Platelet counts and their effect on patient outcomes with patent ductus arteriosus (PDA)

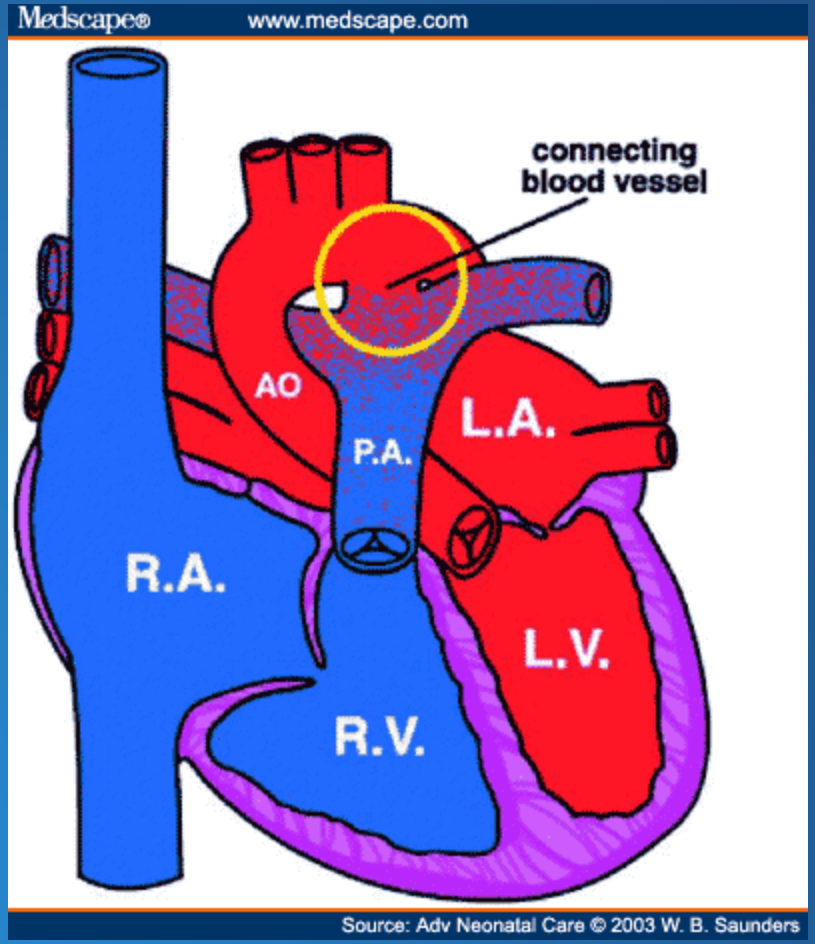
Edel Sah, University of Notre Dame
Lorena Cristal, University of Puerto Rico at Humacao
Chelsea Robalino, University of Florida

Dr. Patrick Breheny, University of Iowa

What is PDA?

- Ductus Arteriosus is a blood vessel that allows the blood to pass from the pulmonary artery to the aorta, bypassing the not yet functional lungs
- Once the baby is born, it is expected to close the open aorta
- If it’s still open, some of the blood skips the step of becoming oxygenated
- This circulatory disorder is called Patent Ductus Arteriosus (PDA)

Picture


Medscape®
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connecting blood vessel
AO
P.A.
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Source: Adv Neonatal Care © 2003 W. B. Saunders

Why is it bad?

