

TITLE: Investigating Potential Risks of Long Labor and Associations of
Emergency Cesarean Sections

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BACKGROUND:

Multiple factors may contribute to mortality during pregnancy. Emergency Cesarean Section (ECS) is a technique done to preserve the life of both mom and baby. Educating women on risk factors may help prevent unnecessary ECS. Additionally, long labor time (LLT) is affected by numerous causes and that can jeopardize health outcomes of mom and baby. This paper will analyze possible risks and associations of ECS and LLT.

METHODS:

An analysis using RStudio was performed on a relatively low-risk birth cohort to assess odds of ECS using Logistic Regression (Log-Reg). Moreover, survival analysis via Cox Regression (Cox-Reg), was performed to analyze factors that affect LLT. The analysis was done using two datasets, `var_labels`, which is a table listing the categorical status of all 8915 patients in the study. The other is `var_numbers`, is a numeric table listing clinical status and outcomes of labor. Both tables were free of major data errors, but flow-charts are included below to showcase where data may have been altered/removed to accurately run the regression models.

RESULTS:

Log-Reg analyzed odds ratios (OR) of ECS using variables such as healthcare facility (i.e. “center_attended”, mid-wife-clinic vs hospital), gestational category (i.e. “Gestation_cat”, <38 weeks, 38-42 weeks, or >42 weeks). Women with a previous c-section (i.e. “PreviousCS” with Gestation_cat, >42weeks) was found significant for an ECS ($p=0.0003$, 95% CI 1.90 - 6.84, OR 76.42) compared to Gestation_cat 38-42 weeks ($p > 0.05$, OR = 3.20). Unsurprisingly, PreviousCS, while significant ($p < 0.05$, OR = 30.40), had a very small number of patients ($n=18$) so further research with larger sample size is warranted. Midwife-clinic was found significant for ECS ($p < 0.05$), but the OR was low (0.074). **Code for the Log-Reg model here:**

- `cslogFULL_MODEL <- glm(EmergencyCS ~ Gestation_cat + center_attended + PreviousCS, family = binomial(link = logit))`

Women in birth cohort dataset:

- $n=8915$



Women excluded in Log-Reg model due to:

- Missing data on gestation: n = 7300
- Missing/invalid data on Mage: n = 7197
- Missing data on center_attended or deleted home category: n= 7136



Women included in Log-Reg model:

- n=7136

Cox-Reg performed survival analysis to assess hazard ratios (HR) of LLT using the variables Gestation (defined above), Maternal Age (i.e. Mage, age under or over 30 years), Parity (number of previous pregnancies), Twins, Cephalic_Breech (position of baby), Membranes_ruptured, and Center_attended. Essentially, HR's <1 means less risk of LLT, and likely reduced risk of complications. Variables associated with increasing LLT was Mage (HR 1.36, p<0.05), having Twins (HR 2.29, p<0.05), Membrane_not_ruptured (HR 1.73, p<0.05). Other variables, like gestation, parity, and center (hospital) had p-values <0.05, but low HR's. As well, higher HR's may contribute to longer LT and possible complications, like ECS. **Code for Cox-Reg model:**

- `cox2 <- coxph(Surv(labor, birth) ~ LL1$Gestation + LL1$Mage_cat2 + LL1$Parity + LL1$Twins + LL1$Cephalic_Breech + LL1$Membranes_rupture + LL1$center_attended)`

Women in birth cohort dataset:

- n=8915



**Women excluded Cox-Reg model
due to:**

- Missing data on gestation: n = 7300
- Missing/invalid data on Mage: n = 7197
- Invalid data on Membranes_ruptured: n= 7196



Women included in Cox-Reg model:

- n=7196

CONCLUSION:

In summary, educating women on their risks for both ECS and LLT are essential to maternal-baby health. Future studies may benefit investigating how previous c-sections may influence future ECS. As well, literature reviews on maternal age, twins, parity, and center of delivery may provide additional context. Finally, there is a need to educate women on risk-factors to prevent harm to mom and baby.