

Impacts of Social Determinants of Health on Disease Burden at Initial Presentation and Clinical Outcomes in Patients With Primary Musculoskeletal Cancers

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INTRODUCTION:

Timely diagnosis and treatment of primary musculoskeletal cancers is crucial to minimize morbidity and mortality. Local control with surgery remains the mainstay of musculoskeletal cancer treatment, and survival rates are generally high if tumors are resected before the detection of distant metastases. Patients with social determinants of health (SDOH) burdens may face challenges in receiving care, with delays in treatment resulting in more advanced disease at initial clinic presentation. Advanced disease progression increases medical complexity and often necessitates comparatively more morbid procedures and increases the likelihood of metastases, thereby portending decreased survival. We sought to identify which SDOH factors affect disease burden at initial presentation, as well as the factors that are associated with poor outcomes in this population.

METHODS:

After obtaining IRB approval, we conducted a retrospective case-control study of patients with primary musculoskeletal cancers evaluated between 2010 and 2024 at a private hospital (PH) or a safety-net hospital (SH) in a major medical center. Subjects were identified via chart review. Outcomes regarding disease burden at initial presentation included cancer stage, size, and presence of metastases at initial presentation. Outcomes regarding clinical outcomes included amputation, systemic progression, and mortality. SDOH variables included PCP coverage, employment, insurance status, Area Deprivation Index (ADI) state deciles, presentation to SH or PH, and primary language. Univariate analysis was performed between all SDOH variables and outcome variables. We used ordinal logistic regression for cancer stage, generalized linear modeling for tumor size, and logistic regression for all other analyses.

RESULTS:

Our sample comprised of 101 patients, with both sexes represented. Regarding effects of SDOH variables on disease burden at initial presentation, risk factors for higher cancer stage were lack of PCP (OR=2.48, 95%CI=1.02–6.04) and SH presentation (OR=2.84, 95%CI=1.18–6.86). Larger tumor size was associated with SH presentation ($\beta=2.84$, 95%CI=0.6–5.08). ADI state decile was a risk factor for higher stage (OR=0.81, 95%CI=0.66–0.99) on multivariate analysis. The presence of metastases at initial presentation was not significantly associated with any SDOH variables. Regarding the effects of SDOH variables on clinical outcomes, amputation was significantly associated with presentation to a SH (OR=11.04, 95%CI=1.22–99.68). Risk factors for systemic progression were lack of PCP (OR=8.79, 95%CI=2.94–28.92), being unemployed (OR=7.82, 95%CI=1.95–52.8), and presenting to a SH (OR=3.16, 95%CI=1.14–9.17). Risk factors for mortality were lack of PCP (OR=8.12, 95%CI=2.59–31.18) and being uninsured (OR=3.83, 95%CI=1.31–11.78). In multivariate analysis, only lack of PCP remained a risk factor for mortality (OR=14.53, 95%CI=1.59–361.66).

DISCUSSION:

The presence of SDOH burdens was significantly associated with higher cancer stage and larger tumor size at initial presentation, both of which increase the medical and surgical complexity required to achieve local disease control. SDOH burdens were also significantly associated with amputation, systemic progression, and increased mortality. These findings highlight the importance of screening musculoskeletal oncology patients for SDOH burdens and working with patients and social workers to identify ways to mitigate the impacts of these burdens with each individual patient, as well as the need to expand access to medical services, including primary care, for underserved patients in musculoskeletal oncology. Our study was limited by the scope of SDOH data available from medical records, and further prospective and qualitative studies investigating additional SDOH variables is warranted to gain a more nuanced understanding of how SDOH barriers preclude timely and medically optimized treatment for musculoskeletal cancers.

CLINICAL RELEVANCE:

Although the impact of social determinants of health on population level health outcomes is well-described, the specific impacts of SDOH variables on patient characteristics and outcomes in primary musculoskeletal cancer patients has not been quantitatively investigated. Our study demonstrates that SDOH burdens have significant associations with increased disease burden and poorer outcomes in this patient population, emphasizing the need for orthopedic oncologists to be cognizant of how SDOH burdens affect patient care.

IMAGES AND TABLES:

Table 1: Univariate analysis of SDOH variables and disease burden at the time of presentation

Predictor	Increased Stage at Presentation		Presence of Metastases at Presentation		Tumor size at presentation	
	Odds Ratio (95% CI)	p-value	Odds Ratio (95% CI)	p-value	Coefficient (95% CI)	p-value
Lack of PCP	2.48 (1.02, 6.04)	0.04	2.13 (0.76, 6.08)	0.15	2.31 (-0.01, 4.62)	0.05
Unemployment	1.30 (0.52, 3.26)	0.58	1.69 (0.56, 5.81)	0.37	2.26 (-0.29, 4.80)	0.08
Lack of insurance	2.12 (0.88, 5.14)	0.09	1.49 (0.51, 4.21)	0.46	1.99 (-0.37, 4.36)	0.10
ADI state decile	0.96 (0.82, 1.13)	0.64	1.04 (0.86, 1.25)	0.72	0.10 (-0.33, 0.54)	0.64
SH Presentation	2.84 (1.18, 6.86)	0.02	2.04 (0.73, 5.90)	0.18	2.84 (0.60, 5.08)	0.01
Non-English speaker	1.67 (0.66, 4.22)	0.28	1.14 (0.33, 3.51)	0.83	1.38 (-1.28, 4.05)	0.31

Reference groups for binary predictors are established PCP, employed, insured, PH presentation, and English primary language

Table 2: Univariate logistic regression of SDOH variables and clinical outcomes

Predictor	Amputation		Systemic Disease Progression		Mortality	
	Odds Ratio (95% CI)	p-value	Odds Ratio (95% CI)	p-value	Odds Ratio (95% CI)	p-value
Lack of PCP	5.33 (0.91, 31.31)	0.06	8.79 (2.94, 28.92)	<0.01	8.12 (2.59, 31.18)	<0.01
Unemployment	3.02 (0.33, 27.33)	0.32	7.82 (1.95, 52.8)	0.01	7.10 (1.3, 132.71)	0.07
Lack of insurance	2.80 (0.52, 15.02)	0.23	2.71 (0.94, 7.94)	0.07	3.83 (1.31, 11.78)	0.02
ADI state decile	1.37 (0.99, 1.90)	0.06	1.02 (0.85, 1.22)	0.83	1.02 (0.84, 1.24)	0.84
SH Presentation	11.04 (1.22, 99.68)	0.03	3.16 (1.14, 9.17)	0.03	2.98 (1.03, 9.39)	0.05
Non-English speaker	4.50 (0.82, 24.68)	0.08	2.34 (0.76, 7.17)	0.13	2.32 (0.71, 7.10)	0.15

Reference groups for binary predictors are established PCP, employed, insured, PH presentation, and English primary language