

Supplementary Online Content

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This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. ICD-9-CM Codes Used to Calculate Subgroups of Complications

SURGICAL COMPLICATIONS			
Complication Type	Code	Number	Description
Anastomotic or bile leak	ICD-9D	997.4	Digestive system complications not elsewhere classified, including complications of intestinal (internal) anastomosis and bypass, not elsewhere classified
	ICD-9D	997.49	Other digestive system complications, including postprocedural bile duct leak, intestinal obstruction due to a procedure, peritonitis due to bile leak after cholecystectomy
Hemorrhagic	ICD-9D	998.1	Hemorrhage or hematoma or seroma complicating a procedure
	ICD-9D	998.11	Hemorrhage complicating a procedure
	ICD-9D	998.12	Hematoma complicating a procedure
	ICD-9D	998.13	Seroma complicating a procedure
		998.2	Accidental puncture or laceration during a procedure
	ICD-9D	E870.0	Accidental cut, puncture, perforation or hemorrhage during surgical operation
	ICD-9P	39.98	Control of hemorrhage, not otherwise specified
	ICD-9P	99.04	Transfusion of packed cells
Wound-related	ICD-9D	998.3	Disruption of wound
	ICD-9D	998.31	Disruption of internal operation (surgical) wound
	ICD-9D	998.32	Disruption of external operation (surgical) wound
	ICD-9D	998.5	Postoperative infection
	ICD-9D	998.51	Infected postoperative seroma
	ICD-9D	998.59	Other postoperative infection
	ICD-9D	998.83	Non-healing surgical wound
	ICD-9P	86.04	Other incision with drainage of skin and subcutaneous tissue
	ICD-9P	86.22	Excisional debridement of wound, infection, or burn
Intra-abdominal abscess	ICD-9D	567.22	Peritoneal abscess
	ICD-9P	54.91	Percutaneous abdominal drainage
Sepsis	ICD-9D	038.9	Unspecified septicemia
	ICD-9D	785.52	Septic shock
	ICD-9D	790.7	Bacteremia
	ICD-9D	995.9	Systemic inflammatory response syndrome (SIRS)
	ICD-9D	995.91	Sepsis
	ICD-9D	995.92	Severe sepsis
	ICD-9D	998.0	Postoperative shock

MEDICAL COMPLICATIONS			
Complication Type	Code	Number	Description
Respiratory	ICD-9D	465	Acute upper respiratory infections of multiple or unspecified sites
	ICD-9D	465.9	Acute upper respiratory infections of multiple or unspecified sites
	ICD-9D	482	Other bacterial pneumonia
	ICD-9D	482.0	Pneumonia due to <i>Klebsiella pneumoniae</i>
	ICD-9D	482.1	Pneumonia due to <i>Pseudomonas</i>
	ICD-9D	482.2	Pneumonia due to <i>Hemophilus influenzae</i>
	ICD-9D	482.41	Methicillin susceptible pneumonia due to <i>Staphylococcus aureus</i>
	ICD-9D	482.82	Pneumonia due to other specified bacteria - <i>Escherichia coli</i>
	ICD-9D	482.83	Pneumonia due to other specified bacteria - Other gram-negative bacteria
	ICD-9D	486	Pneumonia, organism unspecified
	ICD-9D	511.9	Pleurisy - Unspecified pleural effusion
	ICD-9D	518	Other diseases of lung
	ICD-9D	518.0	Pulmonary collapse
	ICD-9D	518.4	Acute edema of lung, unspecified
	ICD-9D	518.5	Pulmonary insufficiency following trauma and surgery
	ICD-9D	518.81	Acute respiratory failure
	ICD-9D	518.82	Other pulmonary insufficiency, not elsewhere classified
	ICD-9D	518.84	Acute and chronic respiratory failure
	ICD-9D	799.1	Other ill-defined and unknown causes of morbidity and mortality; respiratory arrest
	ICD-9D	997.3	Complications affecting specified body systems, not elsewhere classified; respiratory complications from a procedure
Cerebrovascular accidents	ICD-9D	997.0	Complications affecting specified body systems, not elsewhere classified - Nervous system complications
	ICD-9D	997.01	Central nervous system complication (anoxic brain damage; cerebral hypoxia)
	ICD-9D	997.02	Iatrogenic cerebrovascular infarction or hemorrhage
	ICD-9D	997.09	Other nervous system complications
Renal Insufficiency	ICD-9D	584.5	Acute renal failure - With lesion of tubular necrosis
		584.9	Acute renal failure, unspecified
Cardiovascular	ICD-9D	410.1 to 410.9	Acute myocardial infarction - Of other anterior wall; Acute myocardial infarction - Unspecified site

