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Stoma Creation and Reversal After Cytoreductive Surgery with Hyperthermic Intraperitoneal Chemotherapy

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Abstract

Introduction—Cytoreductive surgery with heated intraperitoneal chemotherapy (CRS/HIPEC) often includes stoma creation. We evaluated the indications, morbidity, and mortality associated with stoma creation and reversal after CRS/HIPEC.

Methods—Retrospective analysis of a prospective database of 1149 CRS–HIPEC procedures was performed. Patient demographics, type of malignancy, comorbidities, Claviengraded morbidity, mortality, indications for stoma creation, and outcomes of subsequent reversal were abstracted.

Results—Sixteen percent (186/1149) of CRS/HIPEC procedures included stoma creation, whereas 1.1 % (11/963) of patients without initial stoma creation developed anastomotic leaks requiring stoma. Patients who required a stoma had worse preoperative performance status (ECOG 0/1: 77.2 vs. 86.1 %, $p = 0.002$), greater burden of disease (PCI 17.6 vs. 12.9, $p < 0.0001$), and were more likely to have R2 resections (74.5 vs. 48.8 %, $p < 0.0001$) than those without stoma creation. Stomas were intended to be permanent in 17.5 % (35/199). Of 164 patients with potentially reversible ostomies, only 26.2 % (43/164) underwent reversal. Disease progression (43/164, 26.2 %) and death (40/164, 24.3 %) most commonly precluded reversal. After reversal, 27.9 % (12/43) suffered a Clavien I/II morbidity, 27.9 % (12/43) suffered Clavien III/IV morbidity, and 30-day mortality was 4.7 % (2/43). Anastomotic leak occurred after 9 % (3/33) of ileostomy and 10 % (1/10) of colostomy reversals.

Conclusions—Stomas are more common among CRS/HIPEC patients with a high burden of disease and poor functional status. Reversal is uncommon and is associated with significant major morbidity. Preoperative counseling for those with high disease burden and poor functional status should include the risk of permanent stoma.

The survival benefit for peritoneal surface disease (PSD) treated with cytoreductive surgery (CRS) and heated intraperitoneal chemotherapy (HIPEC) is predominantly driven by the

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completeness of the cytoreduction.¹⁻⁴ Achievement of complete cytoreduction often requires resection of small and large bowel, with either anastomosis or stoma creation. Factors predicting stoma creation in the setting of CRS/HIPEC have not been extensively studied. Likewise, little data exist regarding the likelihood, morbidity, and mortality of stoma reversal in the setting of prior CRS with intraperitoneal chemotherapy. Understanding the characteristics of patients requiring stoma and the factors influencing reversal can improve preoperative planning and patient counseling. The first goal of the current manuscript was to identify predictors of enterostomy creation during CRS/HIPEC procedures. The second goal was to determine the incidence of ostomy reversal as well as the morbidity and mortality associated with such reversal after CRS/HIPEC.

METHODS

Institutional review board approval was obtained for retrospective analysis of a prospectively maintained database of 1149 CRS/HIPEC procedures performed from 1991 to 2014. Eligibility criteria for CRS/HIPEC included histologic diagnosis of peritoneal carcinomatosis, complete recovery from prior systemic chemotherapy, resectable primary lesion, debulkable PSD, and lack of extra-abdominal disease. All patients had a complete history and physical, tumor markers, and computed tomography of the chest, abdomen, and pelvis before CRS/HIPEC procedure. The CRS/HIPEC procedure was conducted as previously described by our group.⁵

Data abstracted from the database included patient age, race, gender, Eastern Cooperative Oncology Group (ECOG) performance status, type of primary malignancy, comorbidities, R resection status, preoperative treatments, peritoneal carcinomatosis index (PCI), and number of resected organs. R0 and R1 resections were grouped together as complete cytoreductions. Cytoreductions with residual macroscopic disease were characterized as R2 and subdivided based on the size of residual disease (R2a $\leq$ 5 mm, R2b $>$ 5 mm and $\leq$ 2 cm, R2c $>$ 2 cm). Outcome variables included morbidity, mortality, readmission, specific complications, and overall survival (OS). Surgical morbidity and mortality were graded according to the Clavien and Dindo classification system.⁶

For those patients requiring stoma, operative reports were reviewed to ascertain indications for stoma creation and type of stoma created. For those in whom the stoma was reversed, length of time to reversal and outcomes of reversal were documented.

