Case series

Association of financial assistance programs and time to completion of therapy in women receiving chemoradiation for cervical cancer

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ABSTRACT

We aimed to evaluate how the need for social services programs is associated with outcomes amongst patients with cervical cancer undergoing chemoradiation with a single institution, retrospective analysis of patients from January 1, 2015-July 31, 2018. Demographic, clinical, and social services utilization data were collected. Descriptive statistics and Chi-squared tests were performed. Kaplan-Meier curves estimated progression free (PFS) and overall survival (OS).

Among 117 eligible patients, median household income was $45,782 ($19,771 – $96,222). There was no difference in stage among income cohorts. Uninsured/publically insured patients had a higher stage at diagnosis than those privately insured (p = 0.003). Patients used 0–5 assistance programs during treatment. 77.6% of low income versus 54.2% of high income patients utilized ≥1 program. Assistance with lodging was utilized more often in low than high income patients.

(36.2% vs 15.7%, p = 0.013). 58.3% of patients completed therapy in less than 56 days. Patients who completed therapy in >56 days utilized 1.44 social services while patients completing in ≤56 days used 1.06 (p = 0.102). Social security disability utilization trended towards completion times >56 days (p = 0.064). There was no difference in PFS or OS based on income or social services utilized.

Financial toxicities associated with therapy are not limited to uninsured/publically insured or low income patients as over 50% of high income patients utilized at least one service. Additionally, the trend towards significance between enrollment in disability and completion of chemoradiation >56 days may highlight a group of at risk patients who need additional support.

1. Introduction

1.1. Background

In 2020, approximately 13,800 new cases of cervical cancer are anticipated and almost 4,300 women are expected to die of this disease in the United States, which equates to roughly 7.6 cases per 100,000 women (Siegel et al., 2019; Society AC, 2020). Rates of this disease vary by state, with the highest frequencies in much of the southern and southeastern states, including Oklahoma (Control CfD, 2018). Both racial and socioeconomic factors have been shown to contribute to the disparities noted in cervical cancer incidence. In particular, the rate of cervical cancer among Black and Hispanic women is significantly higher than that of their White and Asian counterparts (Control, CfD, 2018; Bradley et al., 2004; Fitzmaurice et al., 2017). In addition to racial disparities, data demonstrates that women of lower educational attainment, lower family income, and those who live at or below the poverty level are affected at a significantly higher rate (Clegg et al., 2009). Additional data have demonstrated that in a racially diverse group, when controlling for socioeconomic status and access to care (i.e. in a military population), race is no longer a predictor of outcomes. This suggests that socioeconomic status and access may be the primary drivers of poor outcomes in these populations (Farley et al., 2001).

Socioeconomic status can be assessed in many ways, though most commonly it is evaluated based on income, education level, or occupation. When considering access to health care, household or individual income and income as related to the federal poverty level (FPL), is used to assess socioeconomic status and need. As of 2019, the definition of the federal poverty line for an individual was $12,490 and for a family of 4 was $25,750 (HealthCare.gov, 2019). Data from 2013 to 2016 showed

that the national poverty rate was 12.7%, while in Oklahoma approximately 15.4% of people were living in poverty with a median household income of only $49,176 (Semega, 2016). As Oklahoma is a state that did not expand Medicaid coverage, only those who make less than 100% of the FPL can qualify for Medicaid assistance (HealthCare.gov, 2019). Additional funding for women diagnosed with cervical cancer is available through the Oklahoma Cares program, an extension of the national Breast and Cervical Cancer Treatment Program. To qualify, however, a single woman cannot make more than $22,311 per year and a family of 4 cannot have an income greater than $45,510 (Ok.gov, 2019).

Not only are Black, Hispanic, and socioeconimcally disadvantaged populations, who often have poor access to care, diagnosed with cervical cancer more often, but data also shows that they have worse disease specific outcomes, even when controlling for prognostic factors including age and stage at diagnosis (Bradley et al., 2004; Singh and Jemal, 2017). Outcomes in patients with locoregionallly advanced cervical cancer have also been correlated with time to completion of chemoradiation. In particular, data have shown that completion of chemoradiation within eight to nine weeks was associated with a lower rate of disease progression within the pelvis (Chen et al., 2003; Song et al., 2013).

