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Research Article



Cesarean delivery: Resident scoring and adverse outcomes

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Abstract

Background: The first step in the delivery of a safe health care system should be how to identify and study the patterns of adverse outcomes and causes of error occurrence. Identification of these patterns can help obstetricians to adopt and develop safe practices in order to reduce the likelihood of system failure that can cause adverse outcomes. **Objective:** To assess maternal and fetal outcomes in cesarean deliveries, according to value of the residents' score. **Setting:** Boulak El DaKrou public hospital - Egypt. **Population:** 3000 cases undergone cesarean delivery in the period between January and December 2013. **Main outcome measures:** maternal and neonatal morbidity and mortality adjusted for obstetric resident score. **Results:** Our study reported that laceration of the uterine artery has occurred in 8.67% of the cases, extension of the uterine incision in 8.17% and formation of a broad ligament hematoma in 0.33% of the cases. Bladder injury has occurred in 0.3%, ureteric injury in 0.1% and bowel injury in 0.1% of the cases. 9.83% of the study cases have experienced primary postpartum hemorrhage and 5.33% required blood transfusion, while 0.67% of cases had undergone peripartum hysterectomy. 2% of study cases had suffered from puerperal pyrexia, and deep venous thrombosis was evident in 0.07% of cases. 1% of study cases had been admitted to the intensive care unit. Wound infection was reported in 7% of the cases. 1.67% of cases had required post-partum hospital readmission. Maternal mortality rate was 0.1%. This study also reported that the incidence of birth asphyxia was 6%, neonatal trauma was 0.7% while neonatal death was evident in 1% of the study cases. We have proved that with the increase in the resident score value there is decreased incidence of maternal and neonatal complications. **Conclusion:** Scoring of residents and its correlation with the prevalence of unfavorable maternal and neonatal outcomes could be used as a measure for quality of care provided on cesarean delivery in labor and delivery units.

Keywords: cesarean delivery, Edessy resident score.

Introduction

The cesarean delivery rate has increased throughout the world, but rates in certain parts of the world are still substantially lower than in the United States. The cesarean delivery rate is approximately 21.1% for the most developed regions of the globe, 14.3% for the less developed regions, and 2% for the least developed regions (Betran *et al*, 2007).

In the past decade, an increase in the percentage of births to women aged 30-50 years has occurred despite a decrease in their relative size within the

population. The cesarean rate for mothers aged 40-54 years in 2007 was more than twice the cesarean rate for mothers younger than 20 years (48% and 23%, respectively). The risk of having a cesarean delivery is higher in nulliparous patients, and, with increasing maternal age, the risk for cesarean delivery is increased secondary to medical complications such as diabetes and preeclampsia (Hamilton *et al*, 2010). A cesarean delivery is performed for maternal indications, fetal indications, or both. Maternal indications for cesarean delivery include repeated

cesarean delivery, obstructive lesions in the lower genital tract, including malignancies, large vulvovaginal condylomas, obstructive vaginal septa, and leiomyomas of the lower uterine segment that interfere with engagement of the fetal head and pelvic abnormalities that preclude engagement or interfere with descent of the fetal presentation in labor (*Joy et al, 2009*). Recently, debate has arisen over the option of elective cesarean delivery on maternal request. Evidence shows that it is reasonable to inform the pregnant woman requesting a cesarean delivery of the associated risks and benefits for the current and any subsequent pregnancies. The clinician's role should be to provide the best possible evidence-based counseling to the woman and to respect her autonomy and decision-making capabilities when considering route of delivery (*Hankins et al, 2006*).

Fetal indications for cesarean delivery include situations in which neonatal morbidity and mortality could be decreased by the prevention of trauma as malpresentation, certain congenital malformations or skeletal disorders as neural tube defects, Infection by active genital herpes and prolonged labour (Joy et al, 2009).

Neonatal outcome is influenced by gestational age at delivery, the presence of congenital abnormalities and growth abnormalities, and the indication for delivery itself. Improvement in neonatal outcome has been greatly enhanced by improved technology available to neonatologists and by improvements in prenatal care (eg, identification of patients at high risk, ultrasonography, and increased usage of antenatal steroids, progesterone, and most recently magnesium sulfate cerebral palsy prophylaxis in those at risk for preterm delivery (*Rouse et al, 2008*).

Indications for cesarean delivery that benefit both the mother and the fetus include abnormal placentation, abnormal labor due to cephalopelvic disproportion, situations in which labor is contraindicated (*Joy et al, 2009*).

Compared with a vaginal delivery, maternal mortality and especially morbidity is increased with cesarean delivery to approximately twice the rate after a vaginal delivery. The overall maternal mortality rate is 6-22 deaths per 100, 000 live births, with approximately one third to one half of maternal deaths after cesarean delivery being directly attributable to the operative

procedure itself. Part of this increase in mortality is that associated with a surgical procedure and, in part, related to the conditions that may have led to needing to perform a cesarean delivery (*Landon, 2008*).