Descriptive statistics, including frequencies and percentages for categorical data and means and standard deviations for continuous data, were calculated for those with and without stoma creation and for those with and without reversal. Fisher's exact tests compared categorical variables and Wilcoxon rank-sum tests compared continuous variables between groups. Those variables that emerged as significantly different between those with and without ostomy creation as well as between those with and without reversal on these univariate analyses were incorporated into multivariate logistic regression models. A time variable also was incorporated into these models. Time was defined by grouping HIPEC/CRS procedures into quintiles of institutional experience as previously described by our group.⁴ Such models were used to evaluate the significance of particular variables in

predicting stoma creation and reversal while controlling for clinical confounders. Similar multivariate logistic regression models were used to compare outcome variables (30- and 31–90-day mortality, 30-and 31–90-day readmission, minor morbidity and major morbidity) between those with and without ostomy creation while controlling for such clinical confounders.

OS was calculated from the date of CRS/HIPEC (or first CRS/HIPEC in cases where a patient underwent more than one procedure) to the last known date of follow-up or the date of death. Estimates of survival were calculated using the Kaplan–Meier method. Differences in OS between those with and without stoma creation and between those with and without reversal were assessed using the log-rank test. To control for the effect of confounding factors with respect to survival among those with and without ostomy creation and with and without reversal, multivariate cox proportional hazard models were utilized. Statistical significance was defined as a p value <0.05 . All analyses were performed using SAS 9.4 (Cary, NC).

RESULTS

Of the 1149 of CRS/HIPEC procedures performed over the specified time period, 188 (16 %) included stoma creation during the index operation. Additionally, 1.1 % (11/963) of patients without stoma creation during CRS/HIPEC developed anastomotic leaks requiring reoperation with stoma formation. This resulted in 199 stomas after CRS/HIPEC, of which 37.2 % (74/199) were end ileostomies, 27.6 % (55/199) were loop ileostomies, 23.6 % (47/199) were end colostomies, and 9.0 % (18/199) were loop colostomies. Ostomy type was unknown in five patients (Fig. 1).

Patients undergoing stoma at initial operation did not differ from those patients without stoma in terms of BMI, prevalence of comorbidities, or smoking status. However, stoma patients were younger than their non-stoma counterparts (51.7 ± 13.2 vs. 52.9 ± 12.3 , $p = 0.04$) and were more likely to be male (55.1 vs. 44.8 %, $p = 0.01$). Additionally, stoma patients were more likely to have a colorectal primary (36.2 vs. 20.5 %, $p < 0.0001$) and worse preoperative performance statuses than non-stoma patients (ECOG 0/1: 77.2 vs. 86.1 %, $p = 0.002$). Furthermore, patients requiring stoma had a greater burden of disease and more extensive CRS, as indicated by higher PCI (17.6 vs. 12.9, $p < 0.0001$) and a greater mean number of organs resected (4.1 vs. 2.9, $p < 0.0001$) than their non-stoma counterparts. Not surprisingly, stoma patients were more likely to have preoperative chemotherapy (66.1 vs. 52.7 %, $p = 0.0012$) and incomplete (R2) resections (74.2 vs. 48.7 %, $p < 0.0001$) than those without stoma creation (Table 1).

Multivariate logistic regression analysis evaluating whether or not a patient would require stoma at index operation, revealed that, after controlling for all confounders, only PCI remained a significant predictor of stoma creation, with each increase in PCI increasing the odds of stoma by 8.2 % (odds ratio 1.082, $p = 0.001$; Table 2).

Patients who required stoma at index operation had higher rates of both minor and major morbidities than their non-stoma counterparts (Table 3). Although 30-day mortality was no

different between the groups, 31–90-day mortality was greater among those with stoma creation (4.3 vs. 1.0 %, $p = 0.004$). Similarly, those requiring stomas had significantly higher readmission rates and longer intensive care and hospital stays (Table 3).

Multivariate analysis was used to control for those factors that were significantly different between those with and without stoma creation on univariate analysis (ECOG performance status, R-resection status, etc.) and to control for institutional experience (operative quintiles). This revealed that stoma presence did not remain a significant predictor of minor morbidity ($p = 0.21$), major morbidity ($p = 0.41$), 30-day mortality ($p = 0.84$), or 31–90-day mortality ($p = 0.15$) after accounting for these clinical confounders. However, stoma presence did remain a significant predictor of both 30-day and 31–90-day readmission rates ($p = 0.02$ and $p = 0.03$, respectively).

