Data suggest that immediate action must be taken to improve the time between diagnosis and treatment for disadvantaged patients.

Determinants of Treatment Delays Among Underserved Hispanics With Lung and Head and Neck Cancers

Evelinn A. Borrayo, PhD, Katie L. Scott, PhD, Ava R. Drennen, PhD, Tiare MacDonald, PhD, and Jennifer Nguyen, MS

Background: Evidence is lacking to explain the reasons why treatment is delayed among disadvantaged Hispanic patients diagnosed with lung and head and neck cancers. Data indicate that treatment delays beyond 46 days increase the risk of death for individuals with these cancers.

Methods: A mixed-methods design was used to explore determinants of treatment delays by analyzing data from the medical records of 40 Hispanic patients and data from interviews with 29 Hispanic patients, caregivers, health care professionals, and patient navigators from a safety-net hospital.

Results: Of the 40 Hispanic patients, 35% initiated treatment 46 days or more after being diagnosed, but women experienced longer delays than men (average of 48 days). Women with few comorbid diseases (≤ 4) were more likely to experience treatment delays. Institutional-related determinants at publicly funded hospitals appear to delay treatment for patients at the safety-net hospital, and patient-related determinants common to underserved patients (eg, no health insurance coverage) are likely to further contribute to these delays.

Conclusions: Delayed treatment is associated with poor outcomes and low rates of survival in patients with lung and head and neck cancers. Therefore, action should be taken to improve the time between diagnosis and the initiation of treatment for disadvantaged Hispanic patients.

Introduction

In the United States, lung cancer accounts for more deaths than any other cancer in both men and women. Among Hispanics, lung cancer is the leading cause of cancer-related death for men and the second-leading cause for women. Those with lung cancer are also at increased risk for developing secondary neoplasms of the head and neck and vice versa. Lung and head and neck cancers are largely induced by tobacco use, which accounts for 87% and 70% of lung cancer–related deaths for men and women, respectively. Approximately 75% of head and neck cancers are attributed to tobacco use, and a 30-fold increased risk is seen among those who smoke and drink alcohol. Moreover, those with lung and head and neck...
cancers who smoke cigarettes and drink alcohol are at increased risk for developing comorbid conditions, such as chronic bronchitis, emphysema, and cardiovascular disease. Although Hispanics have lower incidences of and mortality rates from lung and head and neck cancers than non-Hispanic whites, disparities in timely and quality treatment remain for Hispanics — poverty is typically cited as the explaining factor. Mounting evidence demonstrates that worse outcomes (eg, survival, quality of life) for ethnic minorities with cancer are also best explained by their low socioeconomic status (SES). Similarly, inequalities in properly treating medically underserved patients (eg, low-income, uninsured) with lung and head and neck cancers.

In a systemic review and meta-analysis of socioeconomic inequalities and lung cancer treatment, Forrest et al found that lower SES was associated with a statistically significant reduced likelihood of receiving any treatment — particularly surgery and chemotherapy. These SES inequalities could not be accounted for by differences in stage at presentation or by differences in health care systems (ie, publicly funded vs private health care systems). Choi et al conducted a longitudinal study to examine disparities as predictors of survival among patients with head and neck cancers and found that low income, low education, and advanced age were significant independent predictors of poor survival (ie, 5-year overall, cancer-specific, and disease-free survival rates; \( P < .001 \)). Similarly, Yang et al found in a population-based study that significant independent predictors of worse survival rates among patients with lung cancer were older age and severe poverty. The effects of ethnicity were statistically significant: A higher percentage of Hispanic patients resided in the highest poverty areas, were less likely to receive radiotherapy, and had shorter survival rates if they smoked compared with their non-Hispanic white counterparts.

### Treatment Initiation

More than 10 years ago, the Institute of Medicine recommended improving the timeliness of treatment by reducing wait times that can potentially result in harmful delays for patients. Timeliness in the treatment of lung and head and neck cancers is important, because delaying the start of treatment has been associated with disease recurrence, lower rates of survival, and poor patient outcomes (eg, distress). Using the US National Cancer Database, Murphy et al found that the interval from diagnosis to the start of treatment has been increasing since 1985 for Americans diagnosed with head and neck cancers. Their examination of predictors found that patients with advanced-stage disease who underwent chemoradiotherapy, were treated at academic facilities, and who received transitional care had the greatest increases in time to treatment initiation. In a follow-up study using the same database, Murphy et al found that the time to treatment initiation of 46 to 52 days was associated with a significant increased risk of death — a risk that was consistently detrimental beyond 60 days. After examining covariates, the researchers also found that the effect of time to treatment initiation on mortality risk was greater for early-stage (stage I/II) than advanced-stage disease (stage III/IV) and for radiotherapy and surgery than for chemoradiotherapy.