This data led to the hypothesis that the poor outcomes seen in women of lower socioeconomic status may be related to barriers that prolong their time to completion of therapy. A lack of reliable transportation, lack of lodging near the treating facility, or inability to afford supportive medications are just some of these potential barriers. The association between social services utilization and cancer patient characteristics has not been previously described. To our knowledge this is the first study to evaluate the relationship between social services programs and time to completion of therapy in patients with cervical cancer undergoing chemoradiation.

2. Methods

This is a single institution, retrospective analysis of all patients receiving chemoradiation for cervical cancer from January 2015 through July 2018. Demographic, clinical and social services utilization data were collected. Patients were then dichotomized based on income with low income patients defined as a household income less than the median. High income patients were those with a household income at or above the median. Household income was estimated based on patient zip codes and census data. Descriptive statistics were presented as mean and medians for continuous variables and counts and proportions for categorical variables. The Chi-squared test was used to assess the association between social services utilization and income and between social services utilization and time to completion of chemotherapy. The Kaplan-Meier curves were used to estimate the survival curves for progression free (PFS) and overall survival (OS). PFS and OS curves were compared between patients with low and high incomes and between patients with and without the use of assistance programs with the log-rank test. SAS version 9.4 was used for this analysis (Cary, North Carolina).

Social services offered through the cancer center included assistance with registration for Social Security disability, assistance with medication costs, financial assistance for clinic visit co-pays, transportation assistance (including cab vouchers), emergency funds (a one time, up to $100 payment for unforeseen costs), assistance with lodging, and assistance with enrollment in the breast and cervical cancer Medicaid program. Utilization of any of these services at any point during their treatment was considered use of assistance programs. Patients were identified as needing social services consultation based on the results of

Table 1
Patient Demographics

Variable	Number of Patients (%)N = 117
Mean age at diagnosis	48.3 [25–89]
Race	
Black	7 (6.0%)
Asian	3 (2.5%)
American Indian or Native Alaskan	8 (6.8%)
Caucasian, non-Hispanic	80 (68.4%)
Caucasian, Hispanic	18 (15.4%)
Other	1 (0.9%)
Disease Stage	
IA1	1 (0.9%)
IA2	2 (1.7%)
IB1	19 (16.2%)
IB2	28 (23.9%)
IIA1	2 (1.7%)
IIA2	3 (2.5%)
IIB	31 (26.5%)
IIIA	1 (0.9%)
IIIB	25 (21.4%)
IVA	5 (4.3%)
Insurance Status	
Private	48 (41.0%)
Medicaid	32 (27.4%)
Uninsured	24 (20.5%)
Medicare	9 (7.7%)
Indian Health	3 (2.6%)
Unknown	1 (0.8%)

a PHQ-9 questionnaire as well as their insurance status.

3. Results

A total of 117 patients were eligible for this study, however two were excluded from income and time to completion of therapy analysis as zip code data was not available. The average age of our patients was 48.3 years old. The majority were Caucasian (68.4%) and had either stage IB2, IIB, or IIIB disease. Forty-one percent of patients were privately insured, 27.4% were insured through Medicaid, and approximately 20% were uninsured. The remainder were insured through either Medicare, Indian health, or had an unknown insurance status (Table 1). Publically funded (Medicaid, Medicare, and Indian health) and uninsured patients had a higher stage at diagnosis than did privately insured patients ($p = 0.003$). In comparing social services utilization by insurance coverage, those who were uninsured used significantly more financial assistance and medical assistance ($p = 0.005$ and 0.003, respectively). Both uninsured and publically insured patients demonstrated a trend toward increased enrollment in breast and cervical Medicaid and increased use of transportation assistance (Table 2).

