

Effect of Residents on Operative Time and Complications: Focus on Laparoscopic Cholecystectomy in the Community[☆]



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OBJECTIVE: To better understand important aspects of resident education in the perioperative setting, given that there are conflicting data regarding resident training and outcomes (e.g., operative times and complications). To study continuity of care in a resident-run outpatient hospital clinic.

DESIGN: Retrospective analysis of 2 databases.

SETTING: The study was set up in a community teaching hospital.

RESULTS: Of 4603 cases in a cholecystectomy database, 3302 (72%) were assisted by residents, with operative times ranging from 19 to 383 minutes, and 1576 (22.9%) were assisted by nonresidents. The average times were 93 and 77 minutes for resident- and non-resident-assisted cases, respectively. Complications were almost 3 times more likely for urgent vs. elective but were similar for resident-assisted vs. non-resident-assisted cases. The operative time was similar across PGY levels. Of 149 cases in a resident-run outpatient clinic, 100 (67%) of the residents participated in preoperative, intraoperative, and postoperative phases of case, but in only 4% of cases was it the same resident.

CONCLUSION: Resident assistance increased operative times but not complications. Counterbalanced effects of increasing skill and increasing participation may explain this time stability across PGY levels. Continuity of care is preserved in the era of the 80-hour workweek, but not to a patient-specific degree. (J Surg Ed 73:836-843. © 2016 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: resident education, operative time, complications, cholecystectomy, patient safety, continuity of care

COMPETENCIES: Patient Care, Systems-Based Practice

INTRODUCTION

Owing to decreased time available in the hospital following implementation of the 80-hour workweek, and because of changes in the medicolegal system over time, there has been an appropriate increase in reliance on surgical simulation.^{1,2} On the other hand, it is the nature of surgical training that, even after any amount of simulated learning, learning continues and intensifies during hands-on operative exposure and clinical practice. Hence, it is a daily challenge for surgical teaching faculty to balance patient safety and resident education. The educational concerns regarding resident involvement in patient care include the effect of work restrictions on residency training, reduced exposure to surgical cases, and continuity of surgical patient care throughout the perioperative period, and the effect of resident involvement on postoperative complications and patient mortality. Therefore, it is increasingly important to understand the relationship between resident training and patient outcomes to develop an effective resident training curriculum without compromising the quality of patient care.

The objective of this study was to determine if the intraoperative involvement of residents and the level of their postgraduate medical training level would affect duration of operations and postoperative complication rates for patients undergoing cholecystectomy (CCY). Indeed, the current literature is inconsistent, with some studies showing longer operative times by more junior residents,³ whereas others do not.^{4,5} Given obvious time restraints associated with the

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80-hour workweek, a secondary objective was to assess if continuity of care still exists in resident training across preoperative, intraoperative, and postoperative phases of care, and if so, to what extent.

METHODS

Approval was obtained from the Saint Agnes Hospital Institutional Review Board. To analyze effect of resident involvement on efficiency (operating time) and patient safety (postoperative complications), a retrospective analysis of a CCY database was performed. Records were reviewed of patients who had undergone laparoscopic CCY (LCCY) between 2000 and 2011, performed by attending surgeons, assisted either by surgical residents or by nonresident assistants (determined by surgeon preference and assistant availability). Patient information including sex, age, race, and previous upper abdominal operations was collected. In addition, the diagnosis, the date of admission and discharge, the date of operation, time of incision, time of skin closure, resident year level, first assistant, conversion to an open procedure, simultaneous procedures, urgency of the case and postoperative complications were recorded. Operative time was calculated as the time from the first incision to the time of skin closure. Length of stay was calculated from the date of operation to date of discharge.

CCY cases lacking sufficient data, such as those lacking operative time or assistant name, were excluded from the analyses, as were cases that were converted to an open procedure or carried out under the same anesthesia with another major procedure, such as a pancreaticoduodenectomy, liver resection, colectomy, or bariatric procedure. Remaining cases were divided into 2 groups based on whether they were assisted by residents or nonresidents. The group of residents was further subdivided according to the postgraduate year (PGY) levels based on year of clinical training in surgery. The exact role of each resident in the operation was not generally available from the operative note, but in general there was a graded increase in intraoperative role of residents as they progressed from PGY-1 through PGY-5. Because this was a retrospective study, it was not possible of course to control for variable skill levels among residents (e.g., some particularly gifted junior residents may have had a larger role than some still-struggling mid- or upper-level residents).

T-tests and analysis of variance were used to test for statistical differences in mean operating times, blood loss, and duration of hospital stay. Differences in ASA group, history of abdominal surgery, urgency of procedure, and rates of postoperative complications were analyzed using Chi-squared tests. To consider statistical significance for ordinal and binary variables, it was reasonable to accept the *p* value generated for the linear-by-linear association to look for significant trends in findings as PGYs increases. Statistical significance was accepted at a 2-sided *p* < 0.05.

To examine continuity of care, the CCY database was inadequate, however, because of the fact that the vast majority of the preoperative and postoperative notes were in private offices and not in the hospital electronic medical record system. An outpatient resident-run hospital surgery clinic was therefore used to examine continuity of care. The preoperative, intraoperative, and postoperative notes were retrospectively reviewed for patients who presented in this outpatient surgery clinic at Saint Agnes Hospital from 2009 to 2010. This group was not limited to cholecystectomies. In this additional database, the resident name was always available. Additional data, such as date of clinic visit and date of operation, were collected.

RESULTS

Among 6876 cholecystectomies carried out at Saint Agnes Hospital from 2000 to 2011, those lacking adequate data (e.g., assistant name, operative time), those done as part of another major procedure, such as pancreaticoduodenectomy, liver resection, colectomy, bariatric surgery, were excluded, leaving 4494 cases for analysis.

The average age at operation was 51 years (Table 1) and most of them (74%) were female, were White (70%) and had ASA scores of 1 to 2 (68%). Most of the operations were LCCY (88%) without intraoperative cholangiogram (IOC). Not surprisingly, operative times were longer with (116 min) than without (83 min) IOC (*p* < 0.001).

Of the 4031 operations with adequate data for the identity of the assistant, 2942 (73%) were assisted by residents and 1089 were assisted by nonresidents (Table 2). There were no significant differences in patient demographics or ASA diagnosis category between the resident-assisted and the non-resident-assisted cases. Patients in the resident-assisted group had significantly more previous abdominal operations and more emergent procedures than those in the non-resident-assisted group. Resident-assisted operations were completed at an average of 87 minutes, whereas non-resident-assisted cases averaged 68 minutes (*p* < 0.001), and the postoperative length of stay was slightly longer for resident cases (1.07 days) vs. nonresident cases (0.88 days; *p* = 0.022). Estimated blood loss (EBL) and rates of postoperative complications were similar for resident- and non-resident-assisted operations. To be sure that a difference in postoperative complications was detectable (as complications can be difficult to capture in this type of retrospective database) we compared complication rates among urgent and elective operations and found that the complication rate was higher in urgent LCCY (3.4%) vs. elective CCY (1.4%, *p* < 0.001); this finding was not unexpected given prior findings in the literature.⁶⁻⁸ When stratified by urgent vs. elective status, urgent cases had similar operative times regardless of resident vs. nonresident status, but among elective cases,

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