Divine Word Hospital
Tacloban City

POST-OPERATIVE OUTCOMES OF IN-HOSPITAL DELAYED APPENDECTOMY VS EMERGENT APPENDECTOMY - A RETROSPECTIVE COHORT STUDY AT A TERTIARY TRAINING HOSPITAL

A Research

By

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Abstract

This study describes post-operative outcomes of in-hospital delayed versus emergent appendectomies performed at Divine Word Hospital from 2019 to 2024. Using a retrospective cohort and non-experimental archival design, the research examined patient demographics, surgical approaches, and recovery outcomes to inform improvements in surgical practice and patient care. Specifically, the study analyzed patient age and sex, the types of appendectomy performed (laparoscopic versus open), and post-operative outcomes, including length of hospital stay, complications, and the incidence of ruptured appendices.

The results showed a diverse patient population, with the majority of patients being young and male. The largest age group was 19–28 years (27%), followed by patients under 18 years (23%), with males comprising 70% of cases. Open appendectomy was the predominant approach (91%, 208 cases), while laparoscopic procedures accounted for only 9% (20 cases). Emergent surgeries were more frequent among open procedures (41%) compared with laparoscopic cases (10%), and open surgeries were more likely to experience in-hospital delays. Notable differences were observed in post-operative outcomes. Laparoscopic appendectomies were associated with more extended hospital stays but no reported post-operative complications. In contrast, open surgeries had a higher incidence of complications, including rare but serious conditions such as septic shock and pneumonia, particularly in cases with prolonged delays. Nevertheless, most patients in both groups experienced no complications.

Overall, the findings indicate that while open appendectomies remain common, particularly in emergent and complex cases, they are associated with more extended hospital stays and higher complication rates. Laparoscopic appendectomy, although less frequently utilized, has demonstrated fewer complications and may be a safer option for less urgent cases, highlighting the importance of tailoring surgical approaches to the patient's condition and urgency.

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Chapter I

INTRODUCTION

Background of the Study

Appendectomy is the surgical removal of the appendix.[1] In the emergency department, acute abdominal pain comprises about 7-10% of consults. Among the most common causes of lower abdominal pain is acute appendicitis (AA), it is the most common diagnosis made in young patients who end up admitted to the hospital with an acute abdomen.[2]

In developed countries, the incidence of AA occurs at a rate of 5.7-50 patients per 100,000 population annually, occurrences peak at ages 10 to 30 years old.[3] Geographical differences also exist with a lifetime risk for AA in the USA, Europe and Africa at 9%, 8% and 2% respectively.[4] Also, the rate of perforation varies from 16 to 40% with younger age brackets at 40-57% and patients older than 50 years at 55-70%.[5] The incidence of AA in developing countries is lower than in developed countries. In Southeast Asia, Indonesia has the highest prevalence of 0.05% followed by the Philippines, with a prevalence of 0.022% and Vietnam of 0.02%.[6]

The standard of care in the treatment of acute appendicitis is emergency appendectomy. Emergency surgery is commonly performed on patients with appendicitis, but research has explored the effectiveness of urgent surgery (within 12 hours) in a semi-elective setting after administering antibiotics at admission.[7] These studies found no major differences in post-operative outcomes, except for a slightly longer hospital stay in those who underwent urgent surgery.

At present, delaying surgery by less than 12 hours is considered acceptable for patients with symptoms lasting under 48 hours and in cases of non-perforated, non-gangrenous appendicitis.[8] There is a traditional dictum that every unperforated appendicitis would become perforated. Hence, it was widely accepted to do emergency appendectomy with little delay to minimize the development of perforation. This dictum however originated more than 100 years ago when perforated appendicitis had high mortality rates, this is no longer true in modern times.[9]

According to a study[10], the potential disadvantages of doing emergency surgery is the timing where sometimes it would be performed at night. There are reports of higher morbidity and error rates when operating at night. At night, not all hospitals are staffed or set up for 24 hour operating room availability or optimal imaging modalities at their disposal.[11,12] Therefore, delaying appendectomy would provide more opportunities for imaging confirmation of clinical diagnosis or the chance for conservative management with antibiotics.[13]

Open and laparoscopic appendectomy are routinely performed at Divine Word Hospital. Despite its regular occurrence, there appears to be no existing literature or formal studies documenting the hospital's specific practices, outcomes, or case reports related to this procedure. This gap in research presents an opportunity for healthcare professionals and researchers at the hospital to contribute valuable insights to the medical field.

This study sought to compare the post-operative outcomes of in-hospital delayed versus emergent appendectomies performed at Divine Word Hospital from 2019 to 2024. Studies on local appendectomy procedures could provide valuable insights into patient demographics, recovery outcomes, and surgical innovations, which may help refine practices and improve patient care.