The median household income, based on zip code data, was $45,782 ($19,771 - $96,222). This was approximately $4,000 less than the state wide average. Stage at diagnosis of disease was similar between both income cohorts ($p = 0.497$). Our patients used anywhere from 0 to 5 of the seven available assistance programs throughout the course of their treatment. Forty five of the 58 (77.6%) low income patients utilized at least one assistance program, while only 32 of the 59 (54.2%) high income patients used any support. Utilization of assistance with enrollment in social security disability or the breast and cervical cancer Medicaid program, assistance with medication costs, financial assistance for clinic visit co-pays, transportation assistance, or use of emergency funds did not differ between low and high income patients. Assistance with lodging, however, was utilized more often in the low income cohort than their high income counterparts (36.2% vs 15.7%, $p = 0.013$) (Table 3).

Table 2
Association of insurance provider and social services utilization.

Social Service	Publicly insured (Medicaid, Medicare, Indian Health) N=44 (%)	Privately Insured N=48 (%)	Uninsured N=24 (%)	Parametric P-value*
Social Security Disability	6 (13.64)	2 (4.17)	3 (12.5)	0.257
Medication Assistance	5 (11.36)	1 (2.08)	7 (29.17)	**0.003**
Financial Assistance	7 (15.91)	8 (16.67)	11 (47.83)	**0.005**
Transportation Assistance	17 (38.64)	9 (18.75)	9 (37.5)	0.079
Emergency Funds	3 (6.82)	3 (6.25)	0 (0)	0.435
Lodging Assistance	14 (31.82)	13 (27.08)	4 (16.67)	0.421
Breast and Cervix Medicaid Insurance	12 (27.27)	4 (8.33)	4 (16.67)	0.056

*The parametric p-value is calculated by chi-square test

Table 3
Association between income and social services utilization.

Social Service	High Income N=57 (%)	Low Income N=58 (%)	Parametric P-value*
Social Security Disability	8 (66.67)	4 (33.33)	0.211
Medication Assistance	4 (30.77)	9 (69.23)	0.150
Financial Assistance	13 (48.15)	14 (51.85)	0.826
Transportation Assistance	14 (41.18)	20 (58.82)	0.244
Emergency Funds	2 (33.33)	4 (66.67)	0.414
Lodging Assistance	9 (30)	21 (70)	**0.013**
Breast and Cervix Medicaid Insurance	9 (42.86)	12 (57.14)	0.496

*The parametric p-value is calculated by chi-square test

Table 4
Association between time to completion of chemotherapy and social services utilization.

Social Service	Enrollment	Time to Completion of Therapy ≤ 56 days N = 67	Time to Completion of Therapy > 56 N = 48	Parametric P-value*
Social Security Disability	No	63 (61.17)	40 (38.83)	0.064
	Yes	4 (33.33)	8 (66.67)	
Medication Assistance	No	59 (57.84)	43 (42.16)	0.799
	Yes	8 (61.54)	5 (38.46)	
Financial Assistance	No	54 (62.07)	33 (37.93)	0.105
	Yes	12 (44.44)	15 (55.56)	
Transportation Assistance	No	51 (62.96)	30 (37.04)	0.115
	Yes	16 (47.06)	18 (52.94)	
Emergency Funds	No	64 (58.18)	46 (41.82)	0.936
	Yes	3 (60)	2 (40)	
Lodging Assistance	No	49 (57.65)	36 (42.35)	0.822
	Yes	18 (60)	12 (40)	
Breast and Cervix Medicaid Insurance	No	57 (59.38)	39 (40.63)	0.586
	Yes	10 (52.63)	9 (47.37)	

* The parametric p-value is calculated by chi-square test

Sixty seven (58.3%) of patients were able to complete therapy in less than 56 days. The median time to completion of therapy amongst low income patients was 53 days (range: 30 – 149 days), which was similar to that of their high income counterparts at 54 days (range: 32 – 87 days; $p = 0.576$). Patients who completed therapy in > 56 days utilized, on average, 1.44 social services, compared to an average of 1.06 services used by patients completing in ≤ 56 days ($p = 0.102$). No specific social services program was associated with a shorter time to completion of therapy and, in fact, assistance with enrollment in social security disability trended towards a longer time to completion of chemo-radiation ($p = 0.064$) (Table 4). As expected, PFS and OS were longer in patients who took less than 56 days to complete chemoradiation therapy. There was no difference in PFS or OS, however, based on binary income or social services utilized (Figs. 1-4).