Among patients with both low-grade (LGA) and high-grade (HGA) appendiceal primaries, OS was greater among those who did not require stomas. However, among patients with colorectal cancer, the need for stoma creation did not significantly impact survival (Table 3). A multivariate proportional hazard model incorporated the following variables: age, gender, albumin level, ECOG performance status, R-resection status, number of organs resected, preoperative chemotherapy, type of primary tumor, operative quintile, and stoma creation. In this adjusted model, those patients with stomas did have a significantly increased risk of death (hazard ratio 1.28, $p = 0.04$) compared to those without stomas, when other confounders were held constant.

Stoma-related morbidity was reported in 18.6 % (37/199) of patients with stomas. The most common stoma-related complication was a high-output ostomy leading to dehydration, accounting for 25 of the 37 (67.0 %) complications. A contributing factor for such high output ostomies was short-gut syndrome due to extensive bowel resection in 36.0 % (9/25) of such patients. Of reported ostomy complications, 13.5 % (5/37) required operative intervention (2 for stoma stenosis, 1 for stoma necrosis, 1 for a malpositioned stoma, and 1 for volvulus around an end ileostomy).

Of the 199 stomas created during or shortly after index CRS/HIPEC procedure, 35 (17.5 %) were intended to be permanent. Of the 164 patients with potentially reversible ostomies, only 26.2 % (43/164) underwent reversal. Reversed patients did not differ from nonreversed patients in terms of age, gender, body mass index (BMI), or comorbidities. However, reversed patients were more likely to have an appendiceal primary than their non-reversal counterparts (62.8 vs. 41.3 %, $p = 0.05$). Additionally, reversal patients tended to have better performance status (ECOG 0/1 95.2 vs. 75.4 %, $p = 0.005$) and were more likely to have had complete cytoreductions (41.9 vs. 25.8 %, $p = 0.001$). Post-CRS/HIPEC systemic chemotherapy was also more prevalent in the reversal group than the non-reversal group (66.7 vs. 36.8 %, $p = 0.037$). Furthermore, the type of stoma a patient had impacted their probability of reversal. Those with loop ileostomies and loop colostomies were significantly more likely to undergo reversal compared to those with end ileostomies and end colostomies (loop ileostomy: 57.4 % reversed, loop colostomy: 44.4 % reversed, end ileostomy: 3.8 % reversed, end colostomy: 5.9 % reversed, $p < 0.0001$). The most common reasons for failure to reverse were disease progression (43/164, 26.2 %) and death (40/164, 24.3 %).

Multivariate logistic regression analysis demonstrated that only completion of CRS, stoma type, and preoperative chemotherapy significantly predicted reversal after controlling for known confounders (Table 4).

The median time to reversal was 5.4 months and ranged from 2.2 to 26.9 months. After reversal, 27.9 % (12/43) suffered a Clavien I/II minor morbidity, 27.9 % (12/43) suffered Clavien III/IV major morbidity, and 30-day mortality was 4.7 % (2/43). Major morbidity after ileostomy takedown included anastomotic stricture (2/32), small-bowel obstruction (1/33), fascial dehiscence (2/33), enterocutaneous fistula (2/33), and intra-abdominal abscess (1/33). Need for operative intervention after ileostomy reversal was 18.1 % (6/33). Major morbidity after colostomy takedown included enterocutaneous fistula (1/10), fascial dehiscence (1/10), and acute coronary syndrome (1/10).

Reversal was associated with greater OS among those with LGA (median survival: 2.4 years among non-reversed but not reached among reversed, $p = 0.01$), HGA (median survival: 0.43 years among non-reversed vs. 1.4 years among reversed, $p = 0.002$), and colorectal cancers (median survival: 1.1 years among non-reversed but not yet reached among reversed, $p = 0.001$). A multivariate proportional hazards model demonstrated that reversal was independently associated with increased survival, even controlling for previously described clinical confounders (hazard ratio 0.11, $p < 0.01$).

DISCUSSION

Achievement of complete cytoreduction among patients with PSD often requires bowel resection, necessitating either anastomosis or stoma creation. Stomas are associated with a host of complications that may diminish quality of life or require operative intervention to repair. Stoma reversal has an additional risk of morbidity and mortality. Our study sought to identify risk factors for stoma creation during CRS/HIPEC as well as to describe the morbidity and mortality of stoma reversal after CRS/HIPEC.

