Original Research

Fragmented Care and Guideline-Concordant Treatment in Locally Advanced Cervical Cancer

Audrey Mvemba, MD, Jessica Liang, BS, Megan Swanson, MD, Emi Yoshida, MD, Stefanie Ueda, MD, Katherine Fuh, MD, PhD, Lee-may Chen, MD, and Stephanie Cham, MD, MS

OBJECTIVE: To characterize and estimate rates of fragmented care, to investigate its association with the receipt of guideline-concordant treatment, and to evaluate treatment components at risk with fragmented care.

METHODS: This is a single-institution retrospective study of patients with locally advanced cervical cancer (stage IB3–IVA) from January 2003 to September 2023. We stratified patients into fragmented and nonfragmented care groups based on receipt of all care at our institution or if they received any component of care outside of our institution. The primary outcome, *receipt of guideline-concordant treatment*, was defined as a composite of 1) completion of treatment within 56 days, 2) completion of brachytherapy, and 3) receipt of concurrent chemotherapy. Demographic and treatment data were collected, including the Social Vulnerability Index (SVI), a census tract–based measure of disadvantage. Univariate and multivariate analyses were performed.

RESULTS: Two hundred eighty-six patients were identified; 75.5% received fragmented care. Those receiving nonfragmented care were significantly more likely to receive guideline-concordant treatment than those receiving fragmented care (71.4% vs 50.9%, P=.003). This was driven primarily by rates of timely completion (81.4% vs 60.6%, P=.001). Univariate analysis indicated that fragmented care (odds ratio [OR] 0.42, 95% CI, 0.23–0.74) and Medicaid insurance (OR 0.40, 95% CI, 0.20–0.78) were significantly associated with lower odds of guideline-concordant treatment. Multivariate analyses controlling for a priori confounders of insurance type and SVI showed that fragmented care (OR 0.45, 95% CI, 0.23–0.90) and Medicaid insurance (OR 0.42, 95% CI, 0.19–0.89) were independently associated with lower odds of guideline-concordant treatment. Multivariate analysis controlling for demographic covariates found even lower odds of receiving guideline-concordant treatment in those who received fragmented care (OR 0.39, 95% CI, 0.18–0.84) and who had Medicaid insurance (OR 0.35, 95% CI, 0.16–0.78).

CONCLUSION: More than 75% of patients received fragmented care, which had a significant clinical effect and was associated with significantly lower rates of guideline-concordant treatment.

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Despite similar screening rates, cervical cancer incidence and mortality are higher in underrepresented minority populations, potentially reflecting the complex process of seeking treatment in an at-risk population.[1,2] In locally advanced cervical cancer, guidelines recommend external beam radiation therapy with concurrent chemotherapy and brachytherapy boost performed within 8 weeks.[3–5] Prolonging treatment duration, omitting brachytherapy, and receiving radiation therapy alone have been correlated with poorer prognosis and decreased overall

From the Department of Obstetrics and Gynecology, Kaiser Permanente, Oakland, and the School of Medicine, the Division of Gynecologic Oncology, Department of Obstetrics and Gynecology & Reproductive Sciences, and the Department of Radiation Oncology, University of California, San Francisco, San Francisco, California.

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Corresponding author: Stephanie Cham, MD, MS, University of California San Francisco, San Francisco, CA; stephanie.cham@ucsf.edu.

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survival.[6–9] Data suggest that a significant number of patients with locally advanced cervical cancer do not receive guideline-concordant treatment with disparities by race, rurality, and insurance status.[9–13]

Fragmentation of health care is defined as patients receiving care at more than one hospital and is considered a social determinant of health (SDoH) reflecting access and difficulty with care coordination.[14] Fragmentation in cancer care has been associated with increased costs, treatment delays, prolonged treatment courses, and decreased survival.[15–20] Although prior authors have evaluated the role of fragmented care in ovarian cancer, there are little to no data on the association in cervical cancer outcomes.[19,20]

Given the significant coordination required between multiple subspecialists and the considerable disparities in this population, we hypothesized that fragmented care is associated with lower receipt of guideline-concordant treatment. The purpose of this study was to determine the rate of fragmented care and the association between fragmented care and receipt of guideline-concordant treatment. Our secondary objectives were to characterize this phenomenon, to assess risk factors for fragmented care, and to determine the treatment components at risk with fragmented care.