To assess the impact of delayed treatment for lung cancer on an international level, Vinas et al conducted a systemic review of multinational studies and found that long delays were predictive of better survival rates than shorter delays, but patients who experienced longer delays had fewer symptoms — possibly explaining a better prognosis. Instead, short delays in lung cancer treatment had a negative prognostic meaning because urgent treatment was provided to patients with more advanced disease.

Patients with lung and head and neck cancers increasingly experience longer delays between their diagnoses and subsequent treatment. Delays are more prevalent for patients with early-stage disease, thus increasing their disease progression, their wait times (if candidates for surgical treatment), and their level of distress. Instead, shorter delays are experienced by patients with more advanced-stage disease for whom treatment is urgently initiated without clear benefits in their disease progression or rate of survival. A paucity of evidence explains what factors drive the treatment delays experienced by patients with lung and head and neck cancers. Murphy et al contend that the delay in the start of treatment is due to increases in more sophisticated, pretreatment diagnostics, complex multimodal therapies, and transitions in care for patients treated at academic cancer centers. However, these factors are not as likely to explain treatment delays for patients treated at community-based hospitals.

### Community-Based Facilities

Few studies have compared the intervals from diagnosis to treatment among academic and public hospitals that treat head and neck cancers; however, among those that have, significantly longer treatment delays have been observed at public hospitals. In a study by Yorio et al, age, sex, race, and type of insurance coverage were not significantly associated with a longer time to treatment. The single significant factor they found for the delay of lung cancer treatment was receiving that care at a public hospital. Patel et al suggest that the factors that affect the timely delivery of cancer treatment are likely institution-related factors.
that generally apply to public institutions, including availability of specialty services, adequacy of equipment, timely pathological analysis, and lack of imaging and surgical procedures — this is particularly true for patients with head and neck cancers.

**Patient Factors**
Less is known about patient-related factors that might contribute to delays in cancer treatment, but they are likely related to low SES, limited access to transportation, lack of paid leave from work, language barriers, comorbid medical conditions, and homelessness.28

**Purpose**
To our knowledge, no studies have investigated the factors at the institutional and patient levels that are likely to contribute to treatment delays among underserved Hispanic patients with lung and head and neck cancers treated at community-based hospitals, let alone studies that have focused on underserved Hispanic patients who experience high rates of morbidity from these cancers. We conducted this exploratory study to better understand the institution- and the patient-level determinants associated with the timely initiation of cancer treatment among underserved Hispanic patients diagnosed with lung and head and neck cancers.

**Methods**

**Study Design**
A triangulation, mixed-method design (ie, quantitative and qualitative data linked to the literature) was used for breadth and depth of understanding and corroboration from multiple angles to determine the initiation of cancer treatment among the study population.29 We collected quantitative data from medical records to assess the magnitude of the influence of patient variables and diagnostic factors on treatment initiation as well as qualitative research to explore stakeholder perspectives and other influential factors not captured by the data in the medical records. One-on-one interviews were also conducted with patients who had lung cancer and head and neck cancers and their health care professionals (HCPs), while focus-group interviews were conducted with the caregivers and patient navigators who assisted the study patients.

**Theoretical Framework**
The Behavioral Model for Vulnerable Populations was used as the guiding theoretical framework.30,31 The model proposes that need, enabling, and predisposing factors facilitate or block the use of health services by vulnerable populations. Need factors include the vulnerabilities that make patients necessitate medical treatment (eg, cancer type and stage, comorbid diseases); enabling factors include social or environmental variables that procure or impede a patient's initiation of treatment (eg, health insurance, income); and predisposing factors include personal propensities to access treatment (eg, age, sex, language).30,31

**Measures**

Data were extracted from the medical records of Hispanic patients with a primary diagnosis of lung cancer or head and neck cancer treated at a “safety-net” hospital in Colorado across a 1-year period. The patient data included sociodemographic variables (eg, age, sex), diagnosis (eg, cancer type, stages I–IV), cancer treatment (eg, chemotherapy, surgery), number of comorbid diseases (using the Charlson Comorbidity Index), date of cancer diagnosis (by diagnostic biopsy), and date when the patient began any type of cancer treatment.32 The interval between the initial diagnosis and the start of treatment was calculated as the number of days between the date when patients were diagnosed and the date when they began their first curative treatment. For patients diagnosed at the time of resection and surgery was their first treatment, the number of days was coded as 1 day.