	ICD-9D	411.89	Acute coronary occlusion without myocardial infarction-other (coronary insufficiency; subendocardial ischemia)
	ICD-9D	997.1	Complications affecting specified body systems, not elsewhere classified - Cardiac complications
	ICD-9D	998.0	Postoperative shock not elsewhere classified
	ICD-9D	998.01	Postoperative shock, cardiogenic
	ICD-9D	998.02	Postoperative shock, septic
	ICD-9D	998.09	Postoperative shock, other
Urinary tract infection	ICD-9D	997.5	Urinary complications (as due to procedure)
Portal/renal thrombosis & deep vein thrombosis	ICD-9D	444.22	Embolism and thrombosis of arteries of the extremities
	ICD-9D	452	Portal vein thrombosis
	ICD-9D	453.3	Other venous embolism and thrombosis of renal vein
	ICD-9D	453.4	Acute venous embolism and thrombosis of deep vessels of lower extremity
	ICD-9D	453.40	Acute venous embolism and thrombosis of unspecified deep vessels of lower extremity
	ICD-9D	453.41	Acute venous embolism and thrombosis of deep vessels of proximal lower extremity
	ICD-9D	453.42	Acute venous embolism and thrombosis of deep vessels of distal lower extremity
	ICD-9D	453.6	Venous embolism and thrombosis of superficial vessels of lower extremity
	ICD-9D	453.8	Acute venous embolism and thrombosis of other specified veins
	ICD-9D	453.82	Acute venous embolism and thrombosis of deep veins of upper extremity
	ICD-9D	453.84	Acute venous embolism and thrombosis of axillary veins
	ICD-9D	453.85	Acute venous embolism and thrombosis of subclavian veins
	ICD-9D	453.86	Acute venous embolism and thrombosis of internal jugular veins
	ICD-9D	557.0	Acute vascular insufficiency of intestine
Pulmonary Embolism	ICD-9D	415.1	Pulmonary embolism and infarction
	ICD-9D	415.11	Iatrogenic pulmonary embolism and infarction

ICD-9D: Diagnosis code; ICD-9P : Procedure code

eTable 2. Postoperative Morbidity and Mortality of the Study Population and ISS vs ELM Subgroups

		All	ISS	ELM	
		N= 275	N= 139	N= 136	
		N (%)	N (%)	N (%)	<i>P</i> Value
Mortality 90-day	No	259 (94.2)	129 (92.8)	130 (95.6)	.32
	Yes	16 (5.8)	10 (7.2)	6 (4.4)	
Complications (Any)	No	190 (69.1)	91 (65.5)	99 (72.8)	.19
	Yes	85 (30.9)	48 (34.5)	37 (27.2)	
Surgical Complications					
	Bile/ anastomotic leak	17 (6.2)	8 (5.8)	9 (6.6)	.77
	Hemorrhagic/ Transfusion	43 (15.6)	25 (18)	18 (13.2)	.28
	Wound	11 (4)	4 (2.9)	7 (5.1)	.34
	Abscess/Sepsis	17 (6.2)	8 (5.8)	9 (6.6)	.77
Medical Complications					
	Respiratory	32 (11.6)	15 (10.8)	17 (12.5)	.66
	Neurologic/ Stroke	1 (0.4)	1 (0.7)	0 (0)	.32
	Renal	8 (2.9)	3 (2.2)	5 (3.7)	.45
	Cardiovascular	7 (2.6)	4 (2.9)	3 (2.2)	.72
	UTI	3 (1.1)	1 (0.7)	2 (1.5)	.55
	DVT/ PE	5 (1.8)	1 (0.7)	4 (2.9)	.15

UTI - Urinary Tract Infection, DVT - Deep venous thrombosis, PE - Pulmonary Embolism

eTable 3. Predictors of Morbidity or Mortality in ELM Tumors (n=136)