Major sources of morbidity and mortality can be related to sequelae of infection, thromboembolic disease, anesthetic complications, and surgical injury. Recognized intraoperative surgical complications include damage to adjacent structures, including bladder, urinary tract or bowel, as well as unintentional damage to the uterus or cervix. The occurrence of one or more of these complications is reported to be approximately 12%). Hysterectomy was uncommon in the vaginal birth but was significantly more common among women who experienced both elective and emergency cesarean birth. Estimated blood loss of greater than 1000ml was recorded in 9.2% of cesarean deliveries, with 1% requiring blood transfusion (*villar et al, 2007*).

Infectious complications following cesarean delivery include endometritis, urinary tract infection, wound infection and more significant risks such as sepsis and bacteremia (*costantine et al, 2008*).

Thromboembolic disease is a significant contributor to maternal mortality and morbidity, with pulmonary embolism the leading cause of direct maternal death in the UK and the 2nd most common cause of all maternal death accounting for 11% of reported deaths (*Nelson et al, 2009*).

The first step in the delivery of safe health care system should be to identify and study the patterns of adverse outcomes and causes of error occurrence. Identification of these patterns can help obstetricians to adopt and develop safe practices to reduce the likelihood of system failure that can cause adverse outcomes (*Grunebaum, 2007*).

Patients and Methods

The study was conducted on pregnant women in the department of Obstetrics and Gynecology of Boulak El Dakrour General Hospital in the period between January 2013 and December 2013. A total of 3000 cases undergoing caesarean delivery were selected from the outpatient clinic and emergency room and performed by 40 residents. Residents were assessed through residents scoring system (RS) by *Eledessy et*

al. (2009) table (1), by which the Residents can be evaluated regarding experience, education, skills, knowledge and characteristics. Each of the previous items was grade 0, 1 or 2. Residents are divided into 3 groups:

- Group (1): resident score less than 5. This group has performed cesarean section

operations from 1 to 1000, and includes 9 residents.

- Group (2): resident score 5-7. This group has performed cesarean section operations from 1001 to 2000, and includes 25 residents.
- Group (3): resident score above 7. This group has performed cesarean section operations from 2001 to 3000, and includes 6 residents.

Table 1: EdessyResident Score.

Components	Score 0	Score 1	Score 2
Experience	6 to 12 months	1 to 2 years	> 2 years
Education	Bacalor grade (acceptable or good) Subject grade(acceptable or good)	Bacalor grade (very good) Subject grade (good)	Bacalor grade (excellent) Subject grade (very good or excellent)
Skills		One course of skills as basic surgical skills	2 or more courses of skill as basic surgical skills, ultrasonography, ...
Knowledge		One course as computer skills	2 or more courses of knowledge as computer, language, ...
Characteristics	Uncooperative	Cooperative Polite Has good morals and ethics	Cooperative Polite Has good morals and ethics Hard working Hones Self-appraising Respectful Responsible

• (*Eledessy et al, 2009*)

Assessment of the study cases include the following;Past history and associated medical disorders, Type of cesarean delivery, Decision to delivery time interval, Type of anesthesia, Maternal complications(Laceration of the uterine artery, extension of the uterine incision, broad ligament hematoma, bladder injury, bowel injury, ureteric injury, primary postpartum hemorrhage, need for blood transfusion, peripartum hysterectomy, puerperal pyrexia, deep venous thrombosis , intensive care admission , wound infection , need for post-partum hospital readmission and maternal mortality),Neonatal complications(asphyxia, trauma and death),

Statistical analysis

Data were analyzed using Statistical Program for Social Science (SPSS) version 18.0. Quantitative data were expressed as mean and standard deviation (SD). Qualitative data were expressed as frequency and percentage. The following tests were done; Independent-samples t-test of significance, Paired sample t-test of significance, Mann Whitney U test, A one-way analysis of variance (ANOVA),Kruskall Wallis test, Spearman's rank correlation coefficient and Probability value(P-value).

Results

This study was conducted in the department of obstetrics and gynecology of Boulak el Dakrou public hospital on 3000 pregnant women who had undergone for cesarean delivery, age ranging from 17 to 42 years with a mean of 26.18 ± 5.16 . , 3% of the enrolled cases were prior to 37 weeks gestation, 12.3% were more than 40 weeks gestation, while 84.7% were ranging from 37 to 40 weeks gestation. Also 2% of the cases were found to be diabetic (either pregestational or gestational), 3.7% were hypertensive (either gestational or chronic) and 0.3% has had rheumatic heart disease with valvular affection. 43.7% of the cases included have had no previous cesarean deliveries, 37% have had once previous cesarean delivery, 13.6% have had twice previous cesarean deliveries, and 3.7%, 1% and 1% have had previous three, four and five cesarean deliveries, respectively. 5.3% of the cases were emergency cases, 11% were urgent cases, 41% were scheduled and 42.3% were elective cesarean deliveries. The decision to delivery time interval was prolonged in 6% and satisfactory in 94% of the cases. 20% of the cases were delivered under effect of general anaesthesia and 80% under spinal anaesthesia.