**Data Analysis**

For medical record data, a stepwise, multiple regression method was used to evaluate whether predisposing, enabling, and need factors were necessary to predict the range of days between initial diagnosis and initiation of treatment. Data were centered by converting age, cancer stage at diagnosis, and comorbid diseases into Z scores. Regression assumptions and diagnostics were satisfactory, except for homoscedasticity, which led to the removal of a single influential case. Ethnographical content analysis was utilized to extract relevant themes from the semi-structured and focus-group interviews.35

The goal of the analysis was to identify factors that detail the delays in receiving cancer treatment from the perspective of patients, caregivers, HCPs, and patient navigators. Five analysts were trained and employed in this study to follow the content analysis methods of Krippendorff.34 All analysts independently coded each transcript and then met to corroborate the codes, broaden the subject categories, and identify quotes to illustrate the themes.

**Participants**
The patients included in this study were treated at a safety-net hospital that serves impoverished community neighborhoods.

**Medical Records**: Medical records were reviewed for 53 Hispanic patients with a primary diagnosis of lung or head and neck cancer; of those, 40 patients had medical records of the number of days from diagnosis to treatment. Table 1 displays the characteristics
Patients were an average of 57 years of age (standard deviation [SD] 16.3; range, 23–88); 57% were diagnosed with head and neck cancers and 43% were diagnosed with lung cancer. The average number of days from diagnosis to treatment was 40 (SD 33.2; range, 1–141); 65% received treatment in less than 42 days, 18% between 46 and 59 days, and 17% received treatment after more than 60 days. The number of comorbidities in the study patients ranged from 2 to 17 conditions (mean [SD] = 5 [3.84]), with the most common being hypertension (58%), chronic obstructive pulmonary disease (43%), tobacco use (40%), and depression (33%). Men and women were significantly different in their cancer stage at diagnosis: Men were more likely to have advanced cancer (79%) and women were more likely to have less-advanced cancer (stages I/II; 69%). Moreover, men were significantly more likely to have received chemotherapy than women (65% vs 31%, respectively).

**Interviews**

In-depth interviews were conducted in 29 participants: 4 with lung cancer, 5 with head and neck cancers, 6 caregivers, 7 HCPs, and 7 patient navigators. The patients interviewed were an average of 62 years of age (SD 9.64; range, 49–75). Five were men and 4 were women. Five patients were diagnosed with head and neck cancers and 4 with lung cancer; 3 patients were diagnosed at stage I/II disease and 6 at stage III/IV disease. Of the 6 caregivers, two cared for patients with head and neck cancers and 4 cared for patients with lung cancer. The ages of the caregivers ranged from 34 to 59 years (mean [SD] = 46.67 [10.31]). One was a man and 5 were women.

<table>
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<th>Variable</th>
<th>Men (n = 23)</th>
<th>Women (n = 17)</th>
<th>All Participants (N = 40)</th>
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<td>5 (31)</td>
<td>20 (51)</td>
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<td>11 (69)</td>
<td>19 (49)</td>
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<td>6 (27)</td>
<td>7 (44)</td>
<td>13 (34)</td>
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Numbers in the group categories do not sum to the total number of participants because of missing data for certain variables.

*Assessed as the number of days from the time patients received a cancer diagnosis until their first treatment.

*P < .01.

**P < .05.
The 7 HCPs included a pulmonologist, medical oncologist, oncology nurse, oncology pharmacist, otolaryngologist, pulmonology surgeon, and radiation oncologist. Five HCPs identified as being white and 2 self-identified as ethnic minorities; 2 were women and 5 were men. Their time at the safety-net hospital ranged from 9 months to 10 years (mean [SD] = 5.46 [3.28]).

Of the 7 patient navigators, 5 were women and 2 were men. Six self-identified as Hispanic and 1 as non-Hispanic white. Their employment at the safety-net hospital ranged 2 to 9 years (mean [SD] = 3.43 [2.57]).