Review Of Related Literature

An appendectomy is a surgical procedure performed to remove the appendix, a small, finger-shaped organ attached to the large intestine.[1] This operation is typically done when a patient is diagnosed with appendicitis, a condition where the appendix becomes inflamed and infected, often causing severe abdominal pain. If left untreated, an inflamed appendix can rupture, leading to serious complications such as infection of the abdominal cavity (peritonitis).[2] Appendectomy is usually performed either through open surgery, involving a single larger incision, or laparoscopically, using small incisions and a camera to guide the surgery.[3] The procedure is generally safe, with most patients recovering within a few weeks, and it effectively prevents further episodes of appendicitis.[4]

There have been several studies conducted on these surgical procedures. One of these studies was conducted by Téoule[5] and colleagues, acute appendicitis can develop at any age, it is most frequently seen in individuals aged 5 to 45. This distribution indicates a higher likelihood of appendicitis during childhood, teenage years, and early adulthood, with the average age of onset being 28. Additionally, males have a slightly higher risk of developing acute appendicitis compared to females. The lifetime incidence is approximately 8.6% in males and 6.7% in females.

Moreover, according to the study of Petruzziello[6] and colleagues, Acute appendicitis is a frequent cause of Emergency Department (ED) admissions. It predominantly impacts nearly 70% of individuals under the age of 30, while about 10% of cases occur in those over 60 years old.

Another study by Krzyzak[7] et al. concurred these observations that Appendicitis most commonly occurs between the ages of 10 and 20, with a higher likelihood observed in males.

Appendectomy can be performed in two ways, through laparoscopy and open surgery. A laparoscopic appendectomy is a minimally invasive surgical procedure used to remove the appendix, typically when a patient has appendicitis.[8] Instead of making a large incision in the abdomen, the surgeon makes a few small incisions through which a laparoscope—a thin tube with a camera attached—is inserted. The camera allows the surgeon to view the inside of the abdomen on a monitor and perform the surgery with specialized instruments.

This technique offers several advantages over traditional open surgery, including smaller scars, reduced postoperative pain, shorter hospital stays, and faster recovery times.[9] Laparoscopic appendectomy is considered a safe and effective option for treating appendicitis, particularly for patients without severe complications like a ruptured appendix.[10]

On the other hand, An open surgery appendectomy is a traditional surgical procedure used to remove the appendix, typically when a patient has appendicitis. In this method, the surgeon makes a single, larger incision—usually 2 to 4 inches long—in the lower right side of the abdomen.[11] This allows direct access to the appendix for its removal.

Open appendectomy is often chosen when the appendix has ruptured or if there are complications such as abscesses or severe infection, as it provides better visibility and access for cleaning the abdominal cavity.[12] While the recovery time is generally longer than with laparoscopic appendectomy, open surgery is sometimes necessary for more complex cases.[13]

There have been some studies on antibiotic treatment of uncomplicated appendicitis where it involves treating this subgroup of patients conservatively and performing appendectomy only when conservative management fails.[14] In these studies they have shown that the uncomplicated subgroup do not have an increased perforation rate when appendectomy is delayed. Hence the fear of delaying appendectomy due to perforation is not as clear cut as previously thought.[15] The same idea can be surmised in the study of Calpin[16] that There is a lack of clarity on the timeframe in which surgery should be performed to avoid unfavorable outcomes. It can be inferred that the disease process is different from unperforated to perforated appendicitis.[17] Following this train of thought is that most appendices would have been perforated upon arrival to the hospital and perforation cannot be prevented from emergent surgery.

Laparoscopic and open appendectomies can be done via emergent or in-hospital delayed. Laparoscopic appendectomy has become the preferred surgical approach for treating acute appendicitis due to its minimally invasive nature and faster recovery time compared to open surgery.[18] However, debate exists regarding the optimal timing of the procedure—whether emergent or delayed surgery yields better outcomes. Research comparing the outcomes of emergent versus in-hospital delayed laparoscopic appendectomy provides insights into patient safety, recovery, and overall surgical success.

According to 2020 WSES Jerusalem guidelines, delaying an appendectomy for uncomplicated acute appendicitis for up to 24 hours after admission generally does not increase the risk of developing complications such as complicated appendicitis, postoperative infections, or other morbidities. However, performing the surgery more than 24 hours after admission has been associated with a higher likelihood of negative outcomes.[19] This finding was supported by Meschino et al.[20]

where they concluded that increasing length of time between admission and operation and overnight operating were associated with greater morbidity and mortality for emergency general surgery (EGS) patients.

Moreover, several studies emphasize the advantages of emergent laparoscopic appendectomy in cases of uncomplicated appendicitis.[21] An emergent approach, typically performed within hours of diagnosis, reduces the risk of perforation and subsequent complications like peritonitis or abscess formation.[22] Patients undergoing emergent surgery generally experience shorter hospital stays, fewer postoperative complications, and faster recovery times. Studies such as Bhangu et al.[23] indicate that prompt surgery significantly lowers the incidence of postoperative infections, leading to better patient outcomes in the immediate postoperative period.

On the other hand, in-hospital delayed laparoscopic appendectomy is often employed in cases of complicated appendicitis, such as those with abscess formation or severe inflammation.[24] Several studies support this conservative approach, suggesting that delaying surgery until after a period of antibiotic therapy can reduce surgical risks associated with inflamed or infected tissue. For instance, a study by Jo et al.[25] found that patients with appendiceal abscesses who underwent delayed surgery after abscess drainage had lower rates of intraoperative complications compared to those who underwent immediate surgery. Additionally, the risk of postoperative infections and wound complications was lower in the delayed group.