4. Discussion

Cervical cancer is a disease that disproportionately affects women of lower socioeconomic status (Farley et al., 2001). This has been attributed to the relationship between low socioeconomic status and poor understanding of and compliance with screening guidelines (Akyemiju et al., 2016). Access to care, however, is another important contributor to this issue (Douthit et al., 2015). In particular, the financial burden health care costs place on an individual can highlight the significance of this barrier. In 2015, U.S. health care spending increased 5.8% to a nationwide total of $3.2 trillion, or $9,990 per person (Overview of Quality and Access). While only 13% of personal health care costs are estimated as "out of pocket" (Overview of Quality and Access), these costs are staggering when compared to the annual household income defined as the FPL, which is the most commonly used determinant for healthcare access. As of 2019, the definition of the FPL for an individual was $12,490 and $25,750 for a family of 4 (HealthCare.gov, 2019). Data from 2013 to 2016 showed that the national poverty rate was 12.7% (HealthCare.gov, 2019) and in states that did not expand Medicaid, only those who make less than 100% of the FPL can qualify for income based Medicaid.

Additionally, studies have estimated that the direct cost for cisplatin with whole pelvic radiation therapy and brachytherapy amounts to, on average, $22,320 (Phippen et al., 2012). This doesn't account for other direct costs including travel, lodging, medications, and child care. In addition to the direct financial toxicity of therapy, the schedule required for chemoradiation places an undue burden on women of lower socioeconomic status. This burden is realized primarily through increased
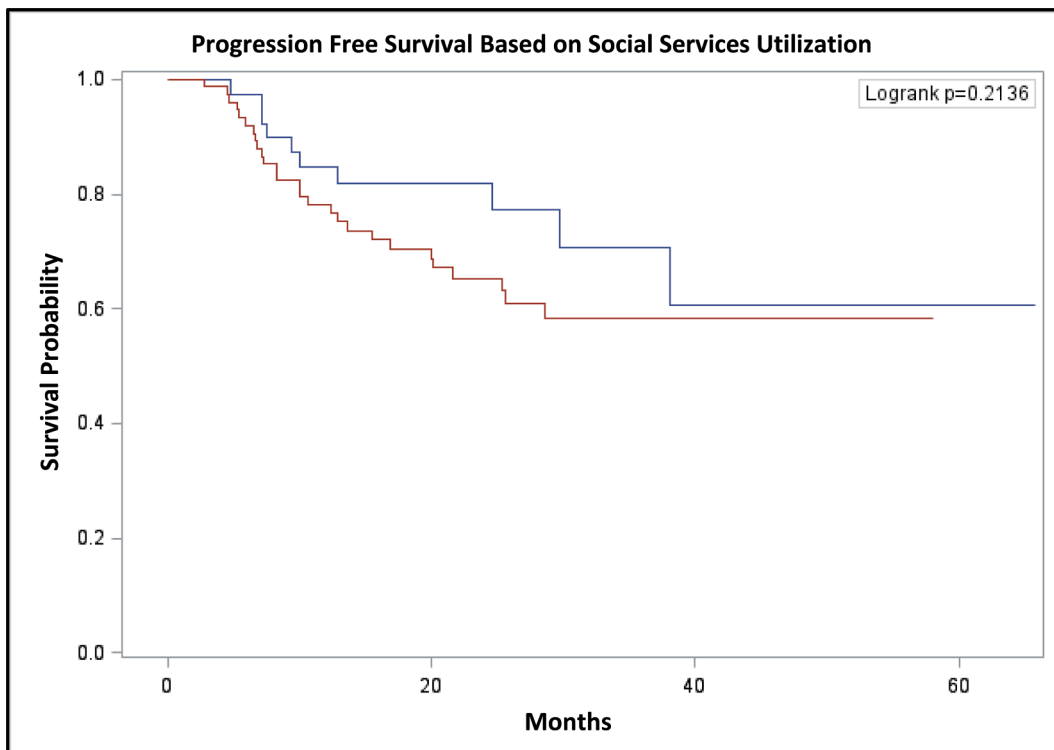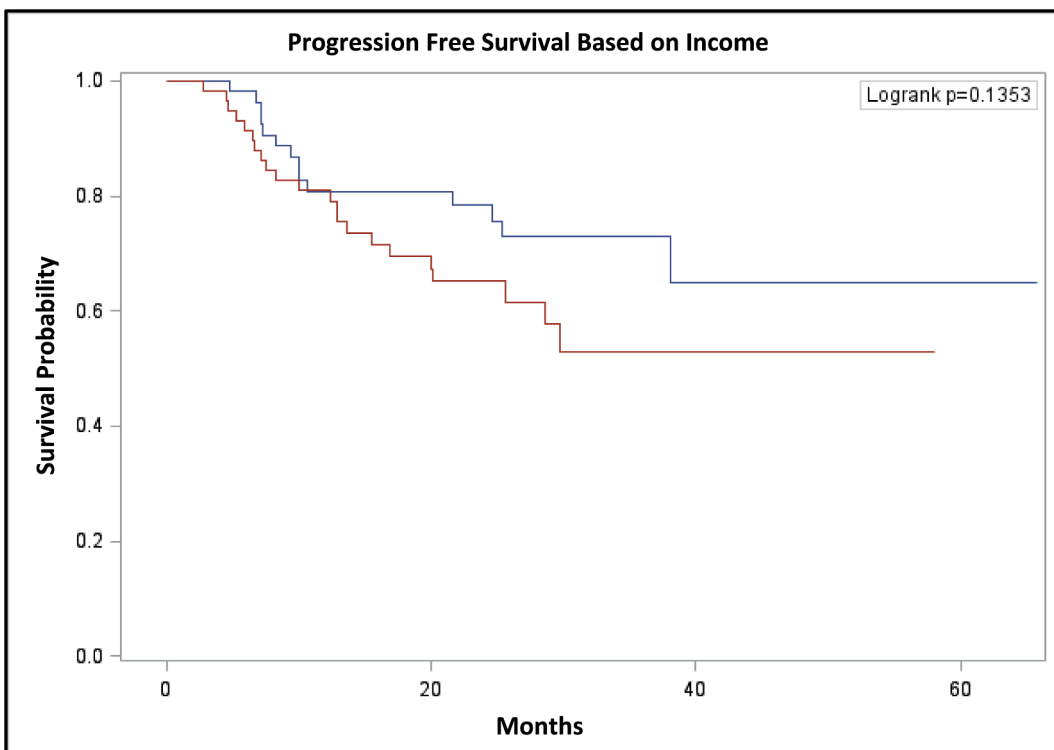
Fig. 1. PFS as a function of social services utilization.
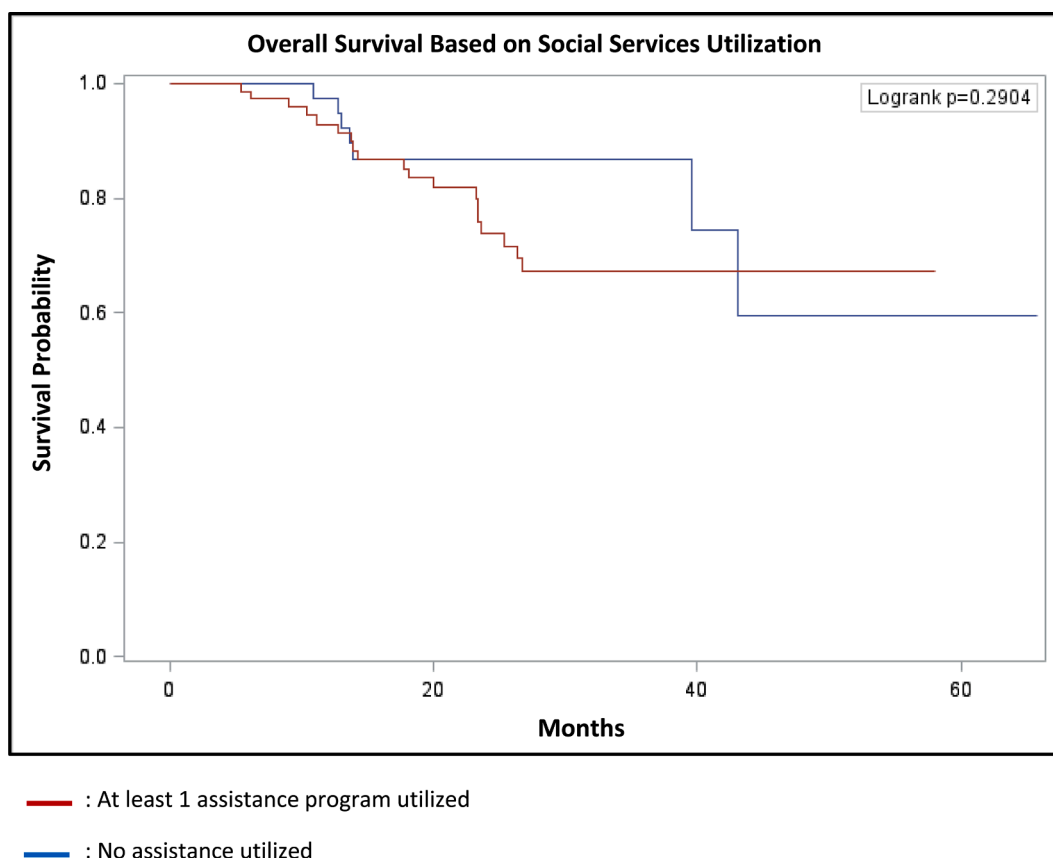

