

*Original article*

## **A Comparison of Effectiveness of Two Surgical Units in Performing Laparoscopic Cholecystectomy**

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### **Abstract:**

This study compared the effectiveness of two surgical units in a tertiary care teaching hospital in performing laparoscopic cholecystectomy procedures from a hospital administration perspective. One surgical unit that was first to undertake laparoscopic procedures in the hospital had more experience than the other. The effectiveness was measured in terms of Average Postoperative Hospital Stay that directly affects Bed Turnover Rate and Average Duration of Surgery that directly affects OT Utilization. Rate of conversion to open cholecystectomy was also calculated for each unit separately. The same was compared with the globally acceptable standard. The study design was retrospective, collecting data from the medical records department. The sample size was calculated at level of significance of 5% and power of 90%. There is significance difference in the two surgical units only in terms of the duration of surgery. Conversion rates to open cases are well within the global standard and there is no significant difference between the two units in terms of post operative stay. Continuous medical education in terms of national/international workshops and in-house training for surgeons of Unit B are enough to further sharpen their skills in laparoscopy.

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### **Introduction**

Many national and international consensus conferences have been held from time to time to question the safety and efficacy of laparoscopic cholecystectomy (LC). The results of these consensus conferences are less than definitive except that a learning curve exists and once a particular surgeon performs 25 - 50 laparoscopic cholecystectomies the incidence of common bile duct injuries greatly decreases. Unfortunately no recommendations have been made at these conferences concerning credentialing. Although certain observations are made concerning

learning curves, individual hospitals have been left with the responsibility of monitoring and regulating surgeons at their respective facilities. Hence significant difference exists from institution to institution concerning requirements for credentialing for individual surgeons to do specific laparoscopic procedures.<sup>(1)</sup>

Laparoscopic cholecystectomy for acute cholecystitis has significantly less operative complications and provides shorter hospital stay than open cholecystectomy, and is therefore in *experienced hands* a safe and recommendable operation for the treatment of this disease.<sup>(2)</sup> Postoperative hospital stay is also shorter in the laparoscopic cholecystectomy group than open procedures. Laparoscopic cholecystectomy tends to be shorter as compared to open cholecystectomy.<sup>(3)</sup> These advantages are of paramount importance to hospital administrators as shortage of hospital beds and below par OT utilization are two main areas of concern for them. However the economic evaluation results of management options for gallstone disease in a developing country differ from comparable previous studies conducted in developed countries, which indicate that LC is a cost-saving strategy. Differences are mainly due to costs of postoperative inpatient care incurred by 'mismanaged' hospitals and value of lost working time.<sup>4</sup> Thus proper management of the hospital and *continuous appraisal of laparoscopic procedures by analyzing hospital statistics* is a must for these procedures to be used as effective tools in any hospital setting.

This study compared the effectiveness of two surgical units in a tertiary care teaching hospital in performing laparoscopic cholecystectomy procedures from a hospital administration perspective. One surgical unit that was first to undertake laparoscopic procedures in the hospital had more experience than the other. The effectiveness was measured in terms of Average Postoperative Hospital Stay that directly affects Bed Turnover Rate and Average Duration of Surgery that directly affects OT Utilization. Rate of conversion to open cholecystectomy was also calculated for each unit separately. The same was compared with the globally acceptable standard.<sup>(5)</sup>

## Objectives

- To compare the effectiveness of two surgical units in performing LC procedures in terms of Average Duration of Surgery and Average Postoperative Hospital Stay, and to find out whether there is *any difference* in the performance of the two units in terms of these outcome variables.
- To calculate the rate of conversion to open cholecystectomy for each surgical unit separately and comparing it with the globally acceptable standard.

## Methods

### *Study Design*

The study was conducted as a retrospective study for duration of one month. Relevant data, as per the given format shown in the annexure, was collected from the respective IP files in the MRD.

### *Target Population:*

All patients coming to the hospital for Laparoscopic Cholecystectomy procedure.

### *Study Population:*

All patients coming to the two surgical units (A & B) for Laparoscopic Cholecystectomy procedure. Unit A had more experience staff than Unit B.

### *Sample Size:*

Comparison of two sample means:

Therefore  $n = 2 (Z_{\alpha} + Z_{\beta})^2 \times (s)^2 / (d)^2$

Assumptions:

- i. Let level of significance be set at 5% i.e.  $Z_{\alpha} = 1.96$  (from the tables).
- ii. Let the desired power of the study be 90%;  $\beta = 0.1$  i.e.  $Z_{\beta} = 1.282$  (from the tables).
- iii. Now we have two outcome variables, namely Average Duration of Surgery (in minutes) and Average Post Operative Hospital Stay (in days).

For Average Duration of Surgery:

- iv. Let the pooled standard deviation of the observations of the two samples be: 43.23 minutes =  $s$  (from pilot study of 26 subjects).

- v. Let the anticipated small difference in the estimate of two groups (i.e. significant difference one wishes to detect) be 20 minutes = d (from expert).
- vi. Therefore  $n = 98.21 \sim 99$ .