Results

Medical Records

Predisposing (ie, age, sex), enabling (ie, health insurance), and need (ie, cancer site, stage at diagnosis, comorbid conditions) variables were entered as predictors of days from diagnosis to the initiation of treatment. The prediction model contained 4 of the 6 predictors and was reached in 4 steps with 2 variables removed (ie, age, health insurance). As shown in Table 2, the model was significant ($F[4, 36] = 2.58; P < .05, R = 0.482; R^2: 0.233$ [adjusted $R^2$: 0.142]). The variables of sex and comorbid conditions were significant predictors of the time from diagnosis to treatment initiation. Compared with men, women were significantly more likely to experience more days between diagnosis and the start of treatment. Although we examined the interaction effect of all the predictors in the model, the interaction alone between sex and comorbidities was found to be significant ($F[2, 21] = 3.68; P = .04$). As seen in the Fig, compared with men, women with fewer comorbidities experienced the longest delay from their initial diagnosis to the start of cancer treatment.

Interviews

Overall, HCPs and patient navigators had more years of experiences to draw upon when discussing how various factors influenced the time from initial diagnosis to treatment initiation among underserved Hispanic patients with lung and head and neck cancers. Thus, patient and caregiver responses were organized around the responses of their HCPs and navigators.

Need Factors: All participating HCPs conveyed that lung and head and neck cancers are usually diagnosed at a later stage of disease, thus decreasing survival rates among patients with these cancers. They recognized that reducing delays in treatment is impor-

<table>
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<th>Model</th>
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<td>Comorbid diseases</td>
<td>-16.53</td>
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<td>-5.23</td>
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$R = 0.482; R^2 = 0.233$ (adjusted $R^2$: 0.142). Sex coded as 0 = men, 1 = women. Cancer site coded as 0 = head and neck cancer, 1 = lung cancer. Cancer diagnosis stage coded as 1 = stage 0/1, 2 = stage II, 3 = stage III, and 4 = stage IV.

*P < .05.
**P < .01.
tant to reduce the high rates of morbidity from these cancers. The pulmonologist said:

*Lung cancer is a progressive disease and cancer grows. My fear with patients is always that this is a particular cancer that can be treated with surgery and cured. If it advances to the point where it can no longer be taken care of in time for surgery, then it’s impossible to cure, and the only thing we can do is give people radiation or drugs to slow it down, but not cure it.*

The HCPs acknowledged lengthy delays in treatment, similar to what the pulmonology surgeon reported:

*Well, ultimately, the care is good. It’s just the delay from one step to the next. They’re getting the appropriate treatments and procedures done — it’s just the delay [of 8 months].*

Delays in treatment were viewed as being influenced by systems-level factors. At the systems level, most patients and caregivers said that a missed diagnosis of cancer by their primary care physician was the factor that contributed to receiving delayed treatment. When 1 caregiver explained the reasons her relative with head and neck cancer experienced a lengthy delay of treatment, she said:

*Just maybe look to see if it was cancer before. Before they thought it was a blister or fever blister. She had it for a long time, and it was probably growing.*

HCPs identified lack of coordinated care as a systems-level factor that contributed to delays in treatment. Although underserved patients receive affordable care at the safety-net hospital, they recognized that the process of coordinating these patients’ treatment is difficult. HCPs believed that enrolling for services was an obstacle to patients because of the amount of paperwork needed and the requirements that they must meet before the coordination of these patients’ treatment can begin. The clinical oncology pharmacist summarized it as such:

*Getting them enrolled is the biggest gap. I think that, if they can get through that hurdle, everything else goes a lot smoother [to begin their treatment].*

HCPs also reported that the coordination of care for lung and head and neck cancers is complex and can delay treatment. Medical care from various departments (eg, medical oncology, surgery, radiation) and specialty clinics (eg, otolaryngology) must be coordinated prior to the start of treatment as well as during the various procedures necessary for the treatment of these cancers. The oncology nurse also reported on the complications of coordinating care among the different specialties:

*Oh, yeah, particularly the head and neck patients because they have to go between radiation, medical oncology, and otolaryngology, so their care is more complicated.*

The complex coordination of care was also believed to result in negative treatment outcomes, as illustrated by the radiation oncologist:

*If the patient at [my institution] had surgery that I’m not aware of, and the patient comes to me, and really there was a long gap, a long interval … I actually had quite a few patients when they had surgery who, when they came to me, their tumor had recurred already.*

Related to lack of care coordination was lack of communication across departments, among HCPs, and with patients. Communication was seen as lacking between different constituents and related to treatment delays and to difficulties tracking patients during follow-up or transitional periods. The pulmonology surgeon said:

*I think the gaps — the major ones — are the communication between clinics and providers. So, we have a gap there that results in delays, and sometimes we don’t have all the information transmitted. It’s only what was written down in the chart. If you don’t look in the right place, you might not find it. That’s the biggest issue.*

Lack of communication between HCPs and patients was also recognized as contributing to delays in treatment. The patient navigators stated that HCPs should better communicate with their patients about the proper expectations of treatment. Patient navigators believed that when the explanation of the HCP is only verbally communicated, without written instructions or drawn diagrams, then patients forget the instructions given to them — which, in turn, results in patients delaying treatment or not adhering to treatment instructions.

**Enabling Factors:** Patients, caregivers, HCPs, and patient navigators agreed that the enabling factors that generally apply to procuring or impeding patient access to health care were also contributors to delays in cancer treatment. Factors related to low SES mentioned by the study participants included financial barriers. All the respondents highlighted that patients at the safety-net hospital generally lacked the finances to cover basic expenses for housing, food, and transportation, as well as health insurance or, if they had insurance, the ability to cover their co-pays. Thus, the access barrier most direct-
ly related to low SES was lack of health insurance or of sufficient health insurance to cover the cancer treatment (e.g., radiotherapy) they needed.

Patients who did have health insurance were, in general, covered through Medicaid or Medicare; few had sufficient private health insurance. Instead, a majority of patients, similar to other underserved Hispanic patients, had no health insurance, which significantly impeded their access to treatment. The medical oncologist summarized it by saying:

"People [who] do not have good health coverage have a hard time accessing the system. There are some things we cannot do for people who do not have good coverage at [this hospital], e.g., positron emission tomography, which is used for staging lung cancer to see how advanced it is."

Delays in proper cancer staging may then lead to delays in timely treatment for these underserved patients.

Due to the significant financial barriers that disadvantaged Hispanic patients at the safety-net hospital face to initiate and complete their cancer treatment, state-funded programs are available for select patients, such as the Colorado Indigent Care Program, or some hospitals can assist them by finding resources that could help them cover some treatment costs. For example, some patients received assistance with medications they could not afford, as mentioned by the oncology nurse:

"There is an indigent formulary at this hospital, so that means certain folks [with no financial resources] come and get certain drugs."

However, the oncology nurse explained that the process of finding resources for underserved patients makes the treatment of these patients difficult:

"We have our hands tied in a lot of situations or have a number of hurdles to jump through to provide the best care that we can for patients, and we absolutely do everything that we can to make sure we are providing the best care possible."

The HCPs believed that the process of assisting patients was also a lengthy process that contributed to treatment delays.

Although the safety-net hospital staff has administrative difficulties in providing care to this underserved population, these patients also face the hurdles of navigating the health care system themselves. Patients encountered system difficulties throughout the treatment process, from scheduling appointments to receiving timely and proper treatment. Navigation hurdles that delayed treatment tended to exist at the system level, as the pulmonology surgeon indicated:

"The routine times to get appointments in some clinics can be pretty long. I think that’s why we see 8-month delays. It’s not surprising when we see it. We see it frequently."

Patients with cancer may receive care at a hematology/oncology clinic that functions within the overall hospital structure, which further contributes to treatment delays, as the oncology nurse explained:

"The patient can call and get scheduled into the wrong clinic. There are issues with having central scheduling that handles all the appointments for all the outpatient clinics, as opposed to having someone dedicated to oncology who knows the patients, understands how our clinic works, and why patients need to be seen in a timely fashion."

At the study hospital, the hematology/oncology clinic does not offer radiation oncology services but refers patients to a partnering academic cancer center when patients require radiotherapy. Navigating between separate treatment clinics was problematic and resulted in further treatment delays, particularly when care coordination was lacking, as the radiation oncologist explained:

"I just had a patient — he bad surgery done, he’s late already, he’s like close to 4 weeks — so I saw the patient. I did the treatment planning the same day, so I want to start the treatment really quick. [Results from] computed tomography were not there [with the patient file from the safety-net hospital]."