Overall, 17 % of patients undergoing CRS/HIPEC required stoma creation and 78 % of such stomas were ultimately permanent (13.5 % permanent stoma rate overall). Only one previous study has evaluated stoma incidence and reversal in the context of CRS/HIPEC.⁷ Although the authors of this study cited a higher (37 %) percentage of patients requiring stoma during CRS/HIPEC, such stomas were reversed in 53 % of cases, resulting in a 17 % permanent stoma rate.⁷

Unsurprisingly, risk factors found to be associated with stoma creation included colorectal primary, higher burden of disease, incomplete CRS and poor functional status. Patients with primary colorectal cancer are more likely to have had prior colon resections or require additional resections of the distal colon or rectum during CRS—both of which may necessitate high-risk anastomoses due to anatomic location and altered blood supply. Analogously, high burden of disease increases the likelihood that multiple bowel resections will be required, thus inherently increasing the need for stoma creation. High burden of disease also signals that future progression or recurrence manifested as bowel obstruction is

likely. As such, multivariate analysis revealed that burden of disease (or PCI) was the single most significant predictor of stoma creation.

The higher morbidity and mortality demonstrated among stoma patients can be understood in terms of the characteristics contributing to the initial need for stoma. That is, patients with high burden of disease, incomplete cytoreductions and poor preoperative functional status are more likely to suffer postoperative complications. This explains why the presence of stoma was no longer a significant predictor of 30- or 31–90-day mortality, minor morbidity or major morbidity in multivariate regression models controlling for such risk factors. Despite this, OS remained foreshortened in those individuals requiring stomas, even after controlling for these clinical confounders. One possible explanation is that those requiring stomas represent a uniquely complicated subset of patients with a volume of disease that requires complex visceral resections. In this respect, need for stoma may serve as an additional marker of advanced stages of disease.

Stoma-related complications reported in this study's patient population mirrored those previously reported in the literature. A recent review article reported the incidence of stoma-related complications ranged from 21 to 70 %.⁸ Such reported complications included minor complications, such as skin excoriation, to more major complications, such as stomal stenosis or parastomal hernias requiring operative intervention.^{8,9} Approximately 20 % of patients in our cohort suffered stoma-related complications, matching reported rates. These stoma-related complications may explain why 30- and 31–90-day readmission rates remain elevated in the group of patients requiring stomas, even when other confounders are held constant.

Major factors influencing stoma reversal among CRS/HIPEC patients were the type of primary tumor, extent of cytoreduction, need for chemotherapy, and type of stoma created. This fact is reasonable given that the biologic behavior of the primary tumor along with the extent of cytoreduction both correlate with progression and survival. Similarly, the need for chemotherapy may signify more aggressive tumor behavior. Furthermore, loop ileostomies and colostomies often are created with the intention of being temporary, for protection of high-risk downstream anastomoses and thus should be more likely to be reversed. For the same reasons, incomplete resections, the need for preoperative chemotherapy, and the creation of an end ileostomy or end colostomy were the single greatest predictors of non-reversal.

The morbidity and mortality of stoma reversal after CRS/HIPEC in this paper is higher than the morbidity and mortality of stoma reversal among non-CRS/HIPEC patients reported in the literature. Most papers have reported mortality rates of reversal as less than 1 %.^{10–12} Although one paper reported 3.3 % mortality, subanalysis of patients who had undergone stoma for malignancy as opposed to benign causes, maintained a lower mortality rate of 1.1 %.¹³ Mortality of stoma reversal in our cohort of CRS/HIPEC patients was nearly 5 %. Additionally, reported rates of anastomotic leak after stoma takedown in the literature range from 2–5 % after colostomy reversal and 0–2 % after ileostomy reversal.^{10–14} In contrast, in our CRS/HIPEC cohort, 10 % of colostomy reversals and 9 % of ileostomy reversals resulted in anastomotic leak.

