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Non-Home Discharge and Prolonged Length of Stay after Cytoreductive Surgery and HIPEC

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BACKGROUND

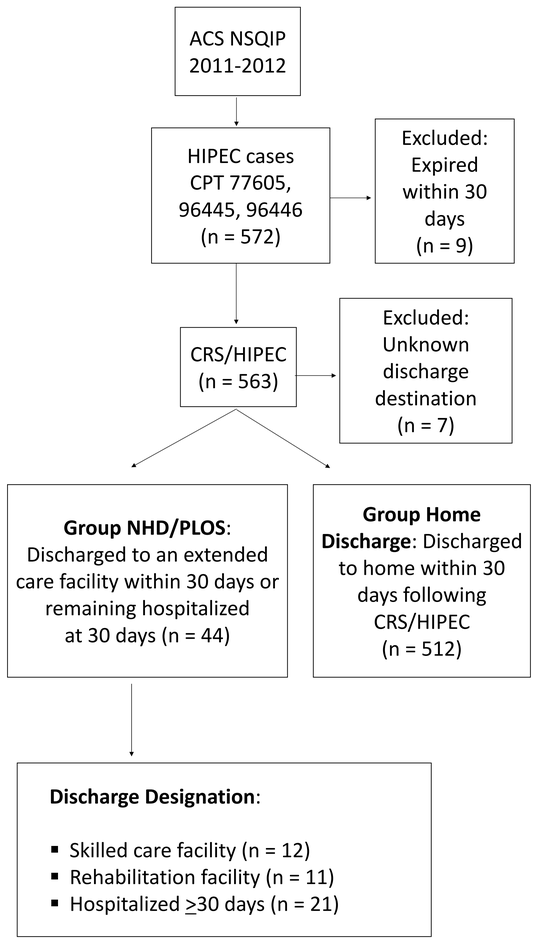
- Cytoreductive surgery with hyperthermic intraperitoneal chemotherapy (CRS/HIPEC) improves survival in selected patients with peritoneal carcinomatosis.
- Given the aggressive nature of the procedure patients are at risk for prolonged length of stay (PLOS) and, or, discharge to an extended care facility which is designated as non-home discharge (NHD).
- These metrics are used to evaluate the quality of care following a variety of major surgical procedures.
- Predictive models for NHD after some major surgical procedures have been proposed. No data has been reported on the rate and risk factors associated with NHD and PLOS in patients following CRS/HIPEC.
- The aim of this study was to identify risk factors for NHD and PLOS following CRS/HIPEC in a national cohort of patients.

PATIENTS AND METHODS

- Patients that underwent CRS/HIPEC from 2011-2012 were identified from the National Surgical Quality Improvement Project (NSQIP) dataset.
- NHD was defined as discharge to an extended care facility that was not home within 30 days.
- PLOS was defined as remaining hospitalized at 30 days following surgery.
- Factors analyzed: Patient characteristics: demographics, diagnosis, comorbidities, CCI, operative details and types of resection, post-operative complications (major and minor by Dindo-Clavien).
- NHD/PLOS and home discharge (within 30 days) groups were compared using Pearson's chi-squared test and two-sample t-test with unequal variances. An MVA logistic regression model was performed to identify predictors of NHD/PLOS.

RESULTS

Figure 1. Consort Diagram



- 563 CRS/HIPEC cases were identified, 7 of which had an unknown discharge destination.
- From the 556 patients with a known discharge destination 44 (7.9%) were not discharged to home within 30 days.
- From these 44 cases, 12 were discharged to a skilled care facility and 11 were discharged to a rehabilitation facility, accounting for a NHD rate of 4.1%.
- Twenty one patients from this cohort remained hospitalized at 30 days accounting for a PLOS rate of 3.7%.
- On univariate analysis, advancing age, COPD, HTN, and low preoperative albumin were identified as preoperative risk factors for NHD/PLOS ($p < 0.05$).
- On multivariate analysis, age ≥ 65, pre-op albumin < 3.0 g/dL, and having a multi-visceral resection were identified as independent predictors of NHD/PLOS.
- If all three predictors are met preoperatively, the probability of NHD/PLOS is 30.2%.