Treatment delays that result from difficulties navigating the health care system are also patient-dependent, and they generally originate from patients not understanding their HCPs' follow-up instructions or not understanding how the health care system works. The pulmonologist made the observation:

"Part of the problem is the patients don’t understand how to get where they need to be. Sometimes they need help filling out forms to get their tests done in a timely fashion."

Lack of patient understanding is likely linked to lack of care coordination at the systems-level, and difficulties navigating the health care system then contribute to delays in treatment, as the pulmonology surgeon explained:

"I think the major barriers are delays related to the process of getting from one clinic to the next in our system. Some of them may be language-related and some of them are just the way our system has been set up."
**Predisposing Factors:** Personal, social, cultural, and psychological propensities were noted as predisposing factors that contribute to a patient’s ability to access cancer treatment. Influential personal factors were related to patient immigration status and included lack of language proficiency and lack of legal status.

Most Hispanic patients at the safety-net hospital spoke only Spanish — a barrier to timely treatment:

*The patient showed up late with the tumor recurred. … I think just for the Spanish patients — I think there are things … they probably bad more difficult than the other patient population. Well, once, for whatever reason, they missed the appointment; they had [a] language barrier.*

Similarly, patients who lacked documentation of their legal immigration status encountered problems accessing treatment care, as the oncology pharmacist explained:

*If they [patients] are undocumented and there is a patient-assistance program available through pharmaceutical companies to provide drugs at low cost or free, undocumented patients don’t qualify.*

Language and legal status barriers impeded access to care, and, if they eventually accessed resources, their treatment was significantly delayed.

Another predisposing factor to timely treatment is a patient’s social support system. Patients who have a caregiver or family members to assist them with navigating the medical system and support them through treatment are more successful at obtaining timely and proper treatment, as noted by the otolaryngologist’s report of the important role of a caregiver:

*I have one man who lost his larynx from laryngeal cancer, and his sister — his wicked sister — brings him in and she’s just a riot, but she keeps on this guy like you can’t believe. She has him here on time, all the time.*

An HCP also emphasized how a social support system can help patients overcome other barriers that impeded timely treatment:

*My Latino patients who have done well have English-speaking families who have been here, and then they bring mom and dad in.*

By contrast, patients without caregivers or family members to care for them have a more difficult experience:

*A lot of our patients have no support system. So, if they get sick, they have no one to help them. And that’s tough, really tough.*

Thus, social support appears to impact patients’ timely access and adherence to treatment.

Lack of health literacy was another predisposing factor that played an important role in whether Hispanic men experienced treatment delays. We found that these underserved patients have difficulties understanding medical information related to their diagnosis and treatment, and, consequently, do not follow-up with their treatment regimen, as explained by the medical oncologist:

*Sometimes patients have no idea that they have to come back. Even though we tell them we want them back, they have no idea why. … And also there is lack of understanding from the patients of what is required to be successful when they’re in treatment.*

Misconceptions about cancer treatment were also reported as stemming from lack of health literacy. For example, when the pulmonologist was asked to expand on how he believed lack of health literacy contributed to treatment delays, he said:

*Well, so, I think one of the things I’ve heard from a lot of immigrants when we talked about surgery for lung cancer is that they don’t want to have surgery because they’ve heard that will cause the cancer to spread.*

Other similar diagnoses and treatment misconceptions also appeared to contribute to treatment delays.

Mental health propensities were identified as directly and indirectly influencing a patient’s ability to initiate treatment. Substance abuse was related to treatment delays, which the medical oncologist explained:

*Yeah, well, that’s a problem because, number one, they sometimes have to actually quit these other complications [before treatment], … and, you know, sometimes that doesn’t happen.*

Similarly, emotional distress (eg, depression, anxiety, fear) affects patients’ ability to participate in treatment. The otolaryngologist illustrated:

*People who drink have depression. Uh, either it’s generated by the alcoholism or it’s preceding the alcoholism — where they drink because they’re depressed. I would think that’s an impediment [to treatment] that begins, you know, with the patient itself.*

Patients and their caregivers also recognized the role of emotional distress in the patient’s ability to initiate treatment and attend follow-up visits, as 1 woman with head and neck cancer explained:

*Yup, it was the first [round of] chemotherapy, after we found out. I missed my first — I was scared — I missed*
my first appointment because I was scared. Same with radiation. I missed the first appointment.

