POSTER 58

Common comorbidities and a comparison of four comorbidity indices in orthopaedic oncology surgical patients

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BACKGROUND: Comorbidity indices are used as tools to help estimate patients' length of hospital stay, costs of care, outcomes, and mortality. Increasingly, cormorbidity assessment has become a major consideration in reimbursement models. The applicability of commonly used comorbidity indices to orthopaedic oncology patients has not yet been studied.

QUESTIONS/PURPOSE: (1) Compared with other published studies, what are the predominant comorbidities in a sample of orthopaedic oncology patients? (2) How do the Charlson comorbidity index (CCI), National Institute on Aging / National Cancer Institute (NIA/NCI) comorbidity index, van Walraven / Elixhauser comorbidity index, and the Agency for Healthcare Research and Quality (AHRQ) / Elixhauser comorbidity index compare using a sample of orthopaedic oncology patients?

METHODS: Patient demographic information, primary cancer diagnosis, number of sites of disease, and number and types of comorbidities were collected retrospectively on 71 randomly selected patients treated surgically in the Department of Orthopaedic Oncology between January 2014 and December 2019 at our institution. Comorbidities were tabulated and weighted according to the guidelines set forth by the CCI, NIA/NCI, van Walraven / Elixhauser, and AHRQ / Elixhauser indices. Two-tailed bivariate Pearson correlations were performed to assess the relationship between the various indices. Comorbidities in our patient population were compared against those published in other studies.

RESULTS: The predominant comorbidities in orthopaedic oncology patients were electrolyte disorders, fluid overload, recent weight loss or being underweight, and deficiency anemias. The percentage of orthopaedic oncology patients with commonly listed comorbidities far exceeded those reported in other cancer populations, orthopaedic populations, and inpatient populations. All four comorbidity indices were highly positively correlated with one another when assessing the comorbidities in our sample patient population.

CONCLUSIONS: Commonly utilized comorbidity indices, while highly correlated with one another, underestimate the true assessment of comorbidities in orthopaedic oncology patients. The number of comorbidities in orthopaedic oncology patients is significantly greater than those reported in other patient populations. These findings highlight the importance of developing tools to properly assess the comorbidities in specific patient populations, especially as we utilize these models to set benchmarks for measuring patient outcomes, assessing department and hospital efficiency and safety, and determining reimbursement criteria.

Table 1. Prevalence of comorbidities for orthopaedic oncology patients compared with patients in other published studies.

Comorbidity	MD Anderson orthopaedic oncology patients (%)	Colorectal cancer patients [4] (%)	Inpatients from the Healthcare Cost and Utilization Project State Inpatient Databases [5] (%)	Shoulder arthroplasty patients [3] (%)	Anterior lumber interbody fusion patients [1] (%)
	Percentage of Sample				
Electrolyte disorders	97.2	2.1	25.7	6.5	8.5
Fluid overload	85.9	2.1	25.7	6.5	8.5
Recent weight loss or Underweight	84.5	2.8	5.2	0.3	0.9
Deficiency anemias	80.3	3.4	18.3	8.1	0.7
Metastatic cancer*	77.5	14.1	2.5	0.1	0.4
Depression	71.8	3.2	11.2	12.9	18.5
Hypertension	71.8	24.8	55.8	66.5	46.9
Neurological disorders	54.9	0.9	8.2	5.0	2.9
Chronic pulmonary disease	50.7	11.9	19.4	17.1	16.0
Liver disease	49.3	3.4	3.5	1.0	1.4
Pulmonary circulation disorders	49.3	1.1	2.2	0.9	0.8
Renal failure	45.1	3.0	13.4	4.4	2.9
Altered mental status or Psychosis	42.3	3.2	5.0	2.0	0.7
Coagulopathy	38.0	--	5.3	1.4	2.0
Peripheral vascular disorders	38.0	6.7	6.5	2.5	2.2
Obesity	32.4	--	12.0	13.1	14.4
Hypothyroidism	29.6	4.9	12.0	15.3	11.7
Diabetes (uncomplicated)	21.1	12.4	21.0	17.8	13.8
Diabetes (complicated)	19.7	3.4	5.2	1.6	1.5
Lymphoma	18.3	--	0.9	0.3	0.3
Peptic ulcer disease	15.5	4.1	0	0.1	0.4
Chronic blood loss anemia	14.1	2.8	1.1	0.7	0.5
Valvular disease	14.1	1.7	3.8	4.1	2.0
Leukemia	12.7	--	--	--	--
Congestive heart failure	9.9	3.6	9.0	3.4	1.8
Rheumatoid arthritis	8.5	1.5	3.0	5.2	3.6
Drug abuse	7.0	--	4.8	0.5	2.1
AIDS or HIV	1.4	1.9	0.2	0	0.1
Alcohol abuse	1.4	1.5	5.4	1.0	1.3

*: Patients with multiple myeloma were excluded from the category of metastatic disease. AIDS: acquired immunodeficiency syndrome. HIV: human immunodeficiency virus.

Table 2. Correlation between weighted comorbidity scores in 71 orthopaedic oncology patients using two-tailed bivariate Pearson correlation tests with 69 degrees of freedom.

Comorbidity Index		NIA/NCI	van Walraven	AHRQ
CCI	Pearson Correlation	0.76	0.68	0.56
	Significance	<0.001	<0.001	<0.001
NIA/NCI	Pearson Correlation		0.64	0.40
	Significance		<0.001	<0.001
van Walraven	Pearson Correlation			0.85
	Significance			<0.001

AHRQ: The Agency of Healthcare Research and Quality. CCI: Charlson Comorbidity Index. NIA/NCI: The National Institute on Aging/National Cancer Institute.