	Morbidity or Mortality		Univariate	<i>P</i> Value	Multivariate	<i>P</i> Value
	No (94)	Yes (42)	OR (95% CI)		OR (95% CI)	
Age - Median (IQR)	65 (54-73)	65 (59-69)		.68		
Race/Ethnicity - N(%)						
Non-Hispanic White	55 (58.5)	20 (47.6)	(reference)			
Asian/ Pacific-islander	20 (21.3)	10 (23.8)	1.37 (0.55-3.43)	.50		
Hispanic White	14 (14.9)	9 (21.4)	1.77 (0.66-4.72)	.26		
Black	4 (4.3)	1 (2.4)	0.69 (0.07-6.52)	.74		
Other	1 (1.1)	2 (4.8)	5.5 (0.47-64.01)	.17		
Sex - N(%)						
Male	33 (35.1)	22 (52.4)	(reference)			
Female	61 (64.9)	20 (47.6)	0.49 (0.23-1.03)	.06		
Year of Diagnosis - N(%)						
2004-06	36 (38.3)	10 (23.8)	(reference)			
2007-09	31 (33)	14 (33.3)	1.63 (0.63-4.17)	.31		
2010-12	27 (28.7)	18 (42.9)	2.4 (0.95-6.02)	.06		
Insurance - N(%)						
Government	54 (57.4)	22 (52.4)	(reference)			
Private	40 (42.5)	20 (47.6)	1.23 (0.59-2.55)	.58		
NCI-designated Cancer Center - N(%)						
No	72 (76.6)	27 (64.3)	(reference)			
Yes	22 (23.4)	15 (35.7)	1.82 (0.82-4.01)	.14		
Charlson-Deyo Comorbidity Score - N(%)						
0	23 (24.5)	5 (11.9)	1 [Reference]		1 [Reference]	

1	51 (54.3)	18 (42.9)	1.62 (0.54-4.91)	.39	-	
2	14 (14.9)	13 (30.9)	4.27 (1.25-14.57)	.02	3.02 (1.12-8.17)	.03
3+	6 (6.4)	6 (14.3)	4.6 (1.04-20.38)	.045	5.25 (1.32-20.9)	.02
Tumor Size - Median (IQR)		7.9 (5.5-9.5)	7.9 (4.8-10.5)		.76	
Extent of Surgery - N(%)						
Minor	42 (45.2)	10 (23.8)	1 [Reference]		1 [Reference]	
Major	51 (54.8)	32 (76.2)	2.63 (1.16-5.98)	.02	3.93 (1.50-10.30)	.005
Portal Lymphadenectomy - N(%)						
No	46 (48.9)	22 (52.4)	1 [Reference]			
Yes	48 (51.1)	20 (47.6)	0.87 (0.42-1.80)	.71		
Vascular Invasion- N(%)						
No	69 (73.4)	30 (73.2)	1 [Reference]			
Yes	25 (26.6)	11 (26.8)	1.01 (0.44-2.32)	.98		
Contiguous organ involvement - N(%)						
No	78 (83)	30 (73.2)	1 [Reference]			
Yes	16 (17)	11 (26.8)	1.79 (0.74-4.29)	.19		
Multifocal - N(%)						
No	58 (61.7)	26 (61.9)	1 [Reference]			
Yes	36 (38.3)	16 (38.1)	0.99 (0.47-2.10)	.98		
95% CI - 95% Confidence Intervals						
Minor, Less than hemi-hepatectomy; Major, Hemi-hepatectomy or Extended hemi-hepatectomy						

eTable 4. Comparison of Predictor Variables in Training and Validation Set

		CCR Training - n(%)	Non-California SEER Validation - n(%)	<i>P</i> Value
Multifocal	N	169 (81.6)	207 (79.3)	.53
	Y	38 (18.4)	54 (20.7)	
Extrahepatic Extension	N	185 (89.4)	247 (94.6)	.03
	Y	22 (10.6)	14 (5.4)	
Grade	N	147 (71)	181 (69.3)	.70
	Y	60 (29)	80 (30.6)	
Node Positive	N	163 (78.7)	216 (82.8)	.27
	Y	44 (21.3)	45 (17.2)	
Age 60+ years	N	83 (40.1)	104 (39.8)	.96
	Y	124 (59.9)	157 (60.2)	
Total		207 (100)	261 (100)	

eFigure. Baseline Kaplan-Meier Overall Survival Estimate of California Cancer Registry (CCR) Training Set and Non-Californian SEER Registry Validation Set