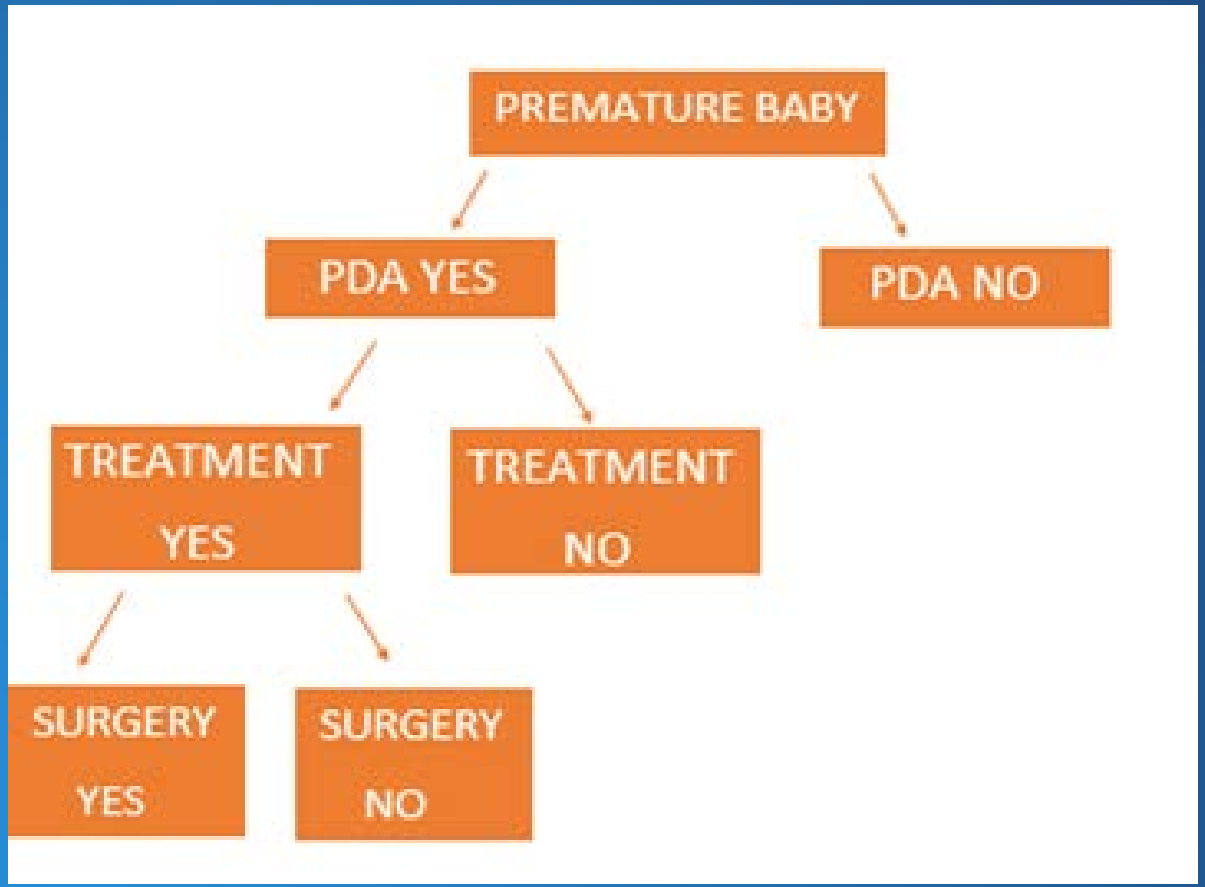
- Deoxygenated and oxygenated blood do not separate.
- Increased pulmonary blood flow
- Pulmonary edema
- Worsening of cardiopulmonary status

Premature babies and PDA

- Not a common problem in full term babies
- There is an increased risk between premature babies and the prevalence of PDA

How is it diagnosed?

- All babies are born with Ductus Arteriosus
- In premature babies, an echocardiogram is performed on the fifth day after birth to diagnose PDA
- Doctors have different thoughts on how to treat it- some are more conservative than others


PREMATURE BABY
PDA YES
PDA NO
TREATMENT YES
TREATMENT NO
SURGERY YES
SURGERY NO

Research Goal:

Find risk factors that examine the relationship in premature babies with three clinical outcomes: development of PDA, recovery without intervention and successful indomethacin treatment.

What is logistic regression?

$$ln\frac{p}{1-p} = \beta_0 + \beta_1 x_1 + \ldots + \beta_i\ x_i\ ..$$

β_0 is the “intercept”

β_i is the regression coefficient of x_i

x_i is a value of the predictor

p is the probability that the dependent variable equals a case

Our Data

- From chart reviews
- 404 babies (207 with PDA)
- University of Iowa Hospitals and Clinics
- All born prematurely (< 29 weeks)
- Very low birth weight (<1800 grams)

Our Factors

- Platelet count
- Gender
- Preeclampsia
- Gestational age(weeks)
- Birth weight (grams)