However, in-hospital delayed appendectomy is not without risks. Some research indicates a higher rate of recurrent appendicitis in patients waiting for surgery, especially when the delay is prolonged beyond recommended timeframes.[26] A meta-analysis by Li[27] found that while in-hospital delayed appendectomy can reduce surgical risks in complicated cases, it may also increase the likelihood of recurrent inflammation, leading to emergency surgery under less controlled conditions.

Post-operative outcomes continue to vary based on factors such as the type of surgery performed (open vs. laparoscopic), the timing of surgery (emergent vs. delayed), and patient-specific variables (age, comorbidities, and the presence of complications like perforation).[28]

However, the shift from open to laparoscopic appendectomy has been widely associated with improved post-operative outcomes.[29] Numerous studies, including a meta-analysis by Zhang and Wu[30] have demonstrated that patients undergoing laparoscopic appendectomy experience shorter hospital stays, reduced post-operative pain, and quicker return to normal activities compared to those who undergo open surgery. Additionally, the minimally invasive nature of laparoscopic surgery results in fewer wound infections and lower rates of post-operative ileus, a common complication in open surgery.[31] Laparoscopic surgery is also associated with better cosmetic outcomes, making it the preferred approach, particularly in younger patients.[32]

Complications following appendectomy are generally low, though they can vary based on the presence of preoperative factors like perforation or abscess formation. Studies have consistently shown that complicated appendicitis (with perforation or abscess) increases the likelihood of post-operative complications, including wound infections, intra-abdominal abscesses, and sepsis. For instance, a study by Fayraq et al.[33] highlighted that the rate of post-operative infections in patients with complicated appendicitis was significantly higher than in those with uncomplicated cases. The use of antibiotics post-surgery has been shown to reduce these risks but does not eliminate them entirely.[34]

Age and comorbidities also play a crucial role in post-operative outcomes. Elderly patients and those with underlying health conditions (e.g., diabetes or cardiovascular disease) tend to have higher rates of post-operative complications, including prolonged hospital stays and a greater need for intensive care. A population-based study by Wu et al.[35] found that elderly patients had a higher risk of post-operative mortality and morbidity, likely due to delayed diagnosis and the presence of comorbidities that complicate both surgery and recovery.

As for recovery time, most patients recover quickly from appendectomy, especially those who undergo laparoscopic surgery.[36] Studies suggest that the majority of patients can return to normal activities within 1-3 weeks post-surgery, with laparoscopic patients typically resuming activities sooner than those undergoing open surgery. A prospective study by Hussein et al.[37] found that patients

who had laparoscopic surgery returned to work significantly earlier and reported better post-operative quality of life scores compared to those who had open appendectomy.

However, some patients experience longer-term complications, such as chronic post-appendectomy pain or adhesions, which can lead to bowel obstructions in rare cases. Research by Jaschinski et al.[38] indicated that while chronic pain after appendectomy is uncommon, it can persist in a small percentage of patients, particularly those who underwent open surgery or had complicated appendicitis.

Long-term outcomes following appendectomy are generally favorable, with most patients experiencing no significant health issues post-surgery.[39] However, some studies suggest that a small subset of patients may develop long-term gastrointestinal issues, such as irritable bowel syndrome (IBS)-like symptoms. For example, a study by Yang et al.[40] found an increased incidence of IBS symptoms in patients post-appendectomy, though the mechanism behind this association remains unclear. Additionally, the risk of adhesions, which can lead to bowel obstructions, is a rare but notable long-term complication, particularly in patients with complicated appendicitis.[41]

Synthesis

In conclusion, the decision between emergent and delayed laparoscopic appendectomy largely depends on the complexity of appendicitis. While emergent surgery provides clear benefits for uncomplicated cases, delayed appendectomy is preferred for patients with complicated presentations to reduce intraoperative risks. Further studies are needed to refine guidelines on optimal timing, particularly in complex cases, to balance the risks of delayed intervention against the benefits of minimizing surgical complications.

Significance of the Study

The findings of the study may be beneficial to the following:

To the surgeons performing appendectomies

By comparing the post-operative outcomes of emergent and in-hospital delayed appendectomy, the study aimed to provide evidence-based insights that can guide surgical decision-making. The findings hope to aid surgeons understand the potential risks and benefits of delaying surgery in specific clinical scenarios, such as in patients with nonperforated appendicitis. Additionally, this research could contribute to optimizing patient care by informing surgeons about the safety and effectiveness of in-hospital delays, potentially leading to improved patient outcomes and more efficient use of hospital resources. Ultimately, the study seeks to enhance the quality of appendectomy procedures performed at Divine Word Hospital and support surgeons in making well-informed, patient-centered decisions.

To the medical academic institution

By generating new knowledge specific to the practices at Divine Word Hospital, the study may fill a critical gap in the existing literature and contribute to the academic community's understanding of its post-operative outcomes. The findings could inform future teaching and training programs, enhancing the curriculum by incorporating evidence-based practices that reflect real-world hospital settings. Furthermore, this research may serve as a foundation for future studies, encouraging further academic inquiry and fostering a culture of research within the institution. Ultimately, the study may strengthen the institution's reputation as a leader in advancing medical knowledge and improving patient care.