METHODS

We conducted a single tertiary academic institution retrospective cohort study on patients seen by the gynecologic oncology outpatient clinic with an International Classification of Diseases, Ninth Revision code for cervical cancer between January 2003 and September 2023. We included patients 18 years old and older with locally advanced cervical cancer as determined by the International Federation of Gynecology and Obstetrics 2018 cervical cancer staging guidelines. We excluded patients who had a remote history of cervical cancer or did not have sufficient follow-up information to determine all components of their treatment and results of the primary composite outcome of guideline-concordant treatment (eg, received only episodic care in the record such as brachytherapy). We excluded patients with rare tumor histology (eg, neuroendocrine) given varying treatment approaches, those who did not pursue cancer-directed therapy, and those who were undergoing active treatment at the time of the chart review. This study was approved by the University of California San Francisco IRB.

Patient demographics that were extracted included age, race, insurance type, ZIP code median income, travel distance and time to the parent institution's primary treatment facility on a standardized date and time, and the Charlson Comorbidity Index. Race was based on patient self-reported demographic data in the medical record and included in the analysis to identify any potential contribution of discrimination to differences in outcomes and have been previously identified as predictors. ZIP code median income was extracted with the United States Census Bureau's 2023 survey data. Travel distance and time were determined by averaging estimates in Google Maps on a uniform arrival time and day of a typical clinic visit (eg, 10:00 AM, Monday, December 11, 2023) and separated into quartiles. We used the Social Vulnerability Index (SVI), a census tract–based index that uses 15 variables that evaluate socioeconomic status, household composition, minority status, and housing type as a proxy for individual-level socioeconomic status.[21] Oncologic factors abstracted included stage and histology. We stratified patients into nonfragmented (receipt of all care at our institution) and fragmented (receipt of any part of their care at an outside facility) care on the basis of the hospital affiliation of the specialists involved in their care.

The primary outcome was the receipt of guideline-concordant treatment. *Guideline-concordant treatment* was defined as a composite of three factors: 1) completion of treatment within 56 days of initiation, 2) completion of brachytherapy boost, and 3) completion of concurrent chemotherapy with external beam radiation therapy. Receipt of all three factors was necessary to be considered as receiving guideline-concordant treatment and to align with existing National Comprehensive Cancer Network cervical cancer practice guidelines.[4] Secondary outcomes included determining demographic risk factors for fragmented care and evaluating which individual components (as listed previously) may be potentially associated with fragmented care. We created a directed acyclic graph that was based on the suspected causal relationships between patient factors, fragmented care, and guideline-concordant treatment (Appendix 1, available online at http://links.lww.com/AOG/E23) to guide our multivariate analysis. The minimal sufficient adjustment set was found to be SVI and insurance type, and we used this information to direct part of our analysis.

Fisher exact tests were used to determine demographic and oncologic risk factors associated with fragmented care, and χ^2 analysis was performed to determine the differences in guideline-concordant treatment. We performed univariate logistic regression analysis to determine associations between

demographics, including fragmented care and guideline-concordant treatment. Two multivariate logistic regression analyses were performed; model 1 used a priori confounders from the minimal sufficient adjustment set per our directed acyclic graph, and model 2 used any identified significant demographic confounders. Assumptions were tested with goodness of fit and evaluated for collinearity. Data analysis was performed with STATA 18.[22] $P<.05$ was considered statistically significant.

RESULTS

A total of 286 patients were identified, and a CONSORT (Consolidated Standards of Reporting Trials) diagram for cohort selection is given in Appendix 2, available online at http://links.lww.com/AOG/E23. Most patients (31.5%) were between age 40 and 49 years at diagnosis. One hundred forty-two (49.7%) self-identified as White, 12 (4.2%) self-identified as Black, and 87 (30.4%) had no documented self-reported race in their record. Most patients had Medicaid as their primary insurance type (75.2%) and had stage IIIA–IIIC disease (65.0%) at the time of diagnosis; the most common histology was squamous cell carcinoma (78.3%) (Table 1).

For the primary outcome, we found that 216 patients (75.5%) received fragmented care. There was a statistically significant difference between the group who received treatment at the same facility and the group who received fragmented care by race ($P<.001$), SVI quartile ($P=.02$), distance quartile ($P<.001$), and stage ($P=.03$) (Table 1).

