

Abstract and Introduction

Two of the most common procedures of General Surgery—hernial repairs and gallbladder removals—were originally conducted through open procedures. In the 1970s, surgeons switched to laparoscopic methods, often including smaller, minimally invasive incisions, and providing better imaging for surgeons both during a procedure and while reviewing the process afterwards [1].

More recently, robots were established as a strong manner of operating for **better dexterity and visualization** for the surgeon. While these robots are extremely expensive and still developing, there are certain scenarios where robots were deemed more beneficial for patient safety based on their medical history [2]. Both laparoscopic and robotic surgeries are improved compared to open procedures; however, there is **limited perspective from physicians to understand why certain surgical methods are used depending on the type of case at hand**. The decision between both surgical techniques relies on many surgical and logistic factors both in and outside of a surgeon's control.

The goal of this research endeavor is to determine **how a surgeon lands on an option between a robot and laparoscope that is best suited for a patient** by investigating the different factors considered by the surgical team.

The resulting data proved that robotic surgeries were the preferred method by surgeons for their improved dexterity, visualization, and efficiency.

Methodology

Short, semi-structured **interviews were conducted with a general surgeon** to obtain key factors for consideration. Additionally, **12 general surgery cases**, involving hernial repairs and gallbladder removals, were included in the study data. Each case featured recorded data between the type of procedure being done, the surgical technique used, and other significant patient or hospital factors specific to the case. All data collected from surgical cases was **non-identifiable to comply with HIPAA regulations**. For each case recorded, additional interview data from the surgeon was collected to identify the recurring themes between patients in the decision-making process. To better compare the data, the main factors were categorized under three general umbrellas:

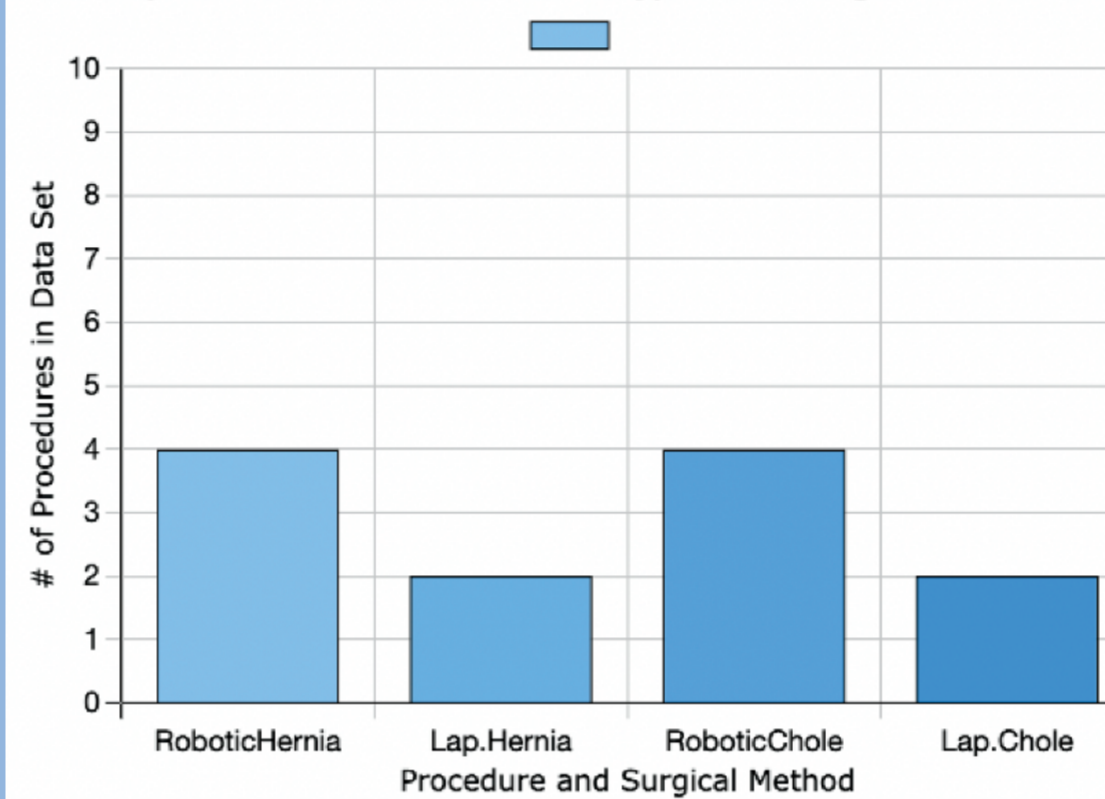
- **Patient-specific factors**
- **Surgeon preference**
- **Hospital logistics**

