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Patient, treatment and discharge factors associated with hospital readmission within 30 days after surgical cytoreduction for epithelial ovarian carcinoma

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HIGHLIGHTS

- Patient age, comorbidities and surgical radicality do not predict for readmission.
- Perioperative complications are highly associated with readmissions after cytoreduction.
- Discharge with visiting nurses or to rehabilitation facility is not associated with a reduction in readmission rate.

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ABSTRACT

Objective. Hospital readmissions are common, costly and increasingly viewed as adverse events. In gynecologic oncology, data on readmissions are limited. The goal of this study was to examine the patient, treatment and discharge factors associated with unplanned readmission after cytoreductive surgery.

Methods. We identified all patients with stages II–IV ovarian cancer who underwent surgical cytoreduction at our institution between 2003 and 2011. A retrospective chart review was performed, and clinical variables were extracted. Utilizing linear and logistic regression, these clinical variables were correlated with risk of readmission.

Results. A total of 460 patients were included in the analysis, with the majority having a stage IIIC high grade serous cancer. Optimal cytoreduction (<1.0 cm residual disease) was obtained in 368 patients (81%), and 233 patients (50%) underwent at least one radical procedure. Perioperative complications were observed in 148 patients (32%). A large proportion of our cohort was discharged to rehabilitation facilities (12%) or with a visiting nurse (38%). Fifty five patients (12%) were readmitted within 30 days. On multivariate logistic regression, reoperation and perioperative cardiopulmonary event were the only factors associated with readmission (OR = 3.2, 95% CI = 1.7–6.0). Discharge home with ancillary services was not protective against readmission, even when controlling for perioperative complications (OR = 1.18, 95% CI = 0.53–2.64).

Conclusions. Readmission after surgical cytoreduction affected 12% of our population. Multivariate analyses suggested perioperative complications, particularly reoperation and cardiopulmonary event, placed the patient at the greatest risk. Age, comorbidities, surgical radicality and discharge with visiting nurse services/rehabilitation facility did not affect the likelihood of readmission.

Introduction

In February of 2009, the Obama administration drafted the Affordable Care Act, citing that the United States spends over $2.2 trillion dollars (16% of national budget) on healthcare. Just 2 months later, Jencks et al. [1] published a sentinel study reviewing over 11 million Medicare beneficiary charts. These data revealed that almost 20% of these patients will undergo an unplanned readmission within 30 days of hospitalization, and that the combined costs of these readmissions will exceed $17 billion dollars. While some readmissions may be unavoidable, unplanned readmissions are adverse events and potentially preventable. Several studies have evaluated hospital readmissions as an indicator of the quality of care delivered, with some concluding that readmissions should be included as a metric for hospital quality surveillance [1–4].

Given that the current rate of healthcare spending is likely unsustainable, policy makers have identified unplanned readmission as a target for health care reform [5]. Recent recommendations by the Medicare Payment Advisory Commission (Med PAC) include providing financial incentives to physicians who reduce readmission

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rates, reducing payments to hospitals with high readmission rates, bundling reimbursements and publicly publishing each hospital's readmission rate. Ultimately, for both hospitals and physicians, these changes could result in a lowering of global revenue [5]. In addition to increasing healthcare costs, unplanned readmissions have a negative impact on patient care and well-being. The aforementioned study of eleven million Medicare patients attributed the majority of readmissions to poor communication with patients, suboptimal follow-up and inadequate care coordination [1]. While it is clear that risk factors for readmission are complex and often multifactorial, most physicians agree that understanding the drivers for readmission will likely prove key in the delivery of high quality and cost efficient health care.

In gynecologic oncology, data on readmissions are limited. A recent investigation highlighted the challenges of caring for surgically and medically complex patients with a spectrum of gynecologic malignancies, finding that readmission rates were highest in patients with ovarian cancer [6]. Surgical cytoreduction for ovarian cancer is one of the most common procedures performed by gynecologic oncologists and is associated with marked morbidity and up to a 16% readmission rate [7–9]. The aim of this investigation was to examine the readmission rate of women undergoing initial surgical cytoreduction for a diagnosis of ovarian cancer at a single institution. We sought to understand the drivers of unplanned readmission by exploring the patient, treatment and discharge factors associated with this adverse event to facilitate insights into potential care redesign for this population of women.

Methods

After obtaining approval from the Massachusetts General Hospital/Partners Healthcare Review Board, we identified all patients at our institution undergoing surgical cytoreduction for ovarian carcinoma between the years of 2003 and 2011. Inclusion into the study required the following: stages II–IV ovarian cancer as defined by the International Federation of Gynecology and Obstetrics Classification, operative and postoperative care provided at our institution and surgery which was undertaken with cytoreductive intent and performed via laparotomy. Exclusion criteria included stage I disease, laparoscopic approach and patients undergoing only palliative or diagnostic surgeries.