To the medical surgical field:

By providing evidence-based data on the post-operative outcomes of their patients, the research can help refine surgical practices and decision-making processes, particularly in managing appendicitis. The findings may challenge or reinforce current standards of care, contributing to the ongoing evolution of surgical protocols and guidelines. Additionally, this study may offer insights into optimizing patient outcomes, reducing complications, and improving resource allocation within surgical departments. Ultimately, the research may support advancements in the surgical field, promoting safer, more effective, and patient-centered approaches to appendectomy.

To future researchers:

By offering detailed insights into the post-operative outcomes and implications of different surgical timing strategies, the study can guide subsequent investigations and help shape research questions. It may identify areas where further exploration is needed, such as the impact of specific patient factors or variations in surgical techniques. Additionally, the data and conclusions drawn from this research can be used to compare with findings from other institutions, fostering broader academic discussions and collaborations. Ultimately, this study may contribute to the ongoing development of evidence-based practices in appendectomy and inspire future researchers to build upon its findings, advancing the field of surgery and medicine.

Conceptual framework

Figure 1 presents the conceptual framework of the study. Foremostly, the study identified the demography of patients in terms of their age and sex, followed by their surgical modality or if they were operated through laparoscopy or open. After the surgical modality was determined, the timing of surgery whether emergent, in-hospital delayed or delayed by more than 24 hours was also considered. By looking at these variables the study determined the post-operative outcomes of the surgery.

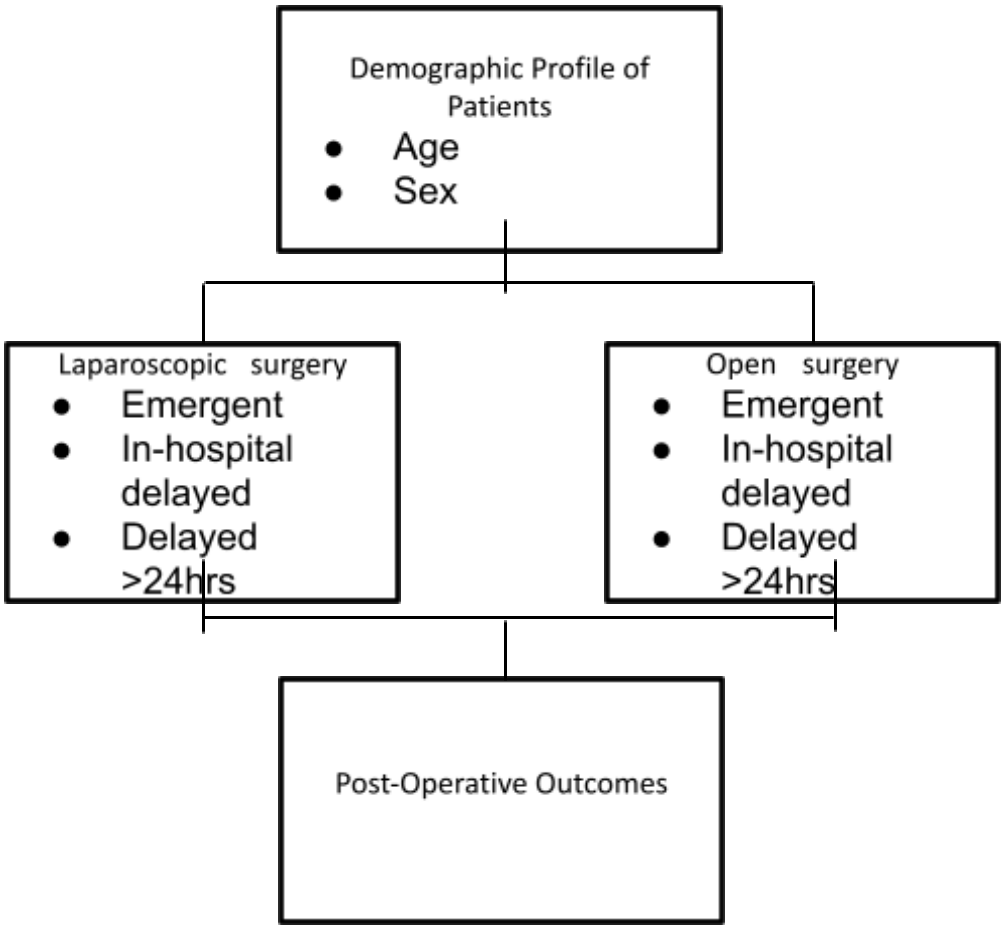

Figure 1: Conceptual Framework of the Study

Research Objectives

General Objective:

To determine the differences in post-operative outcomes of in hospital delayed appendectomy to emergent appendectomy, both for laparoscopic and open surgery procedures.

Specific Objectives:

1. Determine the demographic profile of patients who underwent appendectomy in terms of the following:
    a. Age
    b. Sex
2. Determine the modality of appendectomies done as to:
    a. Laparoscopic surgery
        i. Emergent
        ii. In-hospital delayed
        iii. Delayed >24 hrs
    b. Open surgery
        i. Emergent
        ii. In-hospital delayed
        iii. Delayed >24 hrs
3. Determine the post-operative outcomes of patients who underwent appendectomy in terms of:
    a. Length of hospital stay; and
    b. Postoperative complications
4. Determine the incidence of ruptured appendix during appendectomy.

