. академика И.П. Павлова. – 2015. – № 2. – С. 126 – 134.

20. Демидов В.Н. Ультразвуковая оценка состояния рубца на матке после кесарева сечения // Пренатальная диагностика. – 2009. – Т.8. – № 4. – С. 291– 297.

21. Saeed K.B., Greene R.A., Corcoran P., et al. Incidence of surgical site infection following caesarean section: a systematic review and meta-analysis protocol // BMJ Open. – 2017. – V. 7. – N1. – e013037.

22. Tekelioğlu M., Karataş S., Güralp O., et al. Incomplete healing of the uterine incision after elective second cesarean section // Matern Fetal Neonatal Med. – 2019. – P. 1–5.

23. Wang L.L., Chen J.Y., Yang H.X., et al. Correlation between uterine scar condition and uterine rupture for pregnant women after previous cesarean section // Zhonghua Fu Chan Ke Za Zhi. – 2019. – V. 54. – N6. – P. 375–380.

24. Beucher G., Dolley P., Lévy-Thissier S., et al. Maternal benefits and risks of trial of labor versus elective repeat caesarean delivery in women with a previous cesarean delivery // Gynecol Obstet Biol Reprod (Paris). – 2012. – V. 41. – N8. – P. 708–726.

25. Mascarello K.C., Horta B.L., Silveira M.F. Maternal complications and cesarean section without indication: systematic review and meta-analysis // Rev Saude Publica. – 2017. – V. 51. – P. 105–125.

26. Landon M.B. Predicting uterine rupture in women undergoing trial of labor after prior cesarean delivery // Semin Perinatol. – 2010. – V. 34. – P. 267–271.

27. Guo N., Bai R.M., Qu P.F., et al. Influencing factors and antenatal assessment of the vaginal birth after cesarean section. // Zhonghua Fu Chan Ke Za Zhi. 2019;54(6):369–374.