For Average Post Operative Hospital Stay:

- vii. Let the pooled standard deviation of the observations of the two samples be: 1.84 days = s (from pilot study of 26 subjects).
- viii. Let the anticipated small difference in the estimate of two groups (i.e. significant difference one wishes to detect) be 1 day = d (from expert).
- ix. Therefore  $n = 71.17 \sim 72$ .

Therefore Sample Size =  $99 \times 2 = 198$ .

*Sampling Method:*

100 most recent IP files in the MRD, on the first day of data collection, from each study population group which satisfied the inclusion/exclusion criteria gave the sample for the retrospective study. This includes LC operations conducted by Unit A in last six months and Unit B in last nine months.

*Inclusion Criteria:*

1. Patient who had undergone LC operation in Unit A and Unit B.

*Exclusion Criteria:*

2. Patient with any co-morbid condition, which can complicate or extend the operation procedure.
3. Patient with any co-morbid condition, which can result in postoperative complications.
4. Patient who experienced postoperative complications not related to the operation per se.

*Method of Data Analysis:*

Data was collected as per the format given in annexure. From this data, the two outcome variables were calculated for each of the two sample population. Relevant statistical methods with the help of computer package (SPSS 10) were used.

Rate of conversion to open cholecystectomy was calculated for each unit separately. The same was compared with the globally acceptable standard.

## Results and Discussion

### *Postoperative Stay (in days):*

- Non Normal Distribution for both units A & B (Kolmogorov Smirnov test used as  $N > 50$ ;  $p < .001$ )

**Table 1: showing descriptive statistics of postoperative stay (in days) for surgical units A and B:**

UNIT	25th Percentile	50th Percentile (median)	75th Percentile	IQ Range
A	2	3	4	2
B	3	3	4	1

- *Non-parametric test (as distribution is non-normal) for comparison of two independent populations (Mann-Whitney U Test) was used.*
- *p value  $> .05$  ( $= .253$ ) for the comparison of post operative stay between the two units, thus there is no significant difference in the post operative stay of the patients of the two units.*

### *Duration of Surgery (in minutes):*

- Non Normal Distribution for both units A & B (Kolmogorov Smirnov test used as  $N > 50$ ;  $p < .001$ )

**Table 2: showing descriptive statistics of duration of surgery (in minutes) for surgical units A and B:**

NIT	25 <sup>th</sup> Percentile	50th Percentile (median)	75th Percentile	IQ Range
A	105.00	120.00	157.50	52.50
B	135.00	150.00	180.00	45.00

- *Non-parametric test (as distribution is non-normal) for comparison of two independent populations (Mann-Whitney Test) was used.*
- *p value  $< .05$  ( $< .001$ ) for the comparison of duration of surgery between the two units, thus there is a significant difference in the duration of surgery conducted by the two units.*

- Thus the experienced unit (i.e. Unit A) took shorter duration for LC surgery. This conforms to the findings of J E Kelley et al.<sup>2</sup>

*Rate of Conversion to Open Cholecystectomy:*

- Rate of conversion to open cases for both the units (6.5% and 8.2% respectively) are well with in the globally acceptable standards (with in 15%).

Table 3: showing rate of conversion to open cases in surgical units A and B:

Units	Total Laparoscopic Surgeries <u>Planned</u>	Conversion to Open Surgeries	% Conversion*
A	107 <sup>β</sup>	7	6.5%
B	109 <sup>β</sup>	9	8.2%

\* Global Standard: within 15%

<sup>β</sup> In Unit A, 7 cases out of 107 planned LC cases were converted to open cases. In Unit B, 9 cases out of 109 planned LC cases were converted to open cases. In either unit, 100 LC cases were actually performed.

## Conclusion

There is significance difference in the two surgical units only in terms of the duration of surgery. The two units are performing the procedure in the same OT suite with identical physical facilities and same anesthetic/ancillary/auxiliary/nursing support. Profile of patients operated in the two units is comparable as any patient with any condition/co-morbidity/variable complicating the surgery or extending the post operative stay had been excluded from the study. Thus this difference can be reasonably attributed to the experience and competency of the surgeons. This, in turn, may affect hospital revenue as the patient is charged, in this hospital setting, according to procedure performed and not as per the time spent in the OT.

As the conversion rates to open cases is well within the global standard and there is no significant difference between the two units in terms of post operative stay, continuous medical education in terms of national/international workshops and in-house training for the Unit B surgeons are enough to further sharpen their skills in laparoscopy.

*Limitations:*

*As assumption of normality of data is not valid in this case, a non parametric test has been used. Since Mann-Whitney test does not make a distribution assumption, it is not as powerful as the t-test.*

*Total duration of surgery has been taken from the anesthetist records of the respective IP file, and is liable to human error. A prospective study, though requiring more time and manpower, would be a better option.*

*Apart from the effectiveness of the surgical unit, other factors such as **unknown** co-morbidity, class of the patient (cash/credit) etc. may influence the two outcome variables.*

**References:**

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