Chapter II

METHODOLOGY

Research Design

This study utilizes retrospective cohort analysis for its design.

Participants

Included in the study are all patients who underwent appendectomy at the Divine Word Hospital, from January 2019 to September 2024 who meet the following eligibility criteria:

Inclusion criteria:

a. Patients who underwent in-hospital delayed and emergent appendectomy via laparoscopic and open surgery at Divine Word Hospital.
b. Patients who underwent laparoscopic and open surgery appendectomy at Divine Word Hospital from January 2019 to September 2024.
c. The patient must have a medical record at the Divine Word Hospital medical record section.

Exclusion criteria:

a. Patients whose appendectomy was conducted outside of Divine Word Hospital.
b. Surgery procedures other than appendectomy.

Research Locale

The entire study was conducted at the Divine Word Hospital Medical records section.

Data Collection Process

The data gathering process started with seeking approval from the Department of Surgery to utilize the data from the medical records. The permission clearly indicated that only data from January 2019 to September 2024 will be utilized in this study. After this was settled, the researcher conducted the data collection from the medical records.

Part 1 gathered the patient's demographic profile, which included age and sex.

Part 2 collected information related to the modality of appendectomy conducted, such as whether it was laparoscopic or open surgery and if they are emergent or in-hospital delayed.

Part 3 of the data gathering involved determining the post-operative outcomes of patients who underwent appendectomy, in terms of length of hospital stay, postoperative complications and recovery time.

Data Analysis

A non-experimental/ archival approach was be used to gather data in this study. The data was obtained from existing medical records of patients who underwent appendectomy, both via in-hospital delay and emergent.

The study utilized descriptive analysis technique in the processing and interpretation of data. All the data collected were gathered and process using dummy tables (*See Appendix C for the Dummy Tables*).

For the demographic profile of the patients, the study generated frequency and percentage value, as well as for analyzing the modality of appendectomies and post-operative outcomes.

Budget

This research is not supported by a grant. All expenses was covered by the researcher.

ITEM	NUMBER OF UNITS	COST PER UNIT (Php)	SUBTOTAL (Php)
Personnel Services Research Assistant			5,000 10,000
Maintaining Operation A. Office Supplies Bond Paper Printer Ink Folder Book Binding	 5 reams 5 cartridges 30 pcs 4	 300 150 25 800	 1,500 750 750 3,200

B. Other Miscellaneous/ Incidental Expenses	Snacks and commuting fares		5,000
		TOTAL	**Php 26, 200.00**

Definition of Terms

The following terms were operationally and conceptually used in the study:

Age - refers to the length of time that a person has lived.

Appendectomy - refers to the surgical procedure for removing the appendix, typically performed to treat appendicitis, which is the inflammation of the appendix

Emergent surgery - defined as a surgical intervention that is conducted within less than 12 hours from the time of diagnosis.

In-hospital delayed surgery- refers to a surgical procedure that is performed after a delay from the initial diagnosis, within a hospital setting. This type of surgery occurs when the intervention is scheduled to take place more than 12 hours but less than 24 hours after the diagnosis.

Laparoscopic appendectomy - is a minimally invasive surgical procedure used to remove the appendix by creating several small incisions in the abdomen through which they insert a specialized and other specialized surgical instruments.

Length of hospital stay - refers to the duration of time a patient remains in a hospital from the time of admission until discharge

Open appendectomy - a traditional surgical procedure for removing the appendix through a larger abdominal incision at the lower right side.

Postoperative complications - are any adverse effects or issues that arise following a surgical procedure

Recovery time - refers to the duration needed for a patient to return to their normal level of health and activity after surgery

Sex- categorized into male and female, based on the presence of specific reproductive organs and systems.

Chapter III

RESULTS and CONCLUSIONS

The study collected data from the charts of 228 patients. The researcher referred to the charts of the patients for clinical information related to the study.

Results

1. Demographic Profile

Table 1 summarizes the demographic profile of patients who underwent appendectomy at the Divine Word Hospital from January 2019 to September 2024.

The demographic data reveals a diverse age and sex composition within the population surveyed. Notably, the majority of individuals fall within the younger age brackets. The largest age group is 19-28 years, representing 27% of the total population, followed closely by those under 18, who make up 23%. Individuals aged 29-38 years account for 14%, while those aged 39-48 years represent 13%. Those over 59 years of age make up a smaller portion of the group, at 12%.

Regarding sex distribution, the population is predominantly male, with 139 individuals (70%) identifying as male, while 89 individuals (30%) identify as female. This significant difference in sex distribution could indicate trends in participation rates by gender or reflect the gender composition of the community from which this sample is drawn.

In summary, the population skews younger and is primarily male, which resonates with the findings of Téoule et al. (2020) and Krzyzak et al. (2020). These patterns could have implications for understanding engagement trends, resource needs, or targeted interventions based on age and gender.