Platelet counts

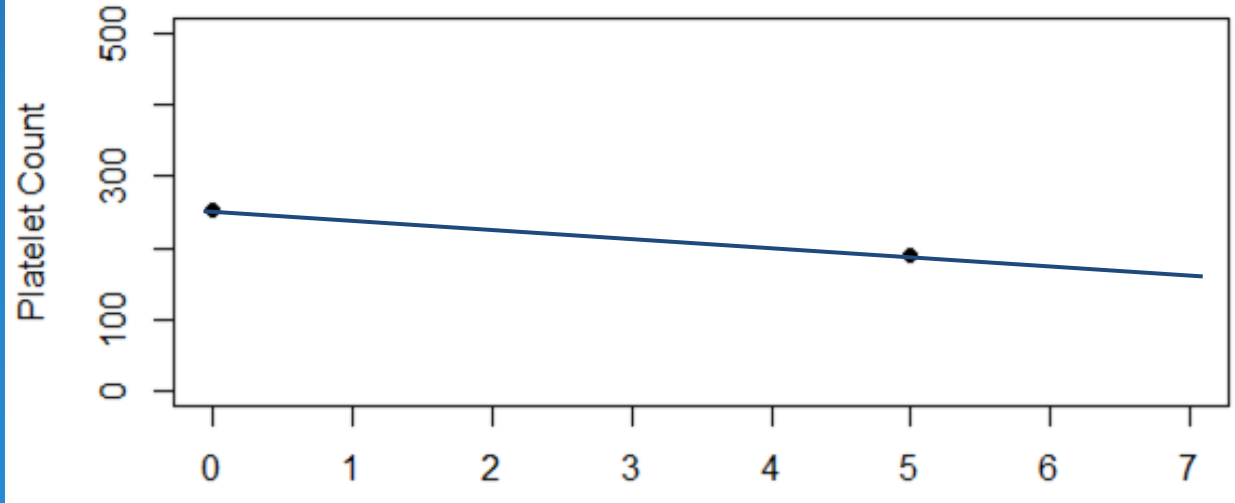
In this study we focused on a baby’s platelet counts. Counts were recorded on their first seven days of life. We are interested in this because platelets help blood clot, meaning there might be an association with PDA.

Missing Data

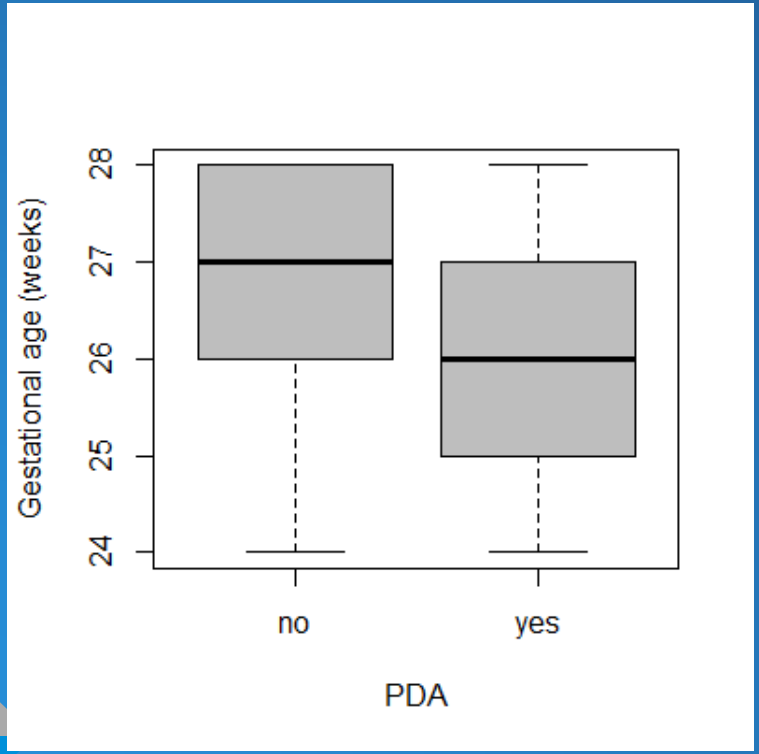
- Incomplete data on platelet counts
- Linear prediction for specific day platelet counts
- This assumes the data is missing at random