Discussion

Our exploratory study findings help to understand the systems- and patient-level determinants of treatment delay among underserved Hispanic patients diagnosed with lung and head and neck cancers. Such contributing evidence was unavailable prior to this study. The literature that does exist suggests that socioeconomic inequalities negatively impact the ability of underserved patients to receive treatment for lung and head and neck cancers, and, when ethnicity is included, impoverished Hispanic patients are at a particular disadvantage.9-11

A paucity of evidence explains what factors determine the treatment delays experienced by this patient population, but the available data indicate that the time interval between the initial diagnosis and the start of treatment continues to increase and that delays beyond 46 days increase the risk of death.17,20 Treatment delays among patients with lung and head and neck cancers occur more often in those with early-stage disease,17,21 placing them at a higher risk for disease progression,22-25 disease recurrence,15-16 increased emotional distress,18,19 and lower rates of survival.17 Thus, assessing the determinants of treatment delays is important, because such understanding could lead to interventions that effectively target the factors that influence treatment inequalities among vulnerable populations, such as underserved Hispanic patients with lung and head and neck cancers.

We used the Behavioral Model for Vulnerable Populations to frame our study design and analysis because it includes domains relevant to understanding the factors that influence access and the utilization of health care services among vulnerable populations.30,31 Thus, the Behavioral Model for Vulnerable Populations guided the choice of variables to include in the prediction model, from the medical records and the questions to ask patients and their caregivers, HCPs, and patient navigators.

Institutional-Related Factors

The literature and our findings unequivocally point to the need to decrease the treatment delays for lung and head and neck cancers because the timely initiation of treatment is likely to result in improved outcomes and survival for patients with these types of cancer. In our study, 35% of patients had treatment delays longer than 46 days, at a point when these patients have a significant increased risk of death.17 Series of institution-level factors common to publicly funded hospitals appear to be associated with such treatment delays in the underserved patients of our study. At the safety-net hospital where we conducted the study, lack of care coordination was common, either from enrolling patients for services to coordinating the specialty treatments they need — all of which were believed to result in treatment delays.

In our study, communication was lacking across various clinics, providers, and patients when coordinating care, and it was consistent with the intuitive notion that the multidisciplinary coordination of care is complex and takes time, particularly if specialty care services are limited.28 Creating and encouraging the participation of HCPs in multidisciplinary tumor boards at public hospitals may help improve communication and contribute to better care coordination among oncologists and other HCPs. Use of tumor review boards has been associated with improved care and increased rates of survival among patients with cancer, although this association is controversial, and limitations still exist for those living in rural, low-resource areas, as well as in other suboptimal settings.35,36 Undergoing curative surgery among patients with early-stage lung and head and neck cancers is also likely to be improved when their HCPs participate in weekly tumor board meetings.37

The patients and caregivers interviewed did not attribute poor treatment outcomes to treatment delays due to lack of care coordination or lack of communication; rather, they attributed treatment delays to an initial missed diagnosis of cancer by their primary care physician. They implied that this initial missed diagnosis resulted in a delayed referral to an oncologist. One meta-analysis found that delayed referrals to specialists predicted a 3-fold mortality risk for patients with head and neck cancers, likely resulting from treatment delays and advanced disease.38 In our study, patients and caregivers believed that, after being diagnosed, the safety-net hospital provided patients with the care that they needed and viewed any treatment delays as being less consequential.

The 7 patient navigators interviewed recognized that delays in treatment were overall related to lack of care coordination and miscommunication across hospital clinics. They were particularly concerned that patients with lung and head and neck cancers need system-navigation services to decrease delays in treatment, but they noted that patients were not receiving such services at the hospital.