Fig. 2. PFS as a function of income.

Fig. 3. OS as a function of any social services utilization.

indirect costs, including productivity loss, and loss of the patient's and caregiver's time. Data demonstrates that indirect costs may account for up to two thirds of all costs incurred during therapy (Yabroff et al., 2011; Cohen et al., 2017) and these costs may be the primary driver of prolonged time to completion of therapy and therefore worse outcomes. Interestingly, over half of our high income patients still utilized at least one social service, demonstrating the pervasiveness of financial burden from cervical cancer treatment. Specifically, one quarter of high income patients utilized transportation assistance and 23% required medication assistance. This data also highlights the need to screen all patients for potential social services needs, regardless of insurance status, as almost 20% of privately insured patients still accessed transportation assistance and over 24% utilized lodging assistance.

Despite potential barriers to care, our socioeconomically diverse population was able to complete chemoradiation in a median of 53 days, well within the recommended timeframe. This compares favorably with other reports from tertiary care centers where the majority of patients required > 56 days to complete therapy (Guzman et al., 2018). We also observed that the time to completion of therapy was no different between patients when dichotomized by income level. The fact that lower income patients utilized more lodging assistance may highlight the income disparity amongst urban and rural areas [21]. To qualify for this resource through the American Cancer Society, patients must live at least 50 miles away from the cancer center. However, to qualify through Medicaid, patients must live at least 100 miles away from the cancer center. Regardless of the metric used, based on the location of our cancer center, this suggests a largely rural population.

No significant relationship between social services and time to completion of therapy was noted. A trend towards significance, however, was seen between enrollment on social services disability and longer time to completion of chemoradiation. This may highlight a group of at risk patients who need additional resources to be successful during their treatment.