Table 1. Demographic Profile of Patients
n=228, January 2019 - September 2024, DWH

Characteristic	Frequency *(f)*	Percentage (%)
Age		
<18	53	23%
19-28	61	27%
29-38	32	14%
39-48	29	13%
49-58	26	11%
>59	27	12%
Sex		
Male	139	70%
Female	89	30%

2. Modality of Appendectomy and OR Timing

As can be seen on Table 2, The findings compare the frequency and timing of laparoscopic and open surgeries. Laparoscopic surgeries accounted for a small portion of the total procedures, with only 20 cases (9%). Among these, 10% (2 cases) were performed emergently, requiring immediate intervention due to critical conditions. The majority of laparoscopic surgeries, 55% (11 cases), were in-hospital delayed but occurred within 24 hours, suggesting a need for further preparation or stabilization before surgery. A notable 35% (7 cases) of laparoscopic surgeries were delayed beyond 24 hours, possibly indicating more complex cases requiring extended evaluation or logistical constraints.

In contrast, open surgeries made up the overwhelming majority, with 208 cases (91%). Of these, 41% (85 cases) were emergent, reflecting a higher rate of immediate need compared to laparoscopic procedures. A significant portion, 33% (69 cases), involved in-hospital delays within 24 hours, while 26% (54 cases) were delayed beyond 24 hours. This suggests that while open surgeries were more common, they also experienced delays, albeit with a smaller proportion delayed for more than 24 hours compared to laparoscopic surgeries.

Overall, open surgeries were far more frequent, and emergent cases were more commonly managed through open surgery, while laparoscopic procedures were less frequent and experienced slightly longer delays in certain cases.

Table 2. Appendectomy Modality and OR Timing
n=228, January 2019 - September 2024, DWH

Characteristic	Frequency *(f)*	Percentage (%)
Laparoscopic surgery	**20**	**9%**
Emergent	2	10%
In-hospital delayed	11	55%
Delayed >24 hrs	7	35%
Open surgery	**208**	**91%**
Emergent	85	41%
In-hospital delayed	69	33%
Delayed >24 hrs	54	26%

3. Post-Operative Outcomes

This study looked into three post-operative outcomes of appendectomy and whether they are influenced by surgical modality and OR timing. The three post-operative outcomes include length of hospital stay and post-operative complications. Based on the data gathered, the data revealed distinct patterns in the duration of hospital stays for patients undergoing these procedures.

For patients who underwent laparoscopic surgery, a total of 20 individuals were recorded. Among these, there were no patients who stayed for 1-2 or 3-4 days, but the breakdown for those who stayed longer was as follows: 8 patients experienced in-hospital delays, with 2 staying 3-4 days and 1 staying 5-6 days, while 11 patients stayed for more than 7 days. Additionally, 4 patients delayed their discharge for more than 24 hours, with 1 staying in the hospital for 3-4 days and 3 for 5-6 days.

In stark contrast, patients undergoing open surgery exhibited a significantly longer average hospital stay, totaling 208 patients. Breaking this down further, 4 patients remained for 1-2 days, while 44 stayed for 3-4 days, 18 for 5-6 days, and 16 for more than 7 days, making a total of 82 patients for emergent cases alone.

The data on in-hospital delays for open surgery showed that no patients were discharged within 1-2 days, but 29 patients remained for 3-4 days, 24 for 5-6 days, and 18 for over 7 days, totaling 71 patients. Furthermore, for those whose discharges were delayed by more than 24 hours, there were again no cases for 1-2 days. However, 8 patients stayed for 3-4 days, 21 for 5-6 days, and a notable 26 patients stayed for more than 7 days, resulting in a total of 55 patients.

Overall, the data on Table 3 underscores a clear trend: patients undergoing laparoscopic surgery typically had shorter hospital stays compared to those who had open surgery, highlighting the potential benefits of minimally invasive procedures in terms of recovery time. This findings corroborates with the findings of Di Saverion et al. (2020) stating that patients undergoing emergent surgery generally experience shorter hospital stays, fewer postoperative complications, and faster recovery times. The findings of the present study was also strengthened by the findings of Zhang and Wu (2022) indicating that patients undergoing laparoscopic appendectomy experience shorter hospital stays, reduced post-operative pain, and quicker return to normal activities compared to those who undergo open surgery.

Table 3. Length of Hospital Stay
n=228, January 2019 - September 2024, DWH

Characteristic	Length of Hospital Stay (in days)				Total
	1-2	3-4	5-6	>7	
Laparoscopic surgery					**20**
Emergent		1	0	0	1
In-hospital delayed		8	2	1	11
Delayed >24 hrs		4	1	3	8
Open surgery					**208**
Emergent	4	44	18	16	82
In-hospital delayed	0	29	24	18	71
Delayed >24 hrs	0	8	21	26	55

Table 3.1 outlines the occurrence of post-operative complications for both laparoscopic and open surgeries, categorized by the urgency and delay in treatment. It tracks the incidence of complications such as death, septic shock, pneumonia, acute kidney injury (AKI), hypokalemia, and the absence of complications.

In laparoscopic surgery, no patients—whether emergent, in-hospital delayed, or delayed for more than 24 hours—experienced any post-operative complications. This includes no instances of death, septic shock, pneumonia, AKI, or hypokalemia. As indicated in the study of Biondi (2016), the shift from open to laparoscopic appendectomy has been widely associated with improved post-operative outcomes. Open surgeries, however, presented more complications. Among emergent

open surgeries, there was one case of death, one case of septic shock, and one case of hypokalemia, but no occurrences of pneumonia or AKI. In-hospital delayed open surgeries saw three cases of pneumonia and two cases of hypokalemia, though no deaths, septic shock, or AKI were noted. When open surgeries were delayed for more than 24 hours, complications became more frequent, with two cases of septic shock, five cases of pneumonia, three cases of AKI, and one case of hypokalemia, though no deaths occurred.