If the systems-level factors are not addressed, our findings suggest that treatment delays are likely to continue — and possibly increase disparities in treatment outcomes — among underserved Hispanic patients with lung and head and neck cancers. An evidence-based solution that can improve communication and care coordination may well be a patient-navigation program for this underserved patient population.39,40

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**Patient-Related Factors**

As is characteristic of other patients at the safety-net hospital, the Hispanic patients in our study were medically underserved, with the majority of participants (60%) being uninsured and all of them being poor (annual income < $36,000). Due to lack of variability in income and health insurance status, this factor did not contribute to the prediction of treatment delays in our study. Instead, sex and number of comorbidities had independent effects on treatment delay, but these variables were also intertwined. Compared with men whose treatment was, on average, delayed by 34 days, disparities in treatment delays were more pronounced for women whose treatment was delayed by, on average, 48 days (above the critical 46-day delay) from initial diagnosis to treatment initiation. Moreover, women with fewer comorbidities (≤ 4) were more likely to have increased delays in treatment compared with women who had more comorbidities or men who had a similar lower number of comorbid conditions. Compared with men, women were also more likely to be diagnosed with early-stage disease. Thus, our findings suggest that healthier women might be at high risk for treatment delays and patients whom safety-net hospital staff should follow-up more closely to avoid disparities in poor treatment outcomes, distress, and low rates of survival.

Some published data indicate that the time from first diagnosis to treatment initiation does not significantly vary by comorbidity among patients treated at academic facilities. For patients treated at high-burden, safety-net hospitals, it is possible that a greater number of comorbidities means that these patients are better integrated into the system and, consequently, experience fewer treatment delays. If this is the case, then we think it appropriate to assume that patients who receive care for comorbid conditions are likely to have already enrolled in hospital services, medication programs, and be adept at navigating the health care system. Thus, having more than 4 comorbid conditions could be a proxy for patients having had some institution-level barriers addressed, possibly resulting in a more timely initiation of cancer treatment.

Lack of legal status in the United States and lack of English-language proficiency are determinants of treatment delays that disadvantage medically underserved Hispanic patients, although the effects of these factors on treatment delays among these patients have not been quantified. As found in our study, patients with undocumented status are unable to qualify for resources that other underserved patients are able to access to cover their cancer treatment, and, if they eventually do, their treatment is likely to be significantly delayed. Similarly, our findings indicate that immigrant Hispanic patients who do not communicate in English face barriers to accessing care that may result in treatment delays. An adequate social support system that can assist patients with language barriers and to navigate the health care system could facilitate the ability of patients to obtain proper and timely treatment. A factor common to underserved patients is the lack of health literacy that, in this study, was reported to be associated with lack of proper and timely adherence to recommended treatment. For patients who lack adequate social support — particularly those with limited proficiency in English — or adequate health literacy, the presence of language translators or of patient navigators can help to engage patients and caregivers during physician visits, thereby increasing their ability to understand and follow the required steps in the cancer treatment process.

A barrier to individuals with lung and head and neck cancers is substance abuse, which, in our study, was anecdotally linked to delays for patients unable to initiate treatment if they continued to smoke tobacco or drink alcohol. In particular, substance-abuse problems place underserved Hispanic patients with these types of cancers at a higher risk for emotional distress and mortality. Because mental health disparities are present among underserved Hispanic patients with cancer, affordable mental health services can assist them in addressing these problems and improve treatment delays.

**Limitations**

This exploratory study used a convenience sample to explore some possible determinants of treatment delays among underserved Hispanic patients with lung and head and neck cancers. A randomly selected sample followed longitudinally would strengthen the generalizability of the study results to this population of patients with cancer. The categorization of patients as Hispanics also limits generalizations to how determinants of treatment delays may differ by other ethnic groups (eg, country of origin, acculturation levels). Methodologically, we were limited by the data available in the medical records of the study patients, and we were unable to assess their reliability.

Because the incomes of all of our study participants fell below the poverty level at the beginning of the study, we could not examine the effects of SES on the number of days from the initial diagnosis to treatment initiation as reported in their medical records. Instead, in-depth interviews with the HCPs suggested that low SES contributed to treatment delays via the patients’ lack of health insurance. We also could not explore the effects of health insurance coverage, because most patients were uninsured or lacked proper health insurance through Medicaid or Medicare. However, the Affordable Care Act that expands the coverage of public health in-
surance for underserved patients may now improve their access to timely and proper treatment; however, its effects on cancer disparities remains to be demonstrated.45

Conclusions
Data suggest that delays in cancer treatment are associated with poor outcomes and lower rates of survival for patients with lung and head and neck cancers. Thus, immediate action should be taken to improve the time between diagnosis and treatment initiation for these disadvantaged patients.

Future studies should assess the effects of the determinants that our interviewees believed influence delays in treatment initiation among underserved Hispanic patients with cancer treated at a safety-net hospital. Our findings could be used to guide future research as well as interventions for underserved patient populations.

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