Limitations of this study include its retrospective nature and relatively limited sample size. In particular, only 13 of 117 patients were both low income and did not use any social services, making it challenging to describe the impact of social services on the low income group in particular. Additionally, specific income data for each individual patient was not available, so income was extrapolated using the patient's zip code and census bureau data. This is therefore a less accurate reflection of the patient's true household income.

The financial toxicity of cervical cancer therapy is substantial and places a significant burden on patients of low socioeconomic status. We demonstrate, however, that the financial burden of treatment is not limited to those of lower incomes or non-privately insured. The financial toxicities all patients incur may contribute to prolonged time to completion of therapy and therefore worse outcomes. Thus, screening all patients, identifying potential barriers, and promoting use of assistance programs may allow patients to overcome the financial toxicity incurred during treatment.

5. Author contribution section

All authors made substantial contributions to this project.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.
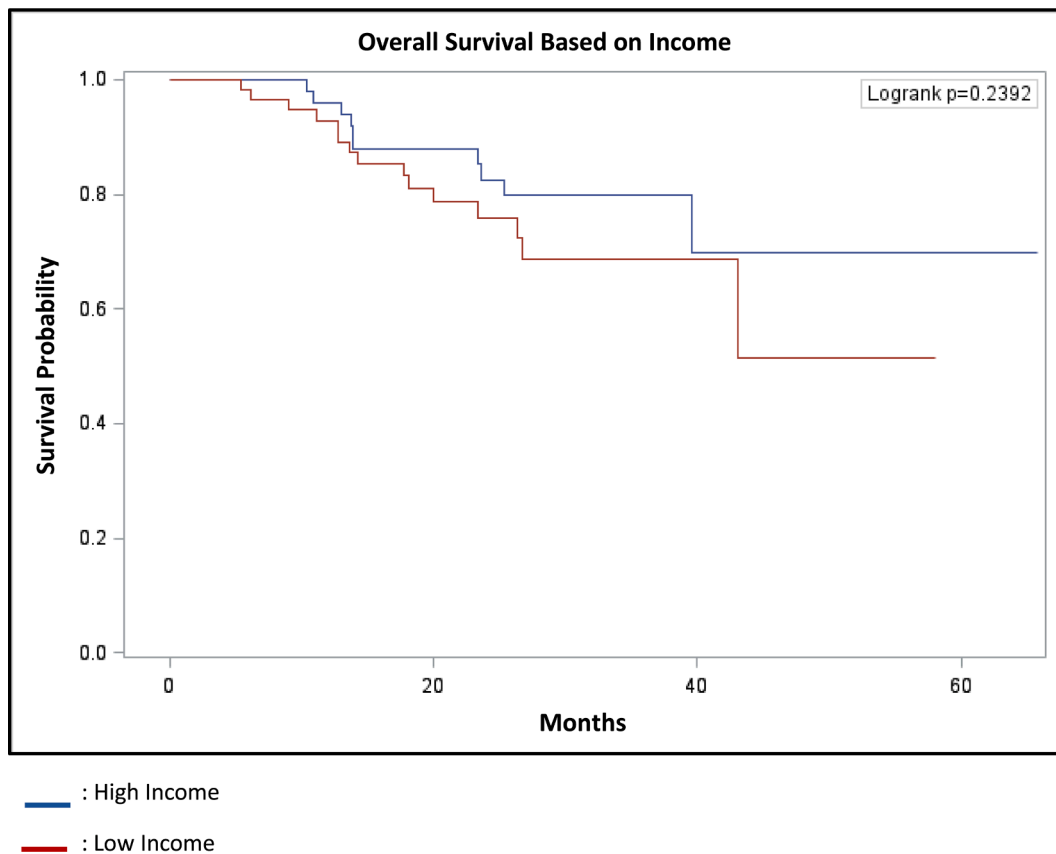
Overall Survival Based on Income

Logrank p=0.2392

— : High Income

— : Low Income

Fig. 4. 1 OS as a function of income.

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