Patients receiving treatment at the same institution were significantly more likely to receive guideline-concordant treatment than those who received fragmented care (71.4% vs 50.9%, $P=.003$). The primary driver of differences in rates of guideline-concordant treatment was the rate of timely treatment completion, with 81.4% who received care at the same institution compared with 60.6% of the patients who received fragmented care receiving timely care ($P=.001$). There were no significant differences between the rates of completion of brachytherapy (85.7% same vs 84.7% fragmented care, $P=.84$) and the rates of completion of chemoradiation (100% same treatment vs 98.1% fragmented care, $P=.25$) (Fig. 1).

Univariate logistic regression indicated that receiving fragmented care (odds ratio [OR] 0.42, 95% CI, 0.23–0.74) compared with receiving care at the same facility (reference) and having Medicaid insurance (OR 0.40, 95% CI, 0.20–0.78) compared with having private insurance (reference) were significantly associated with lower odds of receiving guideline-concordant treatment. Other patient demographics, including the SVI quartile, race, age, distance quartile, Charlson Comorbidity Index, and histology, had no significant differences in odds of receiving guideline-concordant treatment (Table 2).

In model 1 of our multivariate logistic regression analysis controlling for the a priori confounders of insurance status and SVI, we found that receiving fragmented care (OR 0.45, 95% CI, 0.23–0.90) and having Medicaid insurance (OR 0.42, 95% CI, 0.19–0.89) were independently significantly associated with lower odds of receiving guideline-concordant treatment. There was no significant difference in guideline-concordant treatment by the SVI quartile (Table 3). In model 2 of the multivariate logistic regression analysis controlling for the demographic covariates that were identified in our univariate analysis (race, distance from facility, stage), we found even lower odds of receiving guideline-concordant treatment for patients who received fragmented care (OR 0.39, 95% CI, 0.18–0.84) and patients who had Medicaid insurance (OR 0.35, 95% CI, 0.16–0.78). There was no difference in the odds of receiving guideline-concordant treatment by SVI quartiles, race, distance quartile, or stage (Table 3).

Patient case examples within our study comparing fragmented and nonfragmented are depicted in Figure 2. Care at the same facility allowed the prompt receipt of chemoradiation and brachytherapy boost. Fragmented care resulted in a prolonged treatment course resulting from transportation difficulties and delays in completing brachytherapy boost.

DISCUSSION

In our study, more than 75% of patients experienced fragmented care, which was independently associated with lower rates of guideline-concordant treatment. The rate of timely treatment was the primary driver of this difference. Multivariate regression analysis indicated that receiving fragmented care and having Medicaid insurance were independently significantly associated with lower rates of receiving guideline-concordant treatment.

Previous literature has identified potential adverse clinical outcomes associated with receiving fragmented cancer treatment. Fragmented care in pancreatic adenocarcinoma has been associated with prolonged treatment initiation and completion time.[18] Another study in rectal cancer found that patients receiving fragmented care had worse overall survival than those who received single-institution integrated care.[16] Within gynecologic oncology, one study using