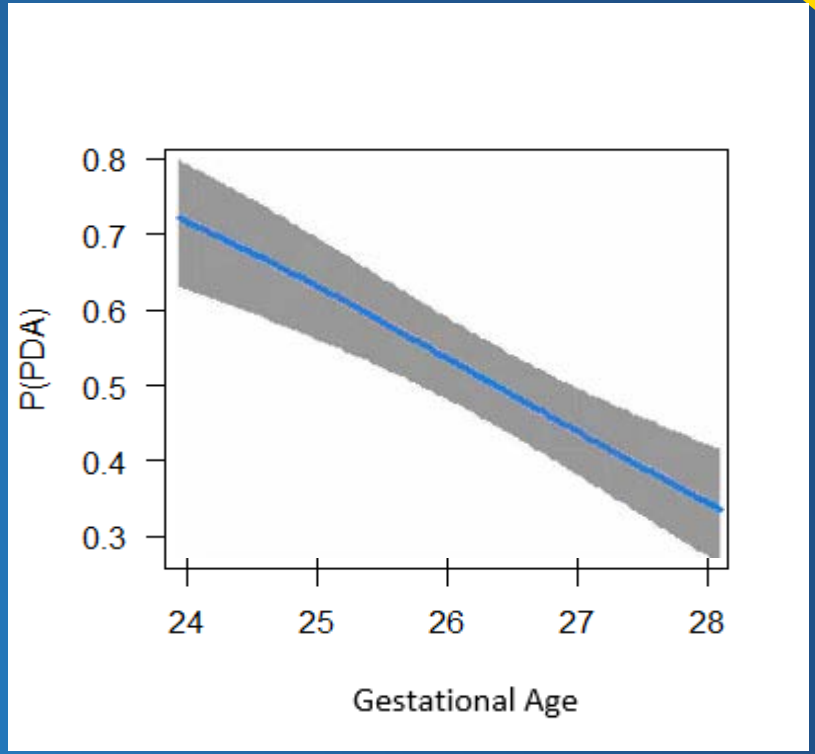
Missing Data Example

pltctD0	pltctD1	pltctD2	pltctD3	pltctD4	pltctD5	pltctD6	pltctD7
254					189		



Predict if a baby will develop PDA





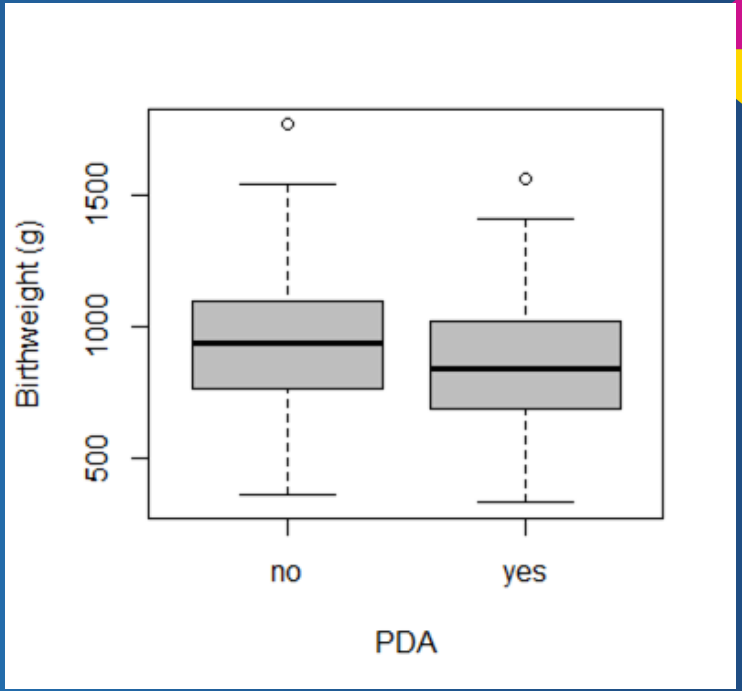
Gestational Age

OR: 0.67 CI: (0.58,0.78) p = 2e-7

Predict if a baby will develop PDA

Birth weight-- but confounding with GA weeks

	Odds Ratio	CI (95%)	p value
	Birthweight on it's own		
Birthweight	0.897	(0.83,0.97)	0.007
	Birthweight + GA weeks		
Birthweight	1.05	(0.94,1.16)	0.402
Gaweeks	0.64	(0.53,0.776)	4.41E-06
**Birthweight is per 100g*			