Table 1. Demographics and Patient Characteristics

Category	Home Discharge (%)	NHD/PLOS (%)	P-Value
Age			.001
< 65	417 (81%)	26 (59%)	
≥ 65	97 (19%)	18 (41%)	
Male gender	213 (42%)	22 (50%)	0.284
Caucasian Race	397 (81%)	32 (80%)	0.895
Current Smoker	69 (13%)	5 (11%)	0.692
ASA class IV	25 (5%)	2 (5%)	0.914
High Charlson Comorbidity Index	71 (14%)	5 (11%)	0.639
Comorbidities			
Malnutrition	119 (23%)	16 (31%)	0.189
COPD	5 (1%)	3 (7%)	**0.002**
Ascites	58 (11%)	6 (12%)	0.918
HTN	181 (35%)	23 (52%)	**0.025**
Diabetes Mellitus	40 (8%)	3 (7%)	0.813
Any Cardiac Disease	7 (1%)	1 (2%)	0.628
Preoperative Labs			
Albumin < 3.0 g/dL	82 (16%)	12 (27%)	**0.056**
Platelets < 150x10^9/L	43 (8%)	6 (14%)	0.240

Table 2. Type of Surgical Resection

Category	Home Discharge (%)	NHD/PLOS (%)	P-Value
Splenectomy	116 (23%)	17 (39%)	**0.017**
Small Bowel Resection	83 (16%)	15 (34%)	**0.003**
Colectomy	245 (48%)	32 (73%)	**0.002**
Proctectomy	5 (1%)	1 (2%)	0.425
Gastrectomy	19 (4%)	2 (4.5%)	0.781
Pancreatectomy	21 (4%)	5 (11%)	**0.029**
Liver Resection	45 (9%)	12 (27%)	**0.000**
Nephrectomy	1 (0.2%)	0 (0%)	0.769
Ovary Tube Resection	112 (22%)	7 (16%)	0.355
Peritonectomy	74 (14%)	8 (18%)	0.503
Omentectomy	184 (36%)	16 (31%)	0.955
Multivisceral Resection	396 (77%)	41 (93%)	**0.014**

Table 3. Post-operative Complications

Category	Home Discharge (%)	NHD/PLOS (%)	P-Value
Reintubation	6 (1%)	11 (25%)	**<0.000**
Ventilator > 48h	7 (1%)	15 (34%)	**<0.000**
Septic Shock	2 (0.4%)	5 (11%)	**<0.000**
Superficial SSI	17 (3%)	7 (16%)	**<0.000**
Deep SSI	2 (0.4%)	0 (0%)	0.678
Organ SSI	17 (3%)	18 (41%)	**<0.000**
Pneumonia	6 (1%)	7 (16%)	**<0.000**
Dehiscence	3 (0.5%)	2 (4.5%)	0.008
PE	4 (1%)	2 (4.5%)	**0.020**
Acute Kidney Injury	7 (1%)	3 (7%)	**0.009**
UTI	21 (4%)	5 (11%)	0.029
DVT	4 (1%)	6 (14%)	**<0.000**
Bleeding Transfusion	171 (33%)	32 (73%)	**<0.000**
Sepsis	24 (5%)	15 (34%)	**<0.000**

RESULTS

Table 4. Multivariable Analysis Summary

Variable	Odds Ratio	95% CI	P-Value
Pre-Operative Factors			
Age > 65	3.05	1.58 – 5.85	0.001
Pre-op Albumin < 3.0 g/dL	2.24	1.08 – 4.64	0.029
Multi-visceral Resection *	4.09	1.23 – 13.58	0.021

* If multi-visceral organ resection is anticipated based on cross sectional imaging.

LIMITATIONS

- NSQIP limitations:
  - Retrospective
  - NSQIP data collection ends at 30 days post-op
  - Limited to 2011-2012 dataset
- Despite identifying a large number of cases, the number of NHD/PLOS (n=44) was low, limiting the power of statistical analysis.

CONCLUSIONS

- In this national cohort of patients, older age (>65), hypoalbuminemia, and multi-visceral resection constituted the main risk factors for NHD/PLOS following CRS/HIPEC.
- Timely identification of these risk factors may facilitate preoperative discussions with patients, and improve discharge planning and resource utilization.
- Future direction: Development of an assessment tool or nomogram that could allow providers and facilities to predict NHD or PLOS after CRS/HIPEC.