In total, across both surgery types and delay categories, there was one death, three cases of septic shock, eight cases of pneumonia, three cases of AKI, and four cases of hypokalemia—all occurring in open surgeries. Despite these complications, the vast majority of patients, 209 in total, experienced no complications following surgery. This suggests that while laparoscopic surgeries had no post-operative complications, open surgeries—especially with longer delays—had relatively rare but more frequent complications.

Table 3.1 Post-Operative Complications
n=228, January 2019 - September 2024, DWH

Characteristic	Post-Operative Complications					
	Death	Septic Shock	Pneu-monia	AKI	Hypo-kalemia	No Complications
Laparoscopic surgery						
Emergent	0	0	0	0	0	0
In-hospital delayed	0	0	0	0	0	0
Delayed >24 hrs	0	0	0	0	0	0
Open surgery						
Emergent	1	1	0	0	1	0
In-hospital delayed	0	0	3	0	2	0
Delayed >24 hrs	0	2	5	3	1	0
Total	**1**	**3**	**8**	**3**	**4**	**209**

4. Rupture Appendix Incidence During Appendectomy

Table 4 compares the number of laparoscopic and open surgeries based on the urgency of the procedure and whether a rupture occurred. In total, there were 32 emergent surgeries, with just 1 being laparoscopic and 31 being open surgeries. For surgeries delayed while the patient was still in

the hospital, there were 31 cases—5 laparoscopic and 26 open. When surgeries were delayed for over 24 hours, there were 25 total procedures, of which 2 were laparoscopic and 23 were open surgeries. Additionally, the table highlights surgeries where no rupture occurred; out of 140 such cases, 12 were laparoscopic and 128 were open surgeries.

In summary, of the 228 surgeries overall, 20 were laparoscopic, while 208 were open, indicating that open surgeries were much more common across all categories, whether emergent, delayed, or involving no rupture.

Table 4. Ruptured Appendix
n=228, January 2019 - September 2024, DWH

Characteristic	Laparoscopic Surgery	Open Surgery	Total
Emergent	1	31	32
In-hospital delayed	5	26	31
Delayed >24 hrs	2	23	25
No rupture	12	128	140
Total	**20**	**208**	**228**

Discussions

The study was conducted to determine the differences in outcome of in-hospital delayed appendectomy to emergent appendectomy, both for laparoscopic and open surgery. The appendectomies were conducted at the Divine Word Hospital from January 2019 to September 2024.

The study found that the demographic data shows a diverse age and sex composition in the surveyed population. The majority are younger, with the largest age group being 19-28 years (27%), followed by individuals under 18 (23%). Other age groups include 29-38 years (14%), 39-48 years (13%), and those over 59 years (12%). In terms of sex distribution, 70% of the population identifies as male (139 individuals), while 30% identify as female (89 individuals). This notable gender disparity may suggest differences in participation rates or reflect the gender composition of the broader community.

Furthermore, the comparison of laparoscopic and open surgeries reveals that laparoscopic procedures accounted for only 9% (20 cases) of the total surgeries, while open surgeries comprised 91% (208 cases). Among laparoscopic surgeries, 10% were emergent, 55% experienced in-hospital delays of less than 24 hours, and 35% were delayed beyond 24 hours, indicating possible case complexity or logistical issues. In contrast, 41% of open surgeries were emergent, with 33% facing in-hospital delays under 24 hours, and 26% delayed for more than 24 hours. Overall, open surgeries were far more common and frequently used for emergent cases, while laparoscopic surgeries, though less frequent, had slightly longer delays in certain instances.

The data reveals significant differences in hospital stays and post-operative complications between laparoscopic and open surgeries. Among 20 laparoscopic surgeries, no patients stayed for 1-4 days, while 11 stayed for more than 7 days. In-hospital delays affected 8 laparoscopic patients, with most staying longer than 7 days. Additionally, 4 patients delayed discharge beyond 24 hours. In contrast, 208 open surgeries were recorded, with longer hospital stays. For emergent open surgeries, 82 patients experienced stays ranging from 1 to over 7 days, and 71 patients with in-hospital delays stayed mostly for 3-7 days. For those delayed more than 24 hours, 55 patients had extended stays, primarily over 7 days.

Laparoscopic surgeries had no reported post-operative complications, while open surgeries had rare but notable complications. Emergent open surgeries saw one death, one septic shock case, and one hypokalemia case, while delayed open surgeries saw more complications, including pneumonia, septic shock, AKI, and hypokalemia. Despite these issues, 209 patients experienced no complications overall, and open surgeries—especially those with longer delays—had more frequent complications compared to laparoscopic procedures.

Of the 228 total surgeries, 20 were laparoscopic, and 208 were open. Open surgeries were more common across all categories, whether emergent, delayed, or with no rupture, highlighting a clear preference for open procedures in more complex or emergent situations.

