Effect of Operation timing on Surgery Outcome

IDS 702 Final Project

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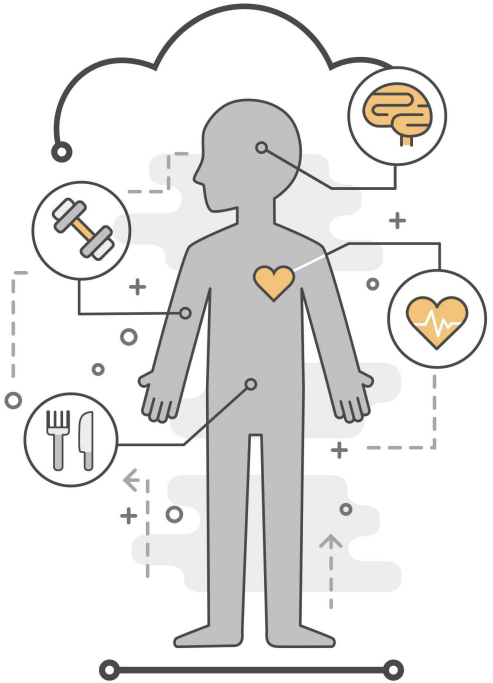
Overview

Human factors such as scheduling and fatigue tend to influence working performance. Hospital personnels shouldn't be an exception

It is natural to assume hospital personnels' effectiveness degrades in the later half of the day/week and during the middle of a year.

Among all other factors, is operation timing significantly associated with surgery outcome?



Data (1/3)

Contains 32,001 general surgical patients. 25 columns in total.

- ***Response variable***: *mort30*: 30-day mortality (Binary)
- ***Predictors***:
  - **Surgical timing** predictors (hour, day of week, month, and moon phase)
  - Patients **physical** predictors (age, gender, race, BMI)
  - 6 **surgical risk** indices variables:
    - asa_status (American Society of Anesthesiologist Physical Status)
    - baseline_charlson(Comorbidity Index)
    - complication_rsi (Risk Stratification Index for In-Hospital Complications)
  - Binary indicators for 8 **baseline diseases** (cancer, cardiovascular, dementia, diabetes, digestive, osteoarthritis, psychiatric disorder, pulmonary disease)

Data (2/3) – Overview of a Row

age	gender	race	bmi	asa_status	baseline_charlson	complication_rsi	mortality_rsi	pulmonary	psych
57.4	F	Other	37.85	2	4	-0.83	-1.35	No	No
cancer	cvd	dementia	diabetes	digestive	osteoarthritis	moonphase	dayofweek	month	hour
No	Yes	No	Yes	No	No	1	4	10	12.67

Physical Predictors Surgical Risk Baseline Disease Surgical Timing

Patient counts for baseline diseases								
# of disease	0	1	2	3	4	5	6	7
Patient count	6410	9581	9085	5055	1597	242	30	1

Data (3/3) – Surgical Timing Predictors

Hour (Continuous)			
Mean	.25	.50	.75
10.38	7.65	9.65	12.72
Lowest: 6.00, 6.03, 6.07; Highest: 18.97, 18.98, 19.00			

Moonphase				
Value	1	2	3	4
Frequency	7708	8100	8051	8142
Proportion	0.241	0.253	0.252	0.254

Day of Week					
Value	1	2	3	4	5
Freq	7005	7008	6266	5635	6087
Proportion	0.219	0.219	0.196	0.176	0.190

Month												
Value	1	2	3	4	5	6	7	8	9	10	11	12
Frequency	2670	2506	2697	2698	2654	2994	2325	3177	3208	2689	2544	1839

Exploratory Data Analysis

Baseline Dementia		
30-day mortality	No	Yes
No	0.9957	0.9876
Yes	0.0043	0.0124

Baseline Osteoarthritis		
30-day mortality	No	Yes
No	0.9954	0.9972
Yes	0.0046	0.0028

Final Model (1/2)

$$logit(\pi_i) = \beta_0 + \beta_1 x_{gender} + \beta_2 x_{asa_status} + \beta_3 x_{osteoar} + \beta_4 x_{baselinecharlson} + \beta_5 x_{complicationrsi} + \beta_6 x_{month}$$

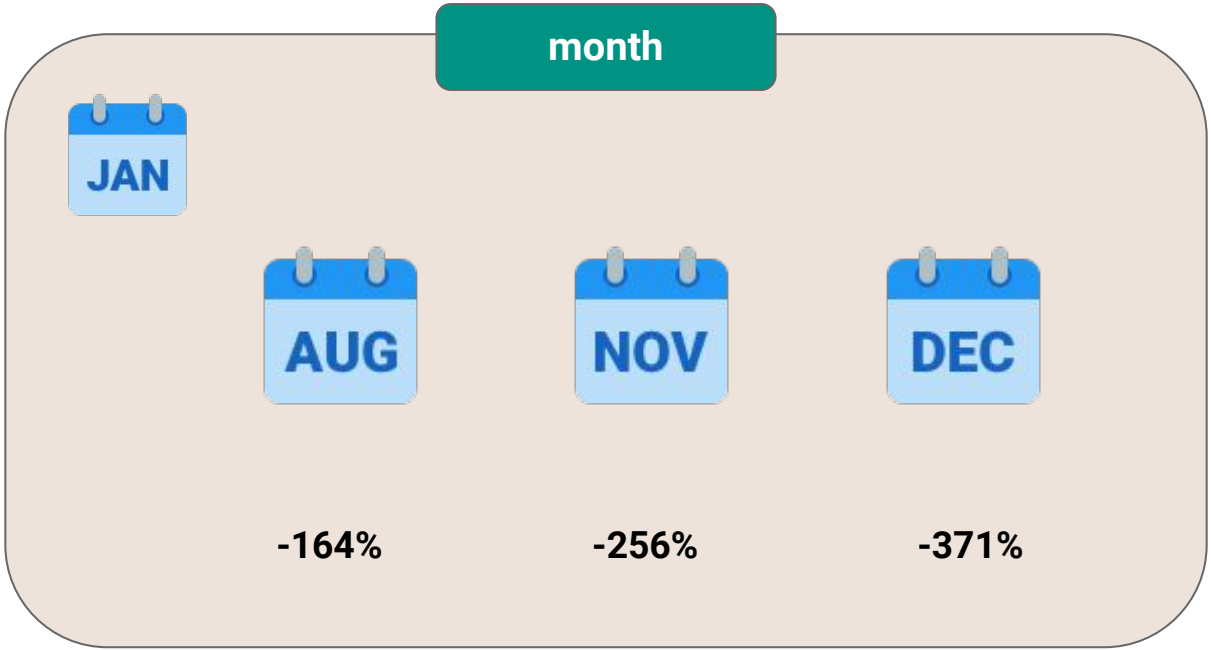
gender

- 43%

osteoarthritis

+ 116 %

Final Model (2/2)



Conclusion

- Hour, day of week, and moonphase are not significant at 0.05 level. No association was found between scheduled hour of surgery and 30-day mortality. Similarly, no association was found for day of week or moonphase.
- There is an association between month and 30-day mortality. If a surgery is scheduled in Aug, Nov, or Dec, the likelihood of death within 30 days decreases.

Limitation:

The observations in this dataset are selected only from scheduled general surgeries that happen on routine workday and workweek, and does not include emergency surgeries. The dataset does not includes all types of surgeries in the hospital, our conclusion might be very biased.


THANK
YOU!