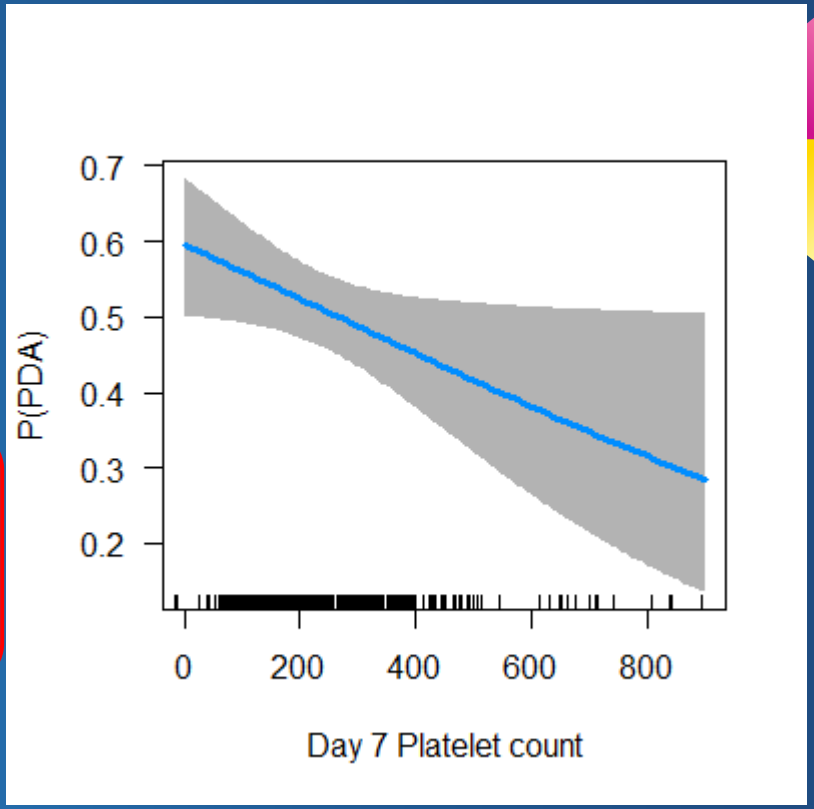


Predict if a baby will develop PDA

Platelet counts

Days	OR	CI 2.5%	CI 97.5%	p value
0	1.02	0.79	1.31	0.87
1	0.87	0.67	1.12	0.28
2	0.85	0.67	1.08	0.18
3	0.81	0.66	1.01	0.06
4	0.80	0.66	0.98	0.03
5	0.83	0.69	0.99	0.04
6	0.85	0.73	0.99	0.04
7	0.86	0.75	0.99	0.04

