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The impact of robotic cholecystectomy on private practice in a community teaching hospital

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Abstract

BACKGROUND: Recently, through aggressive marketing, robotic cholecystectomy has been gaining popularity. The purpose of this study was to evaluate the impact of this technology on private practice and hospital cost and volume.

METHODS: From November 2012 to April 2014, all elective cholecystectomies were evaluated for procedure type, operative time (OR), insurance type and payment, hospital length of stay, and volume. Data were analyzed using the Chi-square test, Student *t* test and the Mann-Whitney U test.

RESULTS: Of 338 patients, 246 had complete financial records. Of these patients, 84.1% (207) patients were female with mean age of 45.4 ± 17.1 years. Patients were divided into 2 groups; group 1: 220(89.4%) patients had laparoscopic cholecystectomy (LC) and group 2: 26(10.6%) patients had robotic cholecystectomy (RC). The mean direct cost was higher in the robotic group $2,704.08 ± 308.40 vs $1,712.51 ± 379.50; $P < .0001$. The median gross margin; however, was not statically different (RC: $1,593.00 (Interquartile range $3,936) vs LC: $1,726.00 (Interquartile range $1,480); $P = .85$). Both case time and OR were higher in the robotic group; case time (RC: 121 ± 15.4 vs LC: 98.4 ± 27.5 minutes, $P < .0001$); OR (RC: 86.6 ± 14.3 vs LC: 63.9 ± 25.9 minutes, $P < .0001$). There was no appreciable change over time in either surgeon or hospital volume.

CONCLUSIONS: There was a statistically significant increase in direct cost in RC vs. LC but not in margin. There was no impact in private practice on the number of cases being done robotically, nor there was an increase in hospital volume. This analysis did not include the purchase cost or maintenance of the robot.

In recent years, there has been a push from industry to increase the use of robotic techniques in cholecystectomy. The introduction of the single incision robotic platform further increased this push. Representatives from industry suggested that this technology would increase the volume of these procedures, thus increasing benefits to both patients and hospitals.

We sought to examine the impact of the introduction of robotic cholecystectomy on private practice and hospital cost and volume by analyzing cost, time, and volume data from patients who had laparoscopic cholecystectomy (LC) vs robotic-assisted cholecystectomy (RC) in a community teaching institution.

There were no relevant financial relationships or any sources of support in the form of grants, equipment, or drugs.

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Methods

All hospital records from November 2012, when the 1st RC was performed, until April 2014 were collected retrospectively and evaluated. We included only patients who underwent elective, outpatient cholecystectomy. Patients who were admitted directly to the hospital or through the emergency room or those with acute cholecystitis, choledocholithiasis, cholangitis, or pancreatitis were excluded. Also excluded were the patients who had any type of preoperative procedures or intraoperative cholangiogram.

Data were analyzed using the Chi-square test, Student *t* test and the Mann-Whitney U test for operative time (OR), length of hospital stay (LOS), total hospital cost of the procedure, and type of insurance. This study is exempt from institutional review board review.

Results

Three hundred thirty-eight elective cholecystectomies were performed during the period by 14 general surgeons. Two hundred forty-six patients had complete financial records and were evaluated. There were 207 (84.1%) females. The mean age was 45.4 ± 17.1 years. Patients were divided into 2 groups. group 1 included 220 (89.4%) patients who had LC. Within this group there were 8 (3.6%) patients who had single incision LC. Their data were included in group 1 analysis. Group 2 included 26 (10.6%) patients who had RC. Within this group there were 14 (53.8%) patients who had single incision RC. Their data were included in group 2 analysis. The mean age did not differ between the 2 groups: LC: 45.3 ± 17.6 vs RC: 46.2 ± 11.2 years, ($P = .72$)

The mean case time was higher in the RC group in spite of having an experienced dedicated group of operative team well versed in setting up the robotic cases (RC: 121 ± 15.4 vs LC: 98.4 ± 27.5 minutes, $P < .0001$). A similar difference was found for mean OR (RC: 86.6 ± 14.3 vs LC: 63.9 ± 25.9 minutes, $P < .0001$). The mean LOS; however, was similar between groups with a mean of 1.02 ± .15 days in the LC group and a uniform LOS of 1.0 day for every person in the RC group.

The mean direct cost was higher in the RC group (RC: $2,704.08 ± 308.40 vs LC $1,712.5 ± 379.5; $P < .0001$). The gross median margin; however, did not show a statistically significant difference between the 2 groups, which was $1,726.00 (Interquartile range 1,481) vs $1,593.00 (Interquartile range 3,936) for LC and RC respectively ($P = .85$). The reason for this could be the increase in percentage of patients who had commercial insurance in group 2 (Table 1). The cost of the robot and the cost of the maintenance agreement were not included in this analysis.

To evaluate the impact of the adaptation of the robot on surgeons' private practice we divided the data between the 2 fiscal periods of FY13 (8 months, Nov 2012 to June 2013) and FY14 (10 months, July 2013 to April 2014). We found a mild decline in the total number of RC in the 2nd period from 14 cases (average 1.75 case per month in FY13) to 12 cases (average 1.2 cases per month in FY14). In addition, we found that the total number of elective cholecystectomies dropped from an average of 20.4 cases per month in the 1st fiscal period of FY13 to an average of 17.5 cases in the 2nd fiscal period of FY14.

Table 1 Insurance distribution ($P = .04$)

Insurance distribution	Commercial	All other
Group 1 (LC)	40.0%	60.0%
Group 2 (RC)	61.6%	38.4%

Of the 14 general surgeons who performed these cholecystectomies, 10 of them were considered active members of the teaching staff. Their volume was evaluated between the 2 fiscal periods. Three of these surgeons performed RC in their practice. We found no effect on the volume of cases performed by the surgeons who did not perform RC. In addition, there was no measurable difference in the volume of the 3 surgeons who used the robotic technique. There was a shift within their practice from LC to RC, which made their total volume similar between FY13 and FY14 (Fig. 1). The volume of the 7 surgeons who performed LC only stayed the same between the 2 fiscal periods with an average of 10.75 vs 10.8 per month as a group for FY13 vs FY14, whereas the volume of the 3 surgeons who incorporated the robot in their practice dropped from 6.25 vs 5.2 cases per month as a group for FY13 and FY14.

Comments

Since the introduction of the robot into the surgical arena in early 2000 for prostatectomy and through active marketing of the industry, robotic surgical procedures have been increasing to include many other procedures.[1] It is a technology that has been pushed with the pretense of improvement over laparoscopic techniques both in surgical

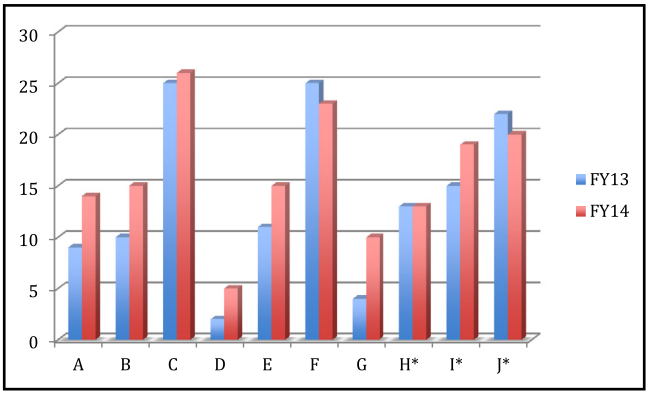

Figure 1 Impact of robotic cholecystectomy on surgeons' volume. Surgeons who did both LC and RC are marked by (*).