Table 1. Patient Demographics for Same Compared With Fragmented Care

Demographic	Overall	Same Care (One Facility)	Fragmented Care (Multiple Facilities)	*P*
n	286	70 (24.5)	216 (75.5)	
Age (y)				.49
Younger than 30	17	5 (7.1)	12 (5.6)	
30–39	65	20 (28.6)	45 (20.8)	
40–49	90	17 (24.3)	73 (33.8)	
50–59	62	13 (18.6)	49 (22.7)	
60–69	29	8 (11.4)	21 (9.7)	
70 or older	23	7 (10.0)	16 (7.4)	
Race				<.001*
American Indian or Alaska Native	5	0 (0.0)	5 (2.3)	
Asian or Pacific Islander	33	18 (25.7)	15 (6.9)	
Black or African American	12	3 (4.3)	9 (4.2)	
More than 1 race	7	1 (1.4)	6 (2.8)	
Unknown	87	13 (18.6)	74 (34.3)	
White	142	35 (50.0)	107 (49.5)	
Ethnicity				.129
Hispanic or Latina	88	15 (21.4)	73 (33.8)	
Not Hispanic or Latina	189	53 (75.7)	136 (63.0)	
Unknown	9	2 (2.9)	7 (3.2)	
Insurance status				.153
Private	48	16 (22.9)	32 (14.8)	
Medicare	20	7 (10.0)	13 (6.0)	
Medicaid	215	46 (65.7)	169 (78.2)	
Uninsured	3	1 (1.4)	2 (0.9)	
SVI quartile				.021*
1 (least vulnerable)	59	20 (37.0)	39 (21.5)	
2	58	13 (24.1)	45 (24.9)	
3	60	15 (27.8)	45 (24.9)	
4 (most vulnerable)	58	6 (11.1)	52 (28.7)	
Distance from facility (min)				<.001*
Less than 45	66	36 (52.9)	30 (14.9)	
45–less than 90	62	15 (22.1)	47 (23.4)	
90–less than 135	74	7 (10.3)	67 (33.3)	
135 or more	67	10 (14.7)	57 (28.4)	
Cancer stage				.025*
IB3–IIB	82	13 (18.6)	69 (31.9)	
IIIA–IIIC	186	55 (78.6)	131 (60.6)	
IVA	18	2 (2.9)	16 (7.4)	
CCI score (median)				.697
6 or lower (low)	161	38 (54.3)	123 (56.9)	
7 or higher (high)	125	32 (45.7)	93 (43.1)	
Histology				.695
Squamous cell carcinoma	224	56 (80.0)	168 (77.8)	
Adenocarcinoma	62	14 (20.0)	48 (22.2)	

SVI, Social Vulnerability Index; CCI, Charlson Comorbidity Index.
Data are n (%) unless otherwise specified.
* $P<.05$.

the Nationwide Readmissions Database identified that fragmented care after ovarian cancer surgery was associated with increased rates of postoperative readmission and risk of death.[20] Another study found delays in the initiation of chemotherapy in patients with ovarian cancer who received fragmented care.[19] Our study is one of the first to evaluate fragmented care and its association with cervical cancer outcomes (based on a search using the PubMed key words "cervical cancer" and "fragmentation" performed in October 2024). We found that a significant proportion of patients received fragmented care (75%), which further exacerbated disparities in receipt of guideline-based treatment in an already at-risk population.

Although fragmented care represents an SDoH, if delivered appropriately, it may be a reasonable approach to meet patients' needs by reducing the burden of both time and financial toxicity. Fragmented

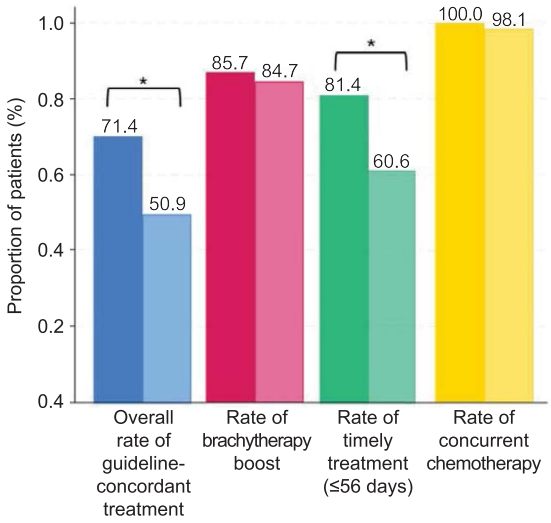

Fig. 1. Comparison of overall rate of guideline-concordant treatment and its individual components in same and fragmented care of locally advanced cervical cancer at our institution. *$P<.005$. *Dark shades* indicate same (n=70); *light shades* indicate fragmented (n=216).

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care represents an SDoH through limited access to subspecialty care and is exacerbated by health-related social needs such as limited finances and transportation.[23] Millions of women have been identified as living in areas with a shortage of gynecologic oncologists within 50 miles with significant geographic disparities in access to subspecialist care.[24] In addition, patients in rural areas receive lower rates of brachytherapy than those in urban areas, possibly associated also with limited access to brachytherapy physicians.[25] However, given the time and financial toxicities associated with receiving cancer care at tertiary care centers, particularly in the setting of treatment requiring daily radiation, receiving fragmented care may be the most realistic option for some patients.

