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Recent relocation and decreased survival following a cancer diagnosis☆

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ABSTRACT

Objective. To determine the impact of recent relocation prior to a cancer diagnosis on cancer-specific outcomes.

Methods. We identified 272,718 patients with two different entries in the Surveillance, Epidemiology, and End Results database within 3 years of each other. Those who had relocated to a different county between entries were identified and we determined the risk of stage IV disease or cancer-specific mortality among relocators and non-relocators after adjusting for other patient-specific demographic and clinical factors.

Results. A total of 4639 (1.7%) patients relocated to a new county within 3 years prior to a second cancer diagnosis and 268,079 (98.3%) patients did not. Patients who had relocated to a new area were more likely to be diagnosed with stage IV cancer (25.2% vs. 20.8%; adjusted odds ratio = 1.27; 95% confidence interval [CI], 1.18–1.37; $P < 0.001$), and had an increased risk of 10-year cancer-specific mortality (20.9% vs. 17.9%; adjusted hazard ratio 1.26; 95% CI, 1.17–1.36; $P < 0.001$).

Conclusion. These results suggest that recent relocation to a new county prior to a cancer diagnosis is associated with an increased risk of late-stage presentation and worse cancer-specific mortality.

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1. Introduction

Cancer patients are a vulnerable population at high risk of mortality for whom psychosocial stressors may affect the timing or delivery of life-saving treatment (Timmons et al., 2013). Although traditional measures of SES such as low income or low education have been previously associated with poor health or cancer-specific outcomes (Bassuk et al., 2002; Ward et al., 2004; Singh et al., 2003), these relatively static measures may not adequately capture the volatility of life changes that may affect the treatment and caregiving processes or long-term survivorship. One such form of psychosocial stress is relocation to a new area shortly preceding or following a cancer diagnosis (Mcgrath and Rawson, 2013). Relocation has previously been shown to affect mental and physical health outcomes (Lix et al., 2006; Lin et al., 2012), but data on the effects of relocation shortly preceding diagnosis among cancer patients are lacking.

Relocation shortly before a cancer diagnosis may have a significant effect on cancer-specific outcomes. In particular, recent relocation, which represents a relatively acute form of psychosocial stress, may have a larger impact on cancer-specific outcomes than more chronic psychosocial stressors such as poverty. Cancer survivors reporting psychosocial stress have been shown to have higher levels of health care utilization and medical expenditures compared to those without cancer (Han et al., 2015); yet, patients who relocate may also experience a break in care continuity (Baugh and Verghese, 2013). Relocation can also lead to social disconnectedness by disrupting social networks, which has been shown to have negative health effects (Cornwell and Waite, 2009).

Research suggests that relocation can also be a proxy for household financial hardship, which has been associated with negative cancer-specific consequences (Hanratty et al., 2007; Coulton et al., 2012; Robinson and Shavers, 2008; Pornet et al., 2010; Barry et al., 2012); and, not surprisingly, cancer survivors reporting financial problems may be likely to delay or forego care compared to cancer survivors not reporting such problems (Kent et al., 2013). Financial stress can arise from the cost of medical treatment, other medical supplies, and health support needs that are not covered by health insurance. Among patients without adequate health insurance coverage, these factors may cause even greater financial stress. In addition to the costs directly associated with treatment, a cancer diagnosis may lead to in inability to work and earn income as has been demonstrated to occur in 7–70% of patients diagnosed with cancer in previous studies (Hewitt et al., 2006; Spelten et al., 2002).

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In this study, we employ a novel approach using the Surveillance, Epidemiology, and End Results (SEER) national cancer database to study the effect of recent relocation on cancer-specific outcomes. The primary aims of the present study were to determine the associations between recent relocation and diagnosis with late-stage cancer and between recent relocation and cancer-specific mortality. A second aim was to determine racial differences in the association between recent relocation and cancer-specific mortality, as other research has previously suggested racial differences in the response to psychosocial stressors (Keyes, 2009; Hughes et al., 2014). Finally, the third aim was to compare the effect of recent relocation to the effect of baseline poverty on cancer-specific mortality. We hypothesized that recent relocation would be associated with an increased risk of stage IV disease at diagnosis as well as increased cancer-specific mortality, even after controlling for other patient characteristics. We also hypothesized that the effect of recent relocation would be stronger among white patients than non-white patients and stronger than the negative consequences of baseline poverty.

