Original Article

Impact of clinical audits on cesarean section rate

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ABSTRACT

Objective: Many countries have noted a substantial increase in the cesarean section rate (CSR). Several methods for lowering the CSR have been described. Understanding the impact of clinical audits on the CSR may aid in lowering CSR. Thus, our aim is to elucidate the effect of clinical audits on the CSR.
Materials and Methods: We retrospectively analyzed 3781 pregnant women who gave birth in a medical center between January 2008 and January 2011. Pregnant women who delivered between January 2008 and July 2009 were enrolled as the pre-audit group ($n = 1592$). After August 2009, all cesarean section cases that were audited were enrolled in the audit group ($n = 2189$). The CSR was compared between groups.
Results: The overall CSR (34.5% vs. 31.1%, adjusted odds ratio [OR] = 0.83, $p = 0.008$) and the cesarean section rate due to dystocia (9.6% vs. 6.2%, $p < 0.001$) were significantly lower in the audit group than the pre-audit group. However, there was no significant difference in the rate of operative vaginal delivery between groups. Consensus on the unnecessity for cesarean section was achieved in 16 (8.2%) of 195 audit cases in the monthly audit conference. In nulliparous pregnant women ($n = 2148$), multivariate analysis revealed that clinical audit (OR = 0.78), maternal age (OR = 1.10), gestational age at delivery (OR = 0.80), and fetal body weight at birth (OR = 1.0005) were independent predictors of cesarean section (all $p < 0.05$). Most variables of maternal and perinatal morbidity and mortality did not differ before and after audits were implemented.
Conclusion: Clinical audits appear to be an effective strategy for reducing the CSR. Therefore, we recommend strict monitoring of the indications in dystocia for cesarean section to reduce the CSR.
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Introduction

The World Health Organization recommends an optimal cesarean section rate (CSR) of no more than 15% [1]. Although a higher rate is not considered beneficial for public health, many countries have noted a substantial increase in the CSR [2–5]. Although the reasons for this increase are unclear, the increase in maternal age, maternal requests, and fears of litigation are implicated [2,6].

Several methods for lowering the CSR have been described, including audits and feedback, quality improvement, and multifaceted programs [7]. In one meta-analysis study, the CSR was only reduced by 13% using audit and feedback alone; however, the CSR decreased by 27% when audit and feedback were part of a multifaceted strategy [7]. Multifaceted strategy included practice guidelines, active management of labor, corrective measures when guidelines are not followed, hospital payment, malpractice reform, and confidential provider feedback [7–9].

Accordingly, the Taiwanese government closely monitors the CSR of each hospital in Taiwan in the interest of public health. In 2009, in response to an increase in the CSR in our hospital, we decided to perform clinical audits to review the indications for each cesarean section (CS). Therefore, this retrospective analysis aimed

to evaluate the effect of clinical audits on the CSR and determine the factors influencing the procedure rate.

Materials and methods

We retrospectively studied all pregnant women who delivered in the Department of Obstetrics & Gynecology of Far Eastern Memorial Hospital between January 2008 and January 2011. The Research Ethics Committee of Far Eastern Memorial Hospital approved this study

The clinical histories of all patients were obtained by medical record review. The patients included in this study gave birth under the supervision of eight obstetricians who worked in the hospital during the study period.

Monthly clinical audits and feedback on CS cases were implemented in August 2009. Thereafter, all CS cases were briefly audited in triweekly obstetric morning meetings. Cases with ambiguous CS indications were reviewed in greater detail during the monthly CSR audit conference to determine whether or not CS was appropriate. Consensus on the indication for CS was reached by all eight members of the obstetric staff participating in the audit conference on the basis of the following specific criteria. Dystocia was defined as cervical os dilatation ≥ 4 cm, arrest of dilation for at least 2 hours, and well-forced uterine contractions [10,11] during the study period. However, we used the criteria of cervical os dilatation ≥ 6 cm [12] and arrest of dilatation for at least 3 hours in the CSR audit starting in 2014 (i.e., not in the study period). Periodic fetal heart beat monitoring was used in cases of low-risk pregnancy. Fetal distress was defined as clinically significant prolonged variable deceleration (i.e., deceleration of fetal heart rate < 70 beats/min lasting > 2 minutes [13,14]) or late deceleration of fetal heart beat as demonstrated by cardiotocography. Most obstetricians in our institute opted to monitor the fetal heartbeat pattern carefully if only one episode of prolonged variable deceleration occurred. If prolonged variable decelerations frequently recurred, we performed a CS or an interventional delivery such as vacuum-assisted delivery.