References

1. Patil, Mihir, et al. "Comparative Analysis of Laparoscopic versus Open Procedures in Specific General Surgical Interventions." Cureus, U.S. National Library of Medicine, 19 Feb. 2024, pmc.ncbi.nlm.nih.gov/articles/PMC10951803/.
2. Morrell, Andre Luiz Gioia, et al. "The History of Robotic Surgery and Its Evolution: When Illusion Becomes Reality." Revista Do Colegio Brasileiro de Cirurgioes, U.S. National Library of Medicine, 13 Jan. 2021, pmc.ncbi.nlm.nih.gov/articles/PMC10683436/.

Results and Findings

Figure 1:
Comparative Data for Procedure Types and Surgical Methods



Analysis of the 12 patient cases in the data showed that procedure types for both hernial repairs and cholecystectomies had the most consideration based on possible risks of procedure type due to patient history (Fig. 2 and Fig. 3). One major preventative factor for robotic surgeries based on patient history was **past abdominal surgeries** like hysterectomies that left prior mesh in the body cavity. Cases with **obesity** could only be operated robotically.

Hospital logistics showed a **scarcity of robots**, resulting in patients with time constraints—upcoming vacations, age, severity of repair—to take the laparoscopic route to get the surgery done as soon as possible.

Doctor preference based on location of hernias and whether better visualization and dexterity from the robot would be needed for suturing purposes. Additionally, in at least 2 of the gallbladder removal cases, doctor preference was influenced by **resident training**—the attending saw the procedure as an opportunity for the resident to practice cholecystectomy robotically (P4 in Figure 3).

Overall, in both the hernial repair procedures and cholecystectomies, the **robot proved to be favored as the method of operation**; even when surgeries were done laparoscopically, it was majorly due to the unavailability of robots at the time and hospital logistics (Figure 1).

Figure 2: Hernial Repairs

Patient	Method	Key Factors	Reason for Approach
P1	Robotic	Prior prostate radiation, possible scarring	Better precision + visualization in scarred tissue
P6	Laparoscopic	Older male, robot unavailable	Availability constraint, standard case
P7	Laparoscopic	Time constraint, robot unavailable	Speed + access dictated approach
P8	Robotic	High BMI	Easier port placement + improved ergonomics
P10	Robotic	Bilateral hernia, no prior surgeries	Efficient for bilateral repair
P11	Robotic	Multiple past surgeries, heart murmur	Safer, controlled dissection in complex patient

Figure 3: Cholecystectomies

Patient	Method	Key Factors	Reason for Approach
P2	Laparoscopic	Low BMI, cancer/polyp concern	Faster, sufficient for straightforward case
P3	Robotic	Multiple gallbladder attacks	Better visualization in inflamed anatomy
P4	Robotic	Robot available, training case	Educational use + standard case
P5	Laparoscopic	Prior mesh from surgeries	Easier navigation with lap approach
P9	Robotic	Need for suturing + visualization	Technical precision required
P12	Robotic	High BMI, severe disease	Ideal robotic candidate (obesity + complexity)

Discussion and Conclusion

The research findings for the patient data show that decision-making for surgical method used in a procedure **goes beyond which method is the most recent or considered superior**; rather, a variety of factors including surgeon preference, patient history and lifestyle, and hospital logistics and availability must also be considered. Times where there were **hospital constraints** with too many robots being booked, combined with a patient's schedule or dangerous medical history meant that the surgeon opted for the laparoscopic method. A combination of conditions was observed in most of the surgical case data that illustrated how specific circumstances at a given time resulted in only one method of procedure being possible in a given time frame.

Overall, the analysis of surgical data pointed towards **robotic surgery as the favored method by doctors**. While there were limitations to this research having a **smaller patient pool size and limited clinic days**, the trends throughout the surgical research prove that procedural decision making is a dynamic process where

factors for consideration often overlap.