2. Materials and methods

2.1. Patient population

The SEER database is a population-based cancer registry that collects cancer diagnostic, treatment, and survival data along with patient demographic characteristics from 18 registries within the United States, representing 28.0% of the population (www.seer.cancer.gov). SEER reports the county of residence at the time of a cancer diagnosis. Therefore, we studied patients who had two cancer diagnoses within 3 years of each other so we could determine whether they had recently moved to a different county. Like all recorded cancer diagnoses in SEER, second cancers are recorded at the registry level and patient data is sent to SEER with a patient-specific identification number and a sequence number describing the order of the tumor in question (e.g. 1st or 2nd). Patients were included if they were diagnosed between 1973 and 2011 and diagnosed with any malignancy at any stage, except for non-melanoma skin cancer, as these cases are not captured in SEER. Patients must have also resided in an area captured by one of the SEER registries (Alaska Native Tumor Registry, Arizona Indians, Cherokee Nation, Connecticut, Detroit, Georgia Center for Cancer Statistics, Greater Bay Area Cancer Registry, Greater California, Hawaii, Iowa, Kentucky, Los Angeles, Louisiana, New Jersey, New Mexico, Seattle-Puget Sound, and Utah) for both cancer diagnoses. This approach identified 272,718 patients. This study was approved by the institutional review board.

2.2. Definition of variables

The primary outcome variables for this study included: (1) stage IV disease at presentation; and (2) 10-year cancer-specific mortality. Our primary predictor variable was recent relocation to a new county. We also extracted data on stage at presentation, county-wide median family income, marital status at diagnosis, race, age at diagnosis, and sex.

2.3. Statistical analyses

Stata/MP 13.1 was used for all statistical analyses. Multivariable logistic regression analysis, adjusting for marital status at diagnosis, change in marital status between diagnoses, sex, age, county-wide median income, and race, was used to model the odds ratio of stage IV disease at presentation among patients who moved to a new county compared to those who did not. A similar logistic regression analysis was used to compare the 10% of patients who lived in the poorest counties to the 10% of patients who lived in the wealthiest counties.

Differences between groups in the 10-year risk of cancer-specific mortality from the second diagnosis of cancer were estimated using the Fine & Gray model (Fine and Gray, 1999) for competing risks after adjusting for marital status at diagnosis, change in marital status between diagnoses, sex, age, county-wide median income level, and race. In a subsequent analysis, we also controlled for stage at diagnosis (stages I–III versus stage IV). Cancer-specific mortality was compared between patients who relocated to a new county and those who did not. This analysis was repeated following stratification by race (white versus non-white) and by cancer site among the four most common cancers (lung, prostate, breast, and colon).

To test the possible effect of cancer recurrences or sites of metastatic disease being incorrectly recorded as second primary malignancies, we also repeated our analyses after excluding patients who were recorded as having been diagnosed with a second primary malignancy at the same site as the first primary malignancy or for whom the second primary malignancy was in a common site of metastatic disease (liver, lung, bone, or brain/central nervous system). We also performed a separate analysis including insurance status and change in insurance status between diagnoses (private/Medicare to Medicaid or no insurance, or Medicaid to no insurance), which was available for 22.0% of patients, as covariates. Cancer-specific mortality was also compared between the 10% of patients who lived in the poorest counties compared to the 10% who lived in the wealthiest counties.

3. Results

3.1. Patient characteristics

Of the 272,718 patients we identified, 4639 (1.7%) relocated to a new county within 3 years prior to their second cancer diagnosis, while 268,079 (98.3%) did not. Baseline characteristics of the patients are shown in Table 1.

3.2. Recent relocation is associated with later-stage diagnosis

Of patients who had recently relocated, 25.2% were diagnosed with stage IV disease, compared to 20.8% of those who had not recently relocated (adjusted odds ratio [AOR] 1.27; 95% confidence interval [CI] 1.18–1.37; $P < 0.001$) (Table 2).

3.3. Recent relocation is associated with increased cancer-specific mortality

Patients who relocated within 3 years of a second cancer diagnosis had an increased risk of 10-year cancer-specific mortality compared to those who did not, even after adjusting for patient-specific demographic factors (20.9% vs. 17.9%; adjusted hazard ratio [HR] 1.26; 95% CI, 1.17–1.36; $P < 0.001$; Fig. 1). When stage at diagnosis was included in the model, the effect of relocation on cancer-specific mortality was attenuated, but remained statistically significant (adjusted HR 1.16; 95% CI, 1.07–1.25; $P < 0.001$) (Table 3).

In a sensitivity analysis to test the possible effect of cancer recurrences or sites of metastatic disease being incorrectly recorded as second primary malignancies, we observed a similar increase in the rate of cancer-specific mortality after excluding the 31.2% of patients for whom their second cancer was at the same site as the first cancer or for whom the second cancer was diagnosed at a common site of metastatic disease (adjusted HR 1.24; 95% CI, 1.13–1.37; $P < 0.001$).

Among the 22.0% of patients with complete insurance information, insurance status and changes in insurance status were not significantly associated with cancer-specific mortality ($P > 0.05$ in all cases), nor did inclusion of these factors in multivariable analysis reduce the estimated effect of relocation on cancer-specific mortality (not shown).

We then conducted subgroup analyses for the four most common cancer types, including lung cancer (N = 704 relocated), prostate cancer (N = 404 relocated), breast cancer (N = 571 relocated), and colon cancer (N = 355 relocated). We observed an increase in cancer-specific mortality associated with recent relocation among patients with lung cancer (adjusted HR 1.26; 95% CI, 1.11–1.42; $P < 0.001$) or prostate

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