Ethical outreach efforts to rural communities should evaluate sustainable ways of improving both clinical and patient-centered outcomes for patients who desire care closer to home without compromising quality of care, which likely requires additional resources and time from health care professionals for care coordination.[26] Furthermore, treating locally advanced cervical cancer is becoming increasingly complex, affecting both coordination of care and time and financial toxicity. Recent studies such as the GCIG INTERLACE trial and KEYNOTE-A18 have shown that the addition of induction chemotherapy or immunotherapy followed by chemoradiation has improved progression-free survival and overall survival, which may further complicate treatment timing and completion.[27]

Given our findings, mechanisms to improve equitable access to guideline-concordant treatment

Table 2. Univariate Analysis of Associations of Guideline-Concordant Treatment

Factor	Guideline-Concordant Treatment (All Metrics)
Care	
Same	Ref
Fragmented	0.42 (0.23–0.74)*
Insurance status	
Private	Ref
Medicare	0.43 (0.15–1.23)
Medicaid	0.40 (0.20–0.78)*
Uninsured	0.39 (0.05–3.04)
SVI quartile	
1 (least vulnerable)	Ref
2	0.87 (0.43–1.79)
3	1.23 (0.59–2.55)
4 (most vulnerable)	0.55 (0.26–1.13)
Race	
White	Ref
American Indian or Alaska Native	0.39 (0.07–2.20)
Asian or Pacific Islander	1.57 (0.71–3.46)
Black or African American	0.39 (0.11–1.36)
More than 1 race	1.96 (0.37–10.42)
Unknown	0.78 (0.46–1.33)
Age (y)	
Younger than 30	Ref
30–39	0.81 (0.28–2.40)
40–49	0.82 (0.29–2.33)
50–59	1.02 (0.34–3.03)
60–69	0.62 (0.19–2.03)
70 or older	0.76 (0.22–2.71)
Distance from facility (min)	
Less than 45	Ref
45–less than 90	1.73 (0.85–3.50)
90–less than 135	0.80 (0.41–1.54)
135 or more	0.77 (0.39–1.50)
Cancer stage	
IB3–IIB	Ref
IIIA–IIIC	0.84 (0.49–1.41)
IVA	0.73 (0.27–1.94)
CCI score (median)	
0	Ref
1 or higher	1.04 (0.66–1.65)
Histology	
Squamous cell carcinoma	Ref
Adenocarcinoma	0.71 (0.40–1.23)

Ref, reference; SVI, Social Vulnerability Index; CCI, Charlson Comorbidity Index.
Data are odds ratio (95% CI).
* $P<.05$.

Table 3. Multivariate Analysis of Guideline-Concordant Treatment

Factor	Guideline-Concordant Treatment (All Metrics)	
	Model 1: A Priori Confounders	Model 2: Demographic Covariates
Care		
Same	Ref	Ref
Fragmented	0.45 (0.23–0.90)*	0.39 (0.18–0.84)*
Insurance status		
Private	Ref	Ref
Medicare	0.85 (0.23–3.15)	0.67 (0.17–2.63)
Medicaid	0.42 (0.19–0.89)*	0.35 (0.16–0.78)*
Uninsured	0.54 (0.04–7.22)	0.38 (0.02–6.05)
SVI quartile		
1 (least vulnerable)	Ref	Ref
2	1.14 (0.53–2.46)	1.23 (0.54–2.80)
3	1.60 (0.72–3.55)	1.80 (0.77–4.18)
4 (most vulnerable)	0.81 (0.37–1.77)	0.88 (0.36–2.14)
Race		
White		Ref
American Indian or Alaska Native		1.07 (0.08–13.86)
Asian or Pacific Islander		1.71 (0.63–4.60)
Black or African American		0.29 (0.05–1.67)
More than 1 race		3.42 (0.53–19.88)
Unknown		1.21 (0.61–2.42)
Distance from facility (min)		
Less than 45		Ref
45–less than 90		2.56 (1.00–6.52)
90–less than 135		1.41 (0.56–3.54)
135 or more		1.28 (0.52–3.16)
Cancer stage		
IB3–IIB		Ref
IIIA–IIIC		0.67 (0.35–1.27)
IVA		1.01 (0.29–3.42)