Regarding unfavorable maternal outcome, our study reported that laceration of the uterine artery has occurred in 8.67% of the cases, extension of the uterine incision in 8.17% and formation of a broad ligament hematoma in 0.33% of the cases. Bladder injury has occurred in 0.3%, ureteric injury in 0.1% and while bowel injury was happened in 0.1% of the cases. 9.83% of the study cases has experienced primary postpartum hemorrhage and 5.33% required blood transfusion, while 0.67% of cases had undergone peripartum hysterectomy. 2% of study cases had suffered from puerperal pyrexia, and deep venous thrombosis was evident in 0.07% of cases. 1% of study cases had been admitted to the intensive care unit. Wound infection was reported in 7% of the cases. 1.67% of cases had required post-partum hospital readmission (mostly due to secondary post-partum hemorrhage and serious wound break down). Maternal mortality rate was 0.1%. table 3 showed statistically significant difference between resident score groups regarding laceration of the uterine artery ,extension of the uterine incision, primary post-partum hemorrhage ,peripartum hysterectomy, need for blood transfusion ,puerperal pyrexia, intensive care admission , wound infection and need for post-partum hospital readmission while the rest showed no significance.

Table 3: Resident score versus maternal complications (intraoperative and Postpartum)

	Group (I)		Group (II)		Group (III)		P1 I vs. II	P2 I vs. III	P3 II vs. III
	No.	%	No.	%	No.	%			
Intra operative complications									
Laceration of the uterine artery	130	13.0	110	11.0	20	2.0	0.191	<0.001	<0.001
Hematoma of the broad ligament	5	0.5	3	0.3	2	0.2	0.723	0.449	0.971
Bladder injury	4	0.4	3	0.3	2	0.2	0.973	0.682	0.617
Bowel injury	1	0.1	1	0.1	1	0.1	1.000	1.000	1.000
Ureteric injury	2	0.2	1	0.1	0	0	0.889	0.479	0.821
Extension of the uterine incision	140	14.0	80	8.0	25	2.5	<0.001	<0.001	<0.001
Postpartum complications									
Primary postpartum hemorrhage	190	19.0	70	7.0	35	3.5	<0.001	<0.001	0.002
Need for Blood transfusion	90	9.0	50	5.0	20	2.0	0.002	<0.001	0.004
Peripartum hysterectomy	8	0.8	7	0.7	5	0.5	0.445	0.009	0.074
Puerperal pyrexia	30	3.0	20	2.0	10	1.0	0.197	0.030	0.097
Deep venous thrombosis	1	0.03	1	0.03	0	0.0	1.000	0.201	0.201
Intensive care admission	20	2.0	0	0.0	10	1.0	<0.001	0.098	0.004
Wound infection	100	10	70	7	40	4	0.020	<0.001	0.005
Need for Postpartum hospital re admission	24	2.4	16	1.6	10	1	0.263	0.025	0.324
Maternal mortality	1	0.1	1	0.1	1	0.1	1.000	1.000	1.000

P-value<0.05 Significant, p-value >0.05 Non-significant, P-value <0.001 highly significant

Although cesarean delivery sometimes is supposed to be performed for the sake of the newborn, this study reported that the incidence of birth asphyxia was 6%, neonatal trauma was 0.7% (mostly were scalp injuries to the fetal head or buttocks) while neonatal

death was evident in 1% of the study cases. Table 4 shows statistically significant difference between resident score groups as regards asphyxia and trauma.

Table 4: Resident score versus neonatal complications

	Group (I)		Group (II)		Group (III)		P1 I vs. II	P2 I vs. III	P3 II vs. III
	No.	%	No.	%	No.	%			
Asphyxia	100	10	50	5	30	3	<0.001	<0.001	0.030
Trauma	10	1	7	0.7	3	0.3	0.636	0.095	<0.001
Death	14	1.4	10	1	6	0.6	0.538	0.116	0.451

P-value <0.001 highly significant; p-value <0.05 Significant; p-value >0.05 Non-significant

Correlative analysis revealed that there is Negative correlation between resident score and the incidence of neonatal complications (Parameters with significance only in asphyxia (**p<0.001**) and death (**p<0.001**), while no significance showed in trauma) and also Negative correlation between resident score and the incidence of maternal complications(Parameters with significance in laceration of the uterine artery (**p<0.001**), Hematoma of the broad ligament(**p<0.001**), extension of the uterine incision (**p<0.001**), Bladder injury(**p<0.001**), Bowel injury(**p<0.001**), Ureteric injury (**p<0.001**), primary post-partum hemorrhage (**p<0.001**), need for blood transfusion (**p<0.001**), peripartum hysterectomy (**p<0.001**), puerperal pyrexia (**p<0.001**), intensive care admission (**p<0.001**), wound infection (**p<0.001**), need for post-partum hospital readmission(**p<0.001**) and maternal mortality(**p<0.001**), while no significance was showed in the incidence of deep venous thrombosis).