Abstracted data included age, comorbidities, stage, grade, pathology, surgical procedures performed, estimated blood loss (EBL), postoperative complications, length of stay, debulking status, readmission(s), readmission diagnosis and whether or not the patient was discharged to home, to home with visiting nurse (VN) or to a rehabilitation facility. Comorbidities were only included if they were systemic, required management by a physician and/or impacted surgical planning. Readmissions were defined as unplanned admission to the hospital within 30 days of discharge from the index hospitalization. Debulking was considered optimal if the patient had less than or equal to 1 cm of residual disease at the conclusion of surgery.

To assess the overall radicality of each surgery for our statistical models, we created a radicality score for each patient. A patient was assigned one point for each of the following procedures performed at the time of their surgery: small bowel resection, large bowel resection, diaphragmatic stripping or resection, splenectomy, liver resection, pelvic lymph node dissection and para-aortic lymph node dissection. Other radical procedures (abdominal wall resection, thoracotomy, cholecystectomy, etc.) were also awarded one point each.

Clinical variables were correlated utilizing Fisher's exact test, ANOVA, χ^2 and Student's *t*-test as appropriate for univariate analysis. Significantly associated variables were then analyzed in linear and logistic regression models in order to determine independent variables associated with length of stay and readmission. Statistical analysis was performed with Stata version 10 (College Station, TX).

Results

A total of 460 patients were included in the analysis. Median age was 61 years old (range = 31–94 years), and patients had an average of 1.2 systemic comorbidities. Most patients (65%) had stage III disease and high grade papillary serous histology (51%). Of our patients, 81% ($n = 373$) underwent an optimal cytoreduction; at the end of surgery, 50% of these patients had no residual disease and 50% had disease less than or equal to 1 centimeter. Average length of stay was 8.62 days, although range varied from 2 to 55 days (Table 1).

Perioperative complications were seen in 32% of our patients, and 10.2% of our patients had more than one complication. Cardiopulmonary events such as pulmonary embolus, pleural effusion, myocardial infarction and heart failure were the most common complications and occurred in 14% of our patients. Wound infections and intra-abdominal collections requiring antibiotics and/or drainage occurred in 12% of our patients. Small bowel obstruction (SBO) and ileus were also relatively common and complicated 11% of patient's initial hospitalization. Reoperation and bleeding requiring transfusion greater than 4 U were less frequently seen, occurring in 3% and 5% of our population, respectively (Table 1).

Of our entire cohort, 12% ($n = 55$) were readmitted within 30 days of discharge. Patients who were readmitted tended to have a longer initial length of stay versus those that did not (10.4 vs. 8.2 days, $p = 0.01$). When readmitted, median length of stay was 5 days (range = 1–86 days). Of the 55 patients that were readmitted, 46 (84%) were only readmitted once. Four patients were readmitted twice, three patients were readmitted three times, one patient had four readmissions and one patient was readmitted a total of 7 times, each within 30 days of the antecedent hospitalization. Length of stay upon readmission varied from 2 to 87 days (Table 2).

The major causes for readmission were wound complications and/or intra-abdominal collections (38%, $n = 22$) followed by SBO/ileus (22%, $n = 12$). Other reasons for readmission included venous-thrombotic event, pain, acute renal failure, pneumothorax, pneumonia, line infection and fistula (Table 2).

Univariate analyses are reported in Table 3. There was no difference in age, stage, grade, histology, EBL or optimal debulking status between patients who were readmitted and those that were not. No single surgical procedure placed the patient at a higher risk for readmission, and while increasing overall surgical radicality was associated with an increased length of stay, it was not associated with an increased risk of readmission (OR = 1.04, $p = 0.54$). It should also be noted that in our study, an increasing number of preoperative comorbidities did not translate to an increased risk of readmission ($p = 0.28$). Likewise, while younger patients were slightly more likely to undergo radical procedures ($p < 0.01$, $r = 0.17$) and be discharged earlier, statistical models controlling for age and radicality did not show a difference in readmission rates.

Readmission was significantly associated with perioperative complications ($p < 0.001$). Cardiopulmonary events, infection, SBO/ileus, bleeding and reoperation were all independently associated with elevated risk on univariate analysis. However, when placing all perioperative complications into a multivariate analysis, only reoperation (OR = 10.74, 95% CI = 3.4–34.2) and cardiopulmonary events (OR = 3.15, 95% CI = 1.4–7.1) proved to be independently associated with unplanned readmission (Table 4). Of note, as the number of complications increased, so did the risk of readmission (OR = 2.3, 95% CI = 1.58–3.40). Patients with two or more perioperative complications had a readmission rate of 32.1%, patients with one perioperative complication had a readmission rate of 17.1% and only 6.1% of patients without perioperative complications were readmitted.

Interestingly, patients who were discharged with a visiting nurse (VN) were just as likely to be readmitted as those who went home without any services (OR = 1.03, 95% CI = 0.55–1.8), even when controlling for perioperative complications (OR = 0.78, 95% CI = 0.42–1.43).