*per 100 counts

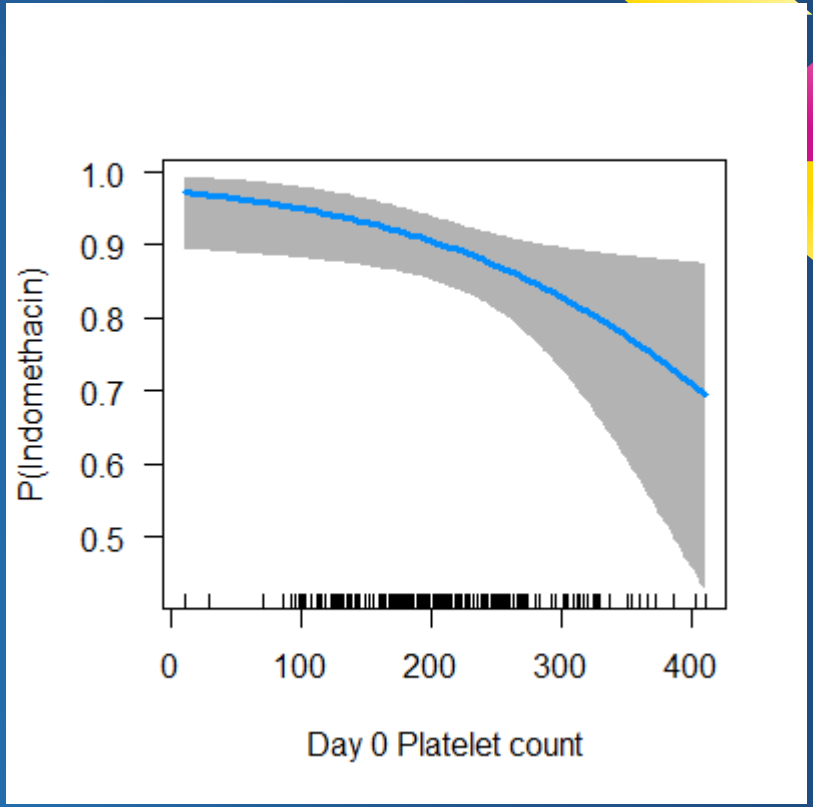


Prediction of recovery without intervention

Platelet counts

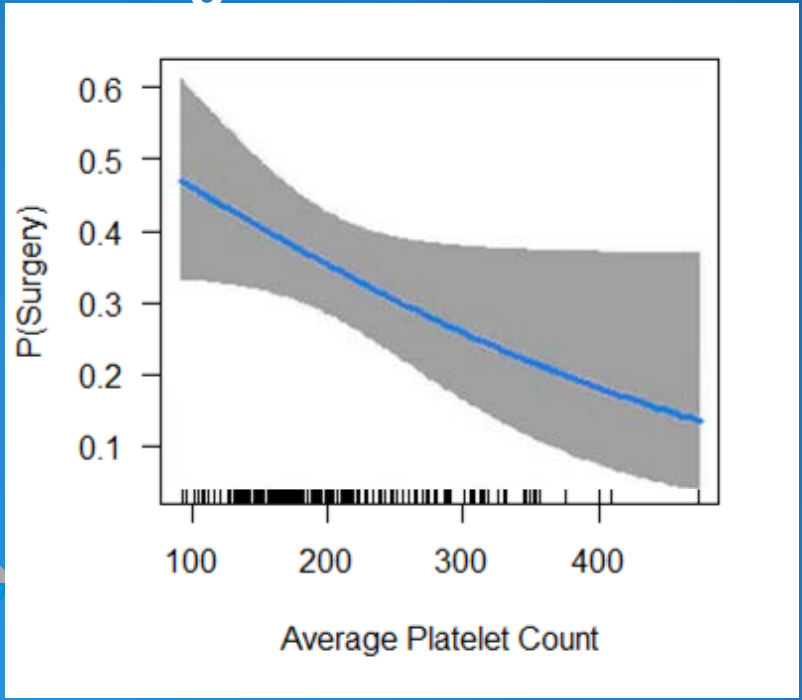
Days	OR	CI 2.5%	CI 97.5%	p value
0	0.51	0.28	0.91	0.02
1	0.63	0.33	1.21	0.16
2	0.58	0.32	1.02	0.06
3	0.73	0.44	1.24	0.24
4	0.98	0.61	1.66	0.94
5	1.00	0.63	1.67	1.00
6	1.14	0.74	1.87	0.58
7	1.19	0.81	1.86	0.40

*per 100 counts



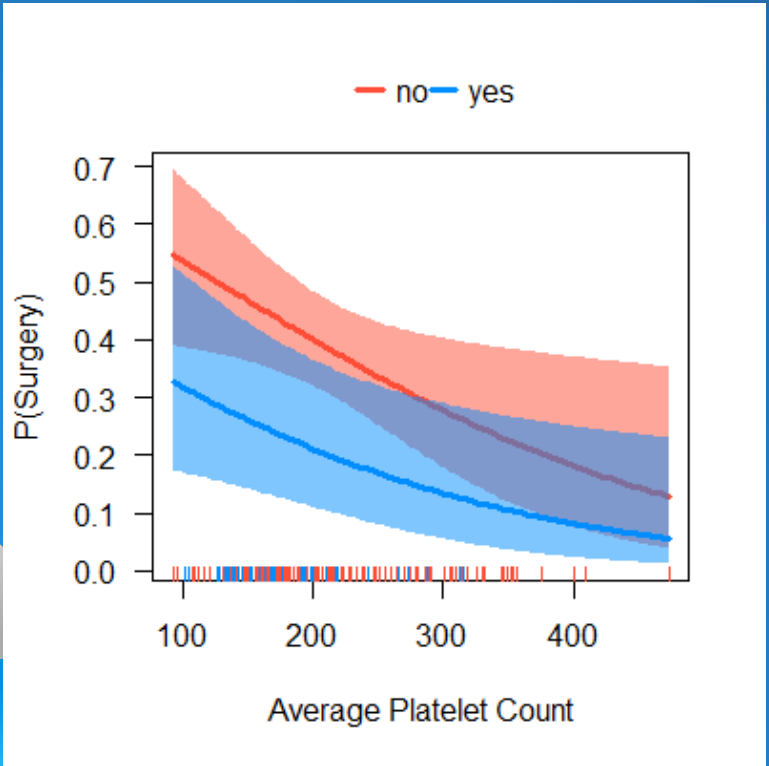
Predict if the indomethacin treatment is effective (no surgery)