Conclusions

The findings demonstrate that open surgeries are far more common than laparoscopic procedures, particularly in emergent and complex cases. Open surgeries were associated with longer hospital stays and a higher incidence of post-operative complications, particularly in cases with extended delays. While laparoscopic surgeries showed no complications, they were less frequently performed and often experienced delays, indicating they may be reserved for less urgent or less complex situations. Despite the higher rate of complications in open surgeries, the majority of patients—both laparoscopic and open—experienced no post-operative issues. The data suggests that while open surgeries are essential in managing more critical cases, laparoscopic surgeries offer a safer alternative with fewer complications when applicable. This highlights the importance of balancing surgical approaches based on the urgency and complexity of the patient's condition.

Recommendations

1. **Prioritize Laparoscopic Surgery When Feasible**. Given the absence of post-operative complications in laparoscopic procedures, healthcare providers should prioritize this minimally invasive option whenever appropriate, especially for non-emergent and less complex cases, to reduce patient risk and improve recovery outcomes.

2. **Streamline Pre-Operative Processes**. Since both laparoscopic and open surgeries experienced delays, hospitals should review and optimize pre-operative processes to reduce in-hospital delays. This could involve improving patient preparation, resource allocation, and scheduling systems to minimize waiting times, particularly for laparoscopic procedures, which had a higher percentage of delayed cases.

3. **Focus on Early Intervention for Open Surgeries**. As emergent open surgeries had higher rates of post-operative complications, early detection and timely intervention in critical cases should

be emphasized to potentially reduce the need for complex open surgeries. This could involve enhancing diagnostic tools and care pathways in emergency settings.

4. **Enhance Post-Operative Monitoring for Open Surgeries**. Since open surgeries were associated with more frequent complications, particularly in delayed cases, hospitals should implement enhanced monitoring and post-operative care protocols for patients undergoing open procedures. This includes closer surveillance for septic shock, pneumonia, AKI, and hypokalemia.

5. **Patient Education on Surgical Options**. Patients should be educated about the differences between laparoscopic and open surgeries, particularly regarding risks, recovery times, and the likelihood of complications. This can empower patients to make informed decisions in collaboration with their healthcare providers when both options are viable.

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Appendices

Appendix A. Data Collection Tool

2019-2024 data

Total number of patients: _____

Characteristic	Frequency	Percentage
Demographic Profile		
Age		
<18		
19-28		
29-38		
39-48		
49-58		
59>		
Sex		
Male		
Female		
Modality of Appendectomy		
Laparoscopic surgery		
Emergent		
In-hospital delayed		
Delayed >24 hrs		
Open surgery		
Emergent		
In-hospital delayed		
Delayed >24 hrs		
Post-operative Outcomes		
Length of hospital stay (in days)		
1-2		
3-4		
5-6		
>7		
Postoperative complications		
Death		
Septic shock		
Pneumonia		
Acute kidney infection		
Hypokalemia		
No complicaions		
Ruptured appendix		
Emergent		
In-hospital delayed		
Delayed >24 hrs		
No rupture		

CURRICULUM VITAE



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PERSONAL DATA

Date of Birth:	October 18, 1990
Place of Birth:	Tacloban City, Leyte, Philippines
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Sex:	Male
Religion:	Roman Catholic
Civil Status:	Single
Home Address:	1248 Ibarra St. Sampaloc Manila 1008

EDUCATIONAL BACKGROUND

Internship

Hospital Attended:	Philippine General Hospital
Year Attended:	2016-2017
Hospital Address:	Taft Avenue, Manila

Medical School

School Attended:	University of Santo Tomas
Year Attended:	2012- 2016
School Address:	Espaňa, Manila

Tertiary

School Attended:	St. Paul University Manila
Year Attended:	2007-2011
Degree:	B.S. in Nursing
Year Graduated:	2011
School Address:	Pedro Gil St., Manila

Secondary

School Attended:	Sacred Heart School- Tacloban

Year attended: 2003-2007
School Address: T. Claudio St., Tacloban City
Year Graduated: 2007

Primary

School Attended: Sacred Heart School- Tacloban
Year attended: 2001-2003
School Address: T. Claudio St., Tacloban City
Year Graduated: 2003

AWARDS/ RECOGNITIONS/ CERTIFICATIONS

Passed the Philippine Nursing Licensure Exams	July 2011
Graduated "Cum laude " in Nursing	March 2011
Passed the Physician Licensure Exams	September 2017
Passed the USMLE step 1	June 2018
Passed the USMLE step 2 CK	February 2019
Completed Basic Course in Orthopedics	September 2019

AFFILIATIONS/ORGANIZATIONS

Name of Organization	Position	Year
Asian Medical Students' Association	Member	2013-2016
Paulinian Debaters Guild	Member	2009-2011
Tanghalang St. Paul	Member	2009-2011
UST Medical Alumni Association	Member	2016-Present
UST Alumni Association	Member	2016-Present

RESEARCHES AND PRESENTATIONS	Year
Spatial Memory-Enhancing Activity of Ocimum Basilicum (Sweet Basil) on Rattus Norvegicus (Wistar Rats) Using the	2014

Morris Water Maze

SKILLS

Fluent in English, Filipino, Cebuano, and Waray-Waray.

Competent with Microsoft Office (Excel and Word)

Proficient in cooking.

Have some video editing skills.