The criterion for routine labor induction was gestational age > 41 weeks in low-risk women [15,16]. In our hospital, prenatal outpatient visits were undertaken every week after 36 gestational weeks. In addition, we asked pregnant women to count daily fetal movements during the near- and post-term periods [17]. To screen high-risk women in postterm pregnancy, fetal ultrasonography, nonstress testing, biophysical profile studies, or umbilical waveform studies were performed as indicated. Clinical audit records were submitted to the hospital president every month. All obstetric staff members received the audit record after the meeting.

We used the nonparametric Wilcoxon rank–sum test or the Chi-square test where appropriate. Univariate logistic regression analysis was used to analyze the effect of clinical audit on the CSR. Backward stepwise multivariate logistic regression analysis including all variables showing $p < 0.05$ in univariate analysis was performed to analyze the effects of individual variables on the CSR [18]. STATA version 11.0 (Stata Corp., College Station, TX, USA) was used for the statistical analysis. The level of significance was set at $p < 0.05$.

Results

A total of 3781 pregnant women who gave birth under the supervision of a staff obstetrician were included. Among them, 1592 patients gave birth before (pre-audit group) and 2189 patients gave birth after auditing was implemented (audit group). The baseline clinical data of the groups are summarized in Table 1. Maternal age

Table 1
Baseline demographic data before and after the implementation of clinical cesarean section audits.

Variable	Before audit ($n = 1592$)	After audit ($n = 2189$)	p^{a}
Maternal age (y)	30.5 ± 4.4	31.2 ± 4.2	<0.001
Parity	1.5 ± 0.7	1.5 ± 0.7	0.37
Birth body weight (g)	3081 ± 555	3066 ± 529	0.09
Gestational age (wk)	38.3 ± 2.2	38.4 ± 2.2	0.049
Taiwanese mothers	96.3	96.3	0.99
Male infants	53.7	50.8	0.08

Data are expressed as mean $\pm$ standard deviation or %.
[a] Wilcoxon rank–sum test or Chi-square test.

and gestation weeks at delivery differed significantly between the two groups.

The CSRs and indications for CS of the two groups are shown in Table 2. The CSR was significantly lower in the audit (31.1%) than in the pre-audit group [34.5%, odds ratio (OR) = 0.85, 95% confidence interval (CI) = 0.74–0.97, $p = 0.02$; Table 2]. After adjusting for maternal age and gestation weeks at delivery, clinical audit remained an independent predictor of CS (OR = 0.83, 95% CI = 0.72–0.95, $p = 0.008$).

The CSR in cases with dystocia was also significantly lower after auditing was implemented [9.6% (pre-audit) vs. 6.2% (audit), $p < 0.001$; Table 2].

Among all CS cases ($n = 680$), 195 cases were reviewed in greater detail during the monthly clinical audit conferences. Consensus on the unnecessity of CS was achieved in 16 (8.2%) of 195 patients. Among them, nine women, six women, and one woman were diagnosed as induction failure, arrest of labor, and variable deceleration, respectively.

Of the 3781 women reviewed, 2148 (56.8%) were nulliparous. In nulliparous pregnant women ($n = 2148$, Table 3), multivariate analysis revealed that clinical audit (OR = 0.78, 95% CI = 0.65–0.95, $p = 0.01$), advanced maternal age (OR = 1.10, 95% CI = 1.08–1.13, $p < 0.001$), later gestational age at delivery (OR = 0.80, 95% CI = 0.75–0.85, $p < 0.01$), and high fetal body weight at birth (OR = 1.0005, 95% CI = 1.0003–1.0007, $p < 0.001$) were independent predictors of CS (Table 3).

The prevalence of hyperbilirubinemia decreased significantly after the implementation of clinical CS audits (24.6% vs. 16.4%, $p < 0.001$). However, no other variables of maternal or perinatal morbidity or mortality differed before and after the implementation of clinical CS audits (Table 4).

Discussion

The present study revealed that clinical audits significantly reduced the CSR. Despite the small decrease, this can be viewed as a success. Similarly, the meta-analysis of Chaillet et al [7] revealed that audits and feedback effectively reduced the CSR, with a pooled risk ratio of 0.87. This reduction in CSR is believed to be partly attributable to the Hawthorne effect, which is the human tendency to improve performance because of the awareness of being studied [19,20]. Scarella et al [21] also reported a decrease in the CSR when audits were implemented. Thus, the present study provides evidence that audits decrease the CSR.

Among all indications for CS, only dystocia was associated with a decreased CSR in the present study. Mohammadi et al [11] reported that the CSR decreased from 40% to 33% particularly because of indications of dystocia, fetal distress, and selective CS. Meanwhile, Liang et al [10] reported that the CSR decreased from 37.0% to 30.7% owing to dystocia. These findings collectively suggest that dystocia