The higher rates of morbidity and mortality among patients undergoing stoma reversal after CRS/HIPEC are likely due to their disease process. CRS/HIPEC patients may have diminished physiologic reserves as a result of heavily pretreated advanced stage of malignancy with prior operations and several lines of systemic chemotherapy. This creates a disadvantage for successful outcomes compared with other populations of individuals who require stomas for localized cancer or benign disease. In addition, the intense desmoplastic activity post CRS/HIPEC may be associated with higher rates of distal bowel obstruction and may interfere with bowel mobilization during reversal thus, precluding a tension free anastomosis. Both factors are likely to result in higher leak and mortality rates. For these reasons, among post-CRS/HIPEC patients undergoing stoma reversal, we advocate a low threshold of converting a reversal through a peristomy incision into a midline laparotomy incision with distal adhesiolysis and adequate mobilization of proximal and distal anastomotic segments.

Despite rates of high morbidity and mortality among stoma patients requiring reversal, LGA, HGA, and colorectal patients undergoing reversal outlived those who did not undergo reversal. This is likely due to self-selection. That is, patients undergoing reversal had to live long enough to undergo this operation and were not likely to be selected for such an operation if they were in poor physical condition. The operative selection process for reversal includes an element of clinical judgment that cannot be controlled for in statistical models such that only patients with attenuated tumor biology are selected for such a procedure. This may explain why reversal remained an independent predictor of increased OS even when controlling for confounding variables, such as R resection status, patient age, and operative experience.

Although this study evaluates a prospectively maintained database, the analysis of this database was performed retrospectively and required additional retrospective chart inquiries. Thus, the study is subject to many of the inherent limitations of a retrospective review. Often the reasons for stoma creation were not explicitly documented in operative reports or progress notes. Furthermore, the studied time period of 23 years includes the historic development of previously unknown selection criteria and institutional expertise. Although the use of operative quintiles in regression models may have helped to control for this, there are likely intangible factors that can never be fully controlled for. However, despite its limitations, this study represents the first in depth evaluation of the risk factors associated with stoma creation and of the morbidity and mortality associated with stoma reversal in the setting of CRS/HIPEC.

CONCLUSIONS

Stomas are required in almost 20 % of CRS/HIPEC patients, and 75 % of these patients are ultimately left with a permanent stoma. Risk of stoma is particularly strong in those with high burden of disease and reversal is unlikely when cytoreduction is incomplete, upfront chemotherapy is required, and end rather than loop ostomies are created. Furthermore, reversal is associated with significant major morbidity and mortality. Patients with high burden of disease requiring preoperative chemotherapy should be counseled prior to CRS/

HIPEC as to their increased risk of stoma creation and their low likelihood of successful reversal.

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FIG. 1.
Types of stomas created

TABLE 1

Baseline characteristics of those with and without ostomy creation at index operation

Characteristic	No ostomy (<i>n</i> = 961)	Ostomy (<i>n</i> = 188)	<i>p</i> value
Female, <i>n</i> (%), <i>n</i> = 1,147	530 (55.2)	84 (44.9)	0.010
Age, mean (SD) year	52.9 (12.3)	51.7 (13.2)	0.042
Diabetes, <i>n</i> (%), <i>n</i> = 1,092	91 (10.0)	16 (8.9)	0.620
Heart disease, <i>n</i> (%), <i>n</i> = 1,092	85 (9.3)	11 (6.0)	0.152
Lung disease, <i>n</i> (%), <i>n</i> = 1,090	40 (4.4)	3 (1.7)	0.083
Smoker, <i>n</i> (%), <i>n</i> = 1,064			0.499
Never	588 (66.3)	127 (71.8)	
Past	163 (18.4)	29 (16.4)	
Current	136 (15.3)	21 (11.9)	
Body mass index, mean (SD)	27.9 (6.1)	26.8 (5.5)	0.114
Albumin, mean (SD)	3.8 (0.6)	3.7 (0.6)	0.039
ECOG performance status, <i>n</i> (%), <i>n</i> = 1,126			0.002
0/1	811 (86.1)	142 (77.2)	
2+	131 (13.9)	42 (22.8)	
Type of primary, <i>n</i> (%), <i>n</i> = 1,149			<0.001
Appendiceal,	468 (48.7)	88(47.3)	
Low-grade	301(77.2)	38 (55.9)	
High-grade	89 (22.8)	30(44.1)	
Colorectal	197 (20.5)	68 (36.2)	
Ovarian	75 (7.8)	5 (2.7)	
Other	221 (23.0)	27 (14.4)	
Resection type, <i>n</i> (%), <i>n</i> = 1,137			<0.001
R0/1	488 (51.2)	48 (25.5)	
R2a	267 (28.0)	62(33.0)	
R2b	104 (10.9)	55 (29.3)	
R2c	94 (9.9)	23 (12.2)	
No. of organs resected, mean (SD)	2.95 (1.5)	4.11 (1.8)	<0.001
PCI	12.90 (8.2)	17.6 (8.8)	<0.001
Preoperative chemotherapy, <i>n</i> = 1,026	449 (52.6)	97 (68.8)	0.001
Postoperative chemotherapy, <i>n</i> = 451	186 (54.9)	25 (50.0)	0.633