Average Platelet Count



OR: 0.64
CI: (0.40,1.0)
p = 0.0547
*per 100 counts

Predict if the indomethacin treatment is effective (no surgery)



Average platelet count + preeclampsia

Average platelet count
OR: 0.58 CI: (0.35,0.91) p = 0.02
*per 100 counts

Preeclampsia
OR: 0.40 CI: (0.16,0.90) p = 0.03

Predict if the indomethacin treatment is effective (no surgery)

No Preeclampsia

Average platelet count * gender

Average Platelet Count

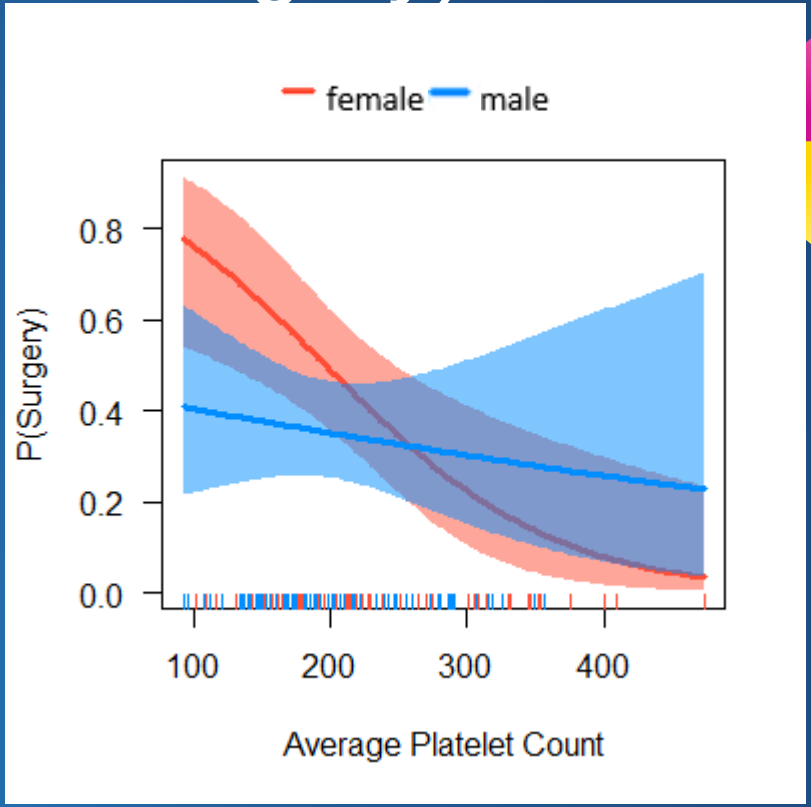
Female OR: 0.30 CI: (0.13,0.62) p = 0.003

Male OR: 0.80 CI: (0.37,1.66) p = 0.554

*per 100 counts

Average Platelet Count : Gender

p = 0.08



Results & Discussion

- Preeclampsia, gender and gestational age are significant
- Platelet count is a significant factor in all three clinical outcomes
- Interesting dynamics between different days and its predictive power
- Higher platelet counts lead to good clinical outcomes

The future

- Clinical collaboration: show our results
- Prospective studies: allow us to have more control of the data
- Randomized trials (far future)

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