Ref, reference; SVI, Social Vulnerability Index.
Data are odds ratio (95% CI).
* $P<.05$.

in cervical cancer are an urgent unmet need in our field, and programs incorporating patient navigation social support may improve outcomes in this challenging setting. Although SDoH are relatively unmodifiable, health-related social needs are modifiable and can be met with intervention efforts.[23] One

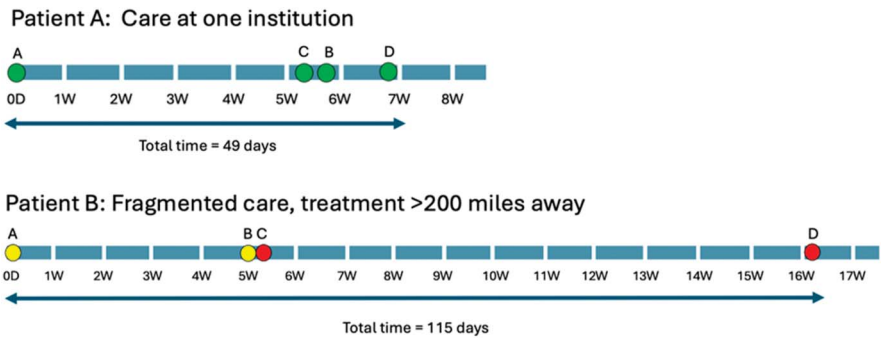

Fig. 2. Two patient cases comparing the course of nonfragmented care with that of fragmented care. Both patients were diagnosed with International Federation of Gynecology and Obstetrics Stage IIIC1 squamous cell carcinoma in their 30s. Patient A received all their care at the same institution and completed chemotherapy with external beam radiation therapy (EBRT) and brachytherapy boost within 49 days (*green*). Patient B experienced fragmented care with chemotherapy with EBRT occurring at an outside facility (*yellow*) and completed treatment and brachytherapy boost (*red*) within 115 days. Chart review indicated that patient B experienced transportation issues between care sites, which contributed to the total treatment time. A, First chemotherapy dose with EBRT. B, Completion of chemotherapy with EBRT. C, Date of first brachytherapy boost. D, Date of second brachytherapy boost.

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retrospective study evaluated the effects of nonmedical financial assistance and found a decreased proportion of no-show visits for radiation therapy.[28] Cancer navigation programs may also be beneficial; one prospective study on the initiation of a cervical cancer navigator program resulted in increased rates of timely treatment, brachytherapy, and completion of chemoradiation.[29] We found that time to complete treatment, particularly brachytherapy, was modifiable and that many patients faced transportation and housing difficulties. Increased efforts should be made to provide support to patients that allows them to optimize their cancer care by either offering these treatments with providing assistance in modifiable social risks such as transportation and housing to receive care at a tertiary institution or offering care coordination to ensure that fragmented care remains guideline-concordant if a patient prefers care near home. We found that patients with Medicaid insurance were less likely to receive guideline-concordant treatment. Prior observational data on the effect of Medicaid expansion after 2014 found that patients had more access and timely care but 2-year survival rates were unchanged in cervical cancer.[30,31] Thus, insurance access alone may not be enough to improve clinical outcomes, and efforts to address social needs may be equally if not more important.

Our study has several limitations. Many patients were excluded because of insufficient records (receiving most of care in the community elsewhere with only episodic care at our institution), and there may be bias from these missing data; however, this potentially would bias the data toward being even less likely to receive guideline-concordant treatment. More than a third of patients did not have self-reported race available, limiting our analysis of disparities from this standpoint, but we identified differences by insurance status, which underscores inequities in care. We used the SVI to represent socioeconomic status, which uses Census-tract data rather than individual-level data. As a result of loss to long-term follow-up, we were unable to evaluate clinical outcomes such as progression-free survival and overall survival. However, an important strength is that fragmented care is not well documented in national databases, and access to detailed patient records was essential in identifying the aspects of care driving these differences. Our cohort also represented a diverse population and a large catchment area.

We found that more than 75% of patients experience fragmented care in the treatment of locally advanced cervical cancer, which was independently associated with lower odds of receipt of guideline-concordant treatment, primarily because of a lack of timely treatment. Future work evaluating interventions of health-related social needs with community-centered approaches may be helpful.

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