Discussion

Labor and delivery environment requires intense, error free vigilance and effective communication between many different clinical disciplines including obstetricians, midwives, nurses, anesthesiologists and pediatricians (Nielsen et al, 2007). Cesarean delivery which is a common procedure in obstetrics, comprises complex skills backed with knowledge and embellished with professional attitudes. Residents initially observe and then assist and gradually becoming competent to perform the cesarean section procedure independently. It usually takes the first two years of residency program for the residents to perform the complete procedure independently, but under supervision (Qureshi and Ali, 2013)

Assessment plays a vital role in ensuring the development of appropriate skills and professional attributes. In addition, it also offers information to candidates about the knowledge skills and other attributes that they can expect to possess after successfully completing an academic program. Assessment also establishes ways for teachers and assessors to understand the dimensions of candidate learning when seeking to improve candidate achievement and the educational process. Teachers and assessors can alter the teaching and/or assessment styles to become more focused in achieving a higher level of efficiency in reaching the targeted objectives. One off the major concerns of assessment is not how many steps were done but if they were done well or not. It is appreciated that as the learner progresses through the years of residency education from being a novice to competent, he/she takes shortcuts based on prior learning and experiences. These shortcuts are accepted as a move towards expertise. Despite different strategies for evaluating surgical procedures, their feasibility and reliability still remain unresolved. The challenge is to develop assessment tools which can be standardized to take into account the experience of the assessor, the level of the trainee, the difficulty of the case and the complex interplay of cognitive/ individual skills and other factors which may influence the observation and the performance (Qureshi and Ali, 2013)

In 2009, Edessyet al had created a "resident score", by which the Residents can be evaluated regarding certain parameters. These parameters included duration of experience, education, skills, knowledge and characteristics.

According to **Eledessy et al. (2009)**, resident score below 5 increase hazards, while score above 7 is associated with better performance and outcome which.

In our study, we have proved that with the increase in the resident score value there is decreased incidence of maternal and neonatal complications. This study proves that Scoring of residents and its correlation with the incidence of unfavorable maternal and neonatal outcomes can be applied as an assessment tool in the work place for the evaluation of competence in cesarean delivery. Validity evidence confirmed that these items can differentiate between residency levels. Validation also has yielded good results with discrimination between different residency levels. This study also attempted to define a standardized process for certifying competence in cesarean delivery. At present, we need to know how many observations and diversity of case complexity to certify competence in surgical procedures in general and cesarean delivery in particular.

The internal structure of the study format demonstrated good evidence for the study items. There was good homogeneity in the items with both positive and negative correlations between them. Principal factor analysis further negatively defined the relation between resident score and the incidence of unfavorable maternal and/or fetal outcome.

The study was confined to one hospital which may be considered as strength as it controls for extraneous factors which may influence the residents' performance. On the other hand, classification of residents according to **Edessy score** into 3 groups has provided us an adequate spectrum for outcome assessment for cases performed by the residents of each group. The developed items need to be further investigated to evaluate its role in promoting learning of the residents and the development of their self-confidence. It may also assist in defining the critical items which indicate expertise in residents' performance .it should be noted that emergency cases were included in our study as surgical practice in emergency situation involves factors such as proper assessment and decision to delivery time interval which were also included in the assessment process.

Conclusion

Scoring of residents and its correlation with the prevalence of unfavorable maternal and neonatal outcomes could be used as a measure for quality of care provided on cesarean delivery in labor and delivery units. It can be utilized by the obstetric chair persons or even by the malpractice insurers to identify the best providers and the best practices in cesarean deliveries.

Recommendations

Additional researches are warranted to understand these tools better. Suggested research might include identification of other factors that could affect the rate of the unfavorable outcomes. For example, the presence of 24- hour dedicated anaesthesia coverage and the level of neonatal intensive care units. Much additional work is also needed to determine if there are any additional outcomes that might be tracked. We also recommend that cesarean section should be performed when a clear benefit is anticipated, a benefit that might compensate for the higher costs and additional risks in the context of specific settings where the operation is taking place. This additional risk should be considered by the health care professionals and patients when deciding the mode of delivery.

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