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# Operative Outcomes in Same Day vs. Next Day Laparoscopic Appendectomies

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## Background

- Acute appendicitis affects over 5% of the US population and is the most common cause of acute abdominal pain requiring surgery.
- Acute appendicitis is usually managed with a combination of antibiotics, pain management and surgical appendectomy.
- Perforation, abscess formation, and sepsis are possible complications of acute appendicitis.
- Postoperative complications include infection, ileus, vomiting, pain, and abscess formation, among others.
- The literature shows great variability in how acute appendicitis is treated including time of treatment, use of antibiotics, administration of IV fluids, and surgical techniques.
- This study aims to investigate if there is an association between time of appendectomy (same day vs. next day) and post-operative outcomes.

## Methods

This was a retrospective cohort study conducted through secondary data analysis of the American College of Surgeons National Surgical Quality Improvement Program of 33,799 adult patients who had laparoscopic appendectomies (25,916 same day; 7,460 next day) in the United States in 2016. The main independent variable was timing of laparoscopic appendectomy and the main dependent variable was adverse outcome. Multivariate logistic regression analysis was conducted to assess the association between timing of appendectomy and adverse outcome. The alpha level was set at 0.05 for statistical significance. Adverse outcomes were defined as post-operative infection and readmission/reoperation. Confounding variables included gender, race, Hispanic ethnicity, diabetes, smoking status, hypertension, BMI, and age.

**Table 1: Characteristics of adult patients who had a laparoscopic appendectomy in 2016 (N=33,799)**

Characteristics	Same Day N (%)	Next Day N (%)	p-value*
Gender			<0.001
Male	13,436 (51.8)	3,650 (48.9)	
Female	12,480 (48.2)	3,810 (51.1)	
Race			<0.001
White	18,359 (85.0)	5,123 (83.1)	
Black	1,812 (8.4)	619 (10.0)	
Asian	1,141 (5.3)	359 (5.8)	
Other <sup>1</sup>	287 (1.3)	65 (1.1)	
Hispanic	3,822 (17.0)	13,221 (20.2)	<0.001
Diabetes	1,186 (4.6)	370 (5.0)	0.166
Smoking	4,462 (17.2)	1,341 (18.0)	0.128
Hypertension	3,865 (14.9)	1,152 (15.4)	0.260
BMI			0.021
<18.5	330 (1.3)	99 (1.3)	
18.5-24.9	7,115 (27.5)	2,121 (28.4)	
25-29.9	8,188 (31.6)	2,217 (29.7)	
>30	10,283 (39.7)	3,023 (40.5)	
Age			0.035
18-55	21,479 (82.0)	6,265 (84.0)	
56-70	3,416 (13.2)	898 (12.0)	
>70	1,021 (3.9)	297 (4.0)	

<sup>1</sup>Other defined as American Indian/Alaskan Native/Native Hawaiian/Pacific Islander

<sup>2</sup>Reference: Odds Ratio=1.00

Abbreviations: BMI= Body Mass Index

## Results

**Table 2: Unadjusted and adjusted associations between days to operation and reoperation or readmission, other patient characteristics and infection in patients who had a laparoscopic appendectomy in 2016 (N=33,799)**

Characteristics	Infection		Reoperation and Readmission	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Days to Operation				
Same Day	Reference <sup>2</sup>			
Next Day	1.08 (1.02-1.14)	1.07 (1.01-1.14)	1.08 (0.92-1.27)	1.15 (0.96-1.37)
Gender				
Male	Reference			
Female	1.07 (1.02-1.12)	1.10 (1.04-1.16)	0.83 (0.73-0.95)	0.83 (0.71-0.97)
Race				
White	Reference			
Black	0.74 (0.67-0.81)	0.67 (0.61-0.74)	1.16 (0.90-1.48)	1.15 (0.89-1.48)
Asian	0.98 (0.88-1.10)	0.95 (0.85-1.07)	0.92 (0.65-1.29)	0.78 (0.54-1.13)
Other <sup>1</sup>	1.60 (1.30-1.98)	1.49 (1.19-1.86)	0.88 (0.43-1.77)	0.83 (0.39-1.77)
Hispanic	0.88 (0.83-0.94)	0.81 (0.75-0.88)	0.67 (0.54-0.83)	0.74 (0.57-0.95)
Diabetes	1.46 (1.31-1.62)	1.37 (1.21-1.55)	1.70 (1.32-2.19)	1.24 (0.91-1.70)
Smoking	1.10 (1.04-1.17)	1.11 (1.04-1.19)	1.25 (1.06-1.48)	1.19 (0.98-1.44)
Hypertension	1.21 (1.13-1.29)	1.11 (1.02-1.20)	1.70 (1.45-2.00)	1.23 (0.99-1.53)
BMI				
<18.5	1.14 (0.93-1.40)	1.20 (0.95-1.51)	1.32 (0.78-2.25)	1.59 (0.87-2.88)
18.5-24.9	Reference			
25-29.9	0.99 (0.93-1.05)	1.00 (0.93-1.08)	0.98 (0.82-1.17)	0.95 (0.77-1.16)
>30	1.19 (1.12-1.26)	1.21 (1.14-1.30)	1.02 (0.87-1.21)	1.02 (0.84-1.24)
Age				
18-55	Reference			
56-70	1.04 (0.97-1.12)	0.94 (0.86-1.02)	1.55 (1.30-1.86)	1.42 (1.15-1.76)
>70	1.14 (1.02-1.28)	0.98 (0.86-1.13)	2.52 (1.98-3.22)	2.08 (1.52-2.84)

<sup>1</sup>Other defined as American Indian/Alaskan Native/Native Hawaiian/Pacific Islander

<sup>2</sup>Reference: Odds Ratio=1.00

Abbreviations: BMI= Body Mass Index

## Discussion

Table 1 shows the characteristics of adult patients who underwent laparoscopic appendectomy in 2016. Males had a 3% greater occurrence of same day surgery while females had a 3% lesser occurrence (p<0.001). White patients had a 2% greater proportion of same day surgery while Black and Asian patients had slightly higher proportions of patients undergoing next day surgery (p<0.001). There was a 3% greater occurrence of Hispanics having next day surgery (p<0.001).

After adjustment, Table 2 shows that next day appendectomy had 1.07 times the risk for infection and 1.15 times the risk for reoperation and readmission although the latter was not significant. Females, smokers, and those with hypertension were about 10% more likely to have an infection. Conversely, females had a 17% decreased risk of reoperation/readmission. Those with a race defined as other, diabetes, or a BMI >30 showed statistically significant increased risks for infection. Black race had 33% lower risk for infection. Patients aged 56-70 had at 42% increased risk while patients older than 70 had a 108% increased risk for reoperation/readmission. Of interest, Hispanic patients had 19% decreased risk of infection as well as a 26% decreased risk of reoperation/readmission.

## Conclusions

- There is an association between same day vs. next day laparoscopic appendectomies and infection.
- Female gender had an increased risk for infection but decreased risk for reoperation/readmission. Future research should identify whether gender plays a role in other outcomes.
- Hispanic ethnicity had decreased risks for both infection and reoperation/readmission.
- Patients older than 56 years had the highest increased risk for reoperation/readmission.
- Future research should aim to identify the exact time interval from hospital arrival to time of surgery to minimize risk of adverse outcomes.