SD standard deviation

TABLE 2

Odds ratios for stoma creation, multivariate analysis

	OR	Lower 95 % CI	Upper 95 % CI	<i>p</i> value
HIPEC age	0.987	0.965	1.01	0.264
Male sex	1.477	0.816	2.672	0.197
Albumin	0.991	0.543	1.809	0.977
ECOG performance status				
0/1	Ref.			
2+	1.043	0.383	2.842	0.934
Type of primary				
Appendiceal	Ref.			
Colorectal	1.514	0.737	3.11	0.259
Ovarian	0.607	0.071	5.216	0.649
Resection type				
R0/1	Ref.			
R2	0.617	0.28	1.355	0.229
No. of organs resected	1.219	0.994	1.494	0.058
PCI lesions at exploration	1.082	1.033	1.134	0.001
Preoperative chemotherapy	2.001	0.984	4.069	0.055

OR odds ratio, *CI* confidence interval

TABLE 3

Postoperative morbidity and mortality of those with and without ostomy creation at index operation

	No ostomy (<i>n</i> = 961)	Ostomy (<i>n</i> = 188)	<i>p</i> value
Minor morbidity, <i>n</i> (%)	320 (51.4)	66 (69.5)	0.001
Major morbidity, <i>n</i> (%)	189 (23.3)	52 (35.4)	0.002
Mortality, 30-day, <i>n</i> (%)	22 (2.3)	4 (2.1)	1.000
Mortality, 31–90-day, <i>n</i> (%)	10 (1.0)	8 (4.3)	0.004
Readmission, 30-day, <i>n</i> (%)	198 (25.6)	38 (31.4)	<0.001
Readmission, 31–90-day, <i>n</i> (%)	115 (13.8)	30 (20.4)	0.037
Operation time, mean (SD), h	8.2 (2.9)	10.6 (2.9)	<0.001
Length of hospital stay, mean (SD), days	13.1 (15.0)	19.2 (20.7)	<0.001
Length of ICU stay, mean (SD), days	2.7 (6.8)	5.9 (14.4)	<0.001
Estimated blood loss, mean (SD), mL	699.9 (727.4)	1,150.4 (963.7)	<0.001
Survival, median (CI), year			
Low-grade appendiceal cancer	14.6 (7.9, NR)	3.6 (1.4, 6.2)	<0.0001
High-grade appendiceal cancer	1.9 (1.4, 2.5)	0.93 (0.4, 1.4)	0.0002
Colorectal cancer	1.5 (1.3, 1.8)	1.3 (0.9, 2.0)	0.685

SD standard deviation, *CI* confidence interval, *NR* not reached

TABLE 4

Odds ratios of stoma reversal, multivariate analysis

	OR	Lower 95 % CI	Upper 95 % CI	p value
HIPEC age	1.016	0.974	1.06	0.4632
Male sex	0.916	0.282	2.973	0.8839
Albumin	0.827	0.282	2.429	0.7302
ECOG performance status				
0/1	Ref.			
2+	0.22	0.018	2.636	0.2323
Type of primary				
Appendiceal	Ref.			
Colorectal	0.313	0.07	1.391	0.127
Ovarian	0.554	0.072	4.237	0.3707
Resection type				
R0/1	Ref.			
R2	0.24	0.061	0.947	0.0415
No. of organs resected	1.055	0.766	1.452	0.7443
Preoperative chemotherapy	0.24	0.059	0.974	0.0458
Type of ostomy				
End ileostomy/jejunostomy	Ref.			
Loop ileostomy/jejunostomy	41.939	6.52	269.788	<.0001
End colostomy	0.514	0.028	9.38	0.653
Loop colostomy	46.328	4.851	442.43	0.0009

OR odds ratio, *CI* confidence interval