Introduction

Healthcare disparities are differences in outcomes that are seen across different racial, ethnic, and underserved populations. Not only are they estimated to cost society $175 billion in terms of lost life years, but they also continue to affect patient survival across diseases (1-4). The Institute of Medicine in its 2003 landmark report, Unequal Treatment: Confronting Racial and Ethnic Disparities in Healthcare, concluded that racial and ethnic healthcare disparities occur in part due to historic and contemporary social and economic inequality in the United States (5). Moreover, recent emphasis has been placed on eliminating structural racism in order to improve healthcare disparities (6). With this goal in mind, the following review will describe the most up to date
literature detailing disparities in esophageal cancer diagnosis and management.

Esophageal cancer (EC) is currently the 6th leading cause of death from cancer and the 8th most common cancer in the world (7). According to the 2019 data from the Surveillance, Epidemiology, and End Results (SEER) Program, the annual incidence in the United States is roughly 18,000 cases, with a current 5-year survival under 20% (8). Surgical disparities have been described in the literature, with a prevailing theme associating minority status with worse outcomes (3,4,9-11). The diagnosis, management, and outcomes of patients with esophageal cancer is subject to these same truths (12-18). The scope of this review is to provide an updated account of the literature on disparities in esophageal cancer presentation and treatment. We will approach this task through the conceptual framework designed by Torain et al. that highlights five main themes of surgical disparities: patient-level factors, provider-level factors, system and access issues, clinical care and quality, and postoperative outcomes, care and rehabilitation (4). We present the following article in accordance with the Narrative Review Checklist (available at: http://dx.doi.org/10.21037/jtd-20-3095).

Methods

This narrative literature review to describe the healthcare disparities in EC presentation and treatment was conducted through a literature search of PubMed for the following terms: healthcare disparities, esophageal cancer, inequality, and surgery. For an updated account, only articles published in the peer-review process after January 1st 2000 were included. In addition, investigations had to be conducted in the United States, published in the English language, and include qualitative, quantitative, or mixed methods in their methodology. Systematic reviews previously published were also included in this study.

Patient-level factors

The predominant histological subtype in the United States is adenocarcinoma (ACA), however, African Americans more commonly present with Squamous Cell Carcinoma (SCC) of the esophagus (18), which portends a worse prognosis (19). ACA accounts for 68% of esophageal cancers in non-Hispanic whites (NHW), but only 15% of EC in African Americans (20). The same pattern is seen in early stage disease: a SEER registry of 1522 patients with T0-T2 esophageal cancer demonstrated that 86% of African American patients were diagnosed with SCC, compared to only 27% of NHW patients (18). Additionally, African Americans diagnosed with SCC were found to have poorly differentiated histology in 40% of cases, which is also associated with worse survival (18).

Patients with SCC are more likely to be tobacco users (88% vs. 79%) and heavy alcohol users (77% vs. 50%), as compared to patients with ACA (21). It is well documented that SCC has a significantly worse survival than ACA, and subsequently African American males worse than NHW males (5-year OS: 18.1% vs. 10.4%); and much of the literature attributes the difference in incidence to the associated risk factors for SCC (22,23).

The primary risk factors associated with the development of SCC include: African American race, NHW women, smoking, alcohol, diet/nutrition, and genetic factors (23,24). Individuals who eat nitrogenous compounds or have significant deficits in the intake of fruits and vegetables are at increased risk of SCC (24). In contrast, the primary risk factors associated with the development of ACA include: male, white race, gastroesophageal reflux disease (GERD), Barrett’s Esophagus, obesity, and tobacco use (25-27).

African Americans are also more likely diagnosed with a more advanced stage of disease. SEER registry analysis has demonstrated that African Americans are less likely to be diagnosed with localized disease as compared to NHWs (20% vs. 24%) (28). A Michigan Tumor Registry review of 1,093 patients with EC demonstrated African Americans were more likely to have metastatic esophageal cancer than NHW patients, regardless of income or insurance status (29). The increased disease burden in African Americans at the time of diagnosis may be attributed barriers to healthcare coverage, access, and system utilization, as well as later recognition of symptoms by providers.

Provider-level factors

Provider level factors play a significant role in the disparities in outcomes of patients with EC through unconscious bias, lack of cultural competency, language usage, and lack of staffed and resourced facilities (30-32). Molena et al. analyzed which patients received high-quality care based on the National Comprehensive Cancer Network guidelines within two academic institutions and found that patients who were African American, from lower socio-economic status (SES), and had SCC tumor histology were more likely to receive low-quality care (32). They hypothesized
that this was due to a lower amount of patients with SCC undergoing esophagectomy (32).

Similarly, multiple large database studies have established an association between African Americans, lower SES, and refusal of esophagectomy leading to worse outcomes (33-35). Rahouma et al. analyzed the NCDB from 2004–2014 and found identified 3.8% of patients who were recommended for surgery but refused (33). By multivariate analysis these patients were more likely to be: elderly, female, nonwhite, SCC histology, absence of insurance, lower income, and treated at nonacademic centers. The patients who refused esophagectomy had worse median survival (32 vs. 21 months, P<0.001) (33).

Qualitative research has suggested that discrepancies in cancer surgery adherence can stem from differences in patient-provider communication (36,37). In 2004, Johnson et al. found that surgeons can be more verbally dominant and less patient-centered in their approach to African American patients (30). Additionally, it has been demonstrated that implicit biases and previous cultural exposures affect whether or not patients receive surgery and what type of surgery is performed (38-42). African American and minority patients are less likely to receive surgery for non-small cell lung cancer, pancreatic cancer, prostate cancer, colon cancer, and esophageal cancer (40,41,43,44).

System & access

There are significant barriers to equitable care in esophageal cancer for patients from disadvantaged backgrounds, among them are patient education, family support structures, financial burden/employment and centralization. Lineback et al. found communication difficulties and difficulty with patient education more common in patients from low SES backgrounds (45). In addition, support structures are key to optimal patient outcomes. EC patients in a Michigan cancer registry found that single African American patients were the least likely to undergo esophagectomy, placing social support as a perceived barrier that some disadvantaged patients may further suffer from (46). The diagnosis of cancer places the patient under an immense financial burden, especially in patients from the lowest household income (47). Among cancer survivors, uninsured patients are significantly less likely to receive necessary medical care (48). Furthermore, cancer survivors are more likely to be unemployed than healthy controls (33.8% vs. 15.2%), a burden most felt on those from disadvantaged backgrounds (49). Specifically, one study of EC survivors found that 33.3% of patients from low SES were unemployed on follow up compared with only 2.6% of patients in high SES group (45).

Increasingly there has been a push towards centralization of care at high volume centers. However, this invariably leads to a new burden being placed on patients from low SES backgrounds. New York, New Jersey, and Pennsylvania patients from 1996–2006 experienced increased median travel distances for care, highest among them were patients with EC, with a 72% increased travel distance (50). Although, a review of the National Inpatient Sample demonstrated that centralization led to a decrease in post-operative mortality, proportionally the highest among disadvantaged groups defined as non-White race, public insurance, low household income (51). It appears that minority patients may derive the greatest benefit from treatment at high-volume centers. However, barriers such as distance traveled and cost may prevent them from having access to these facilities.

Barrett’s esophagus is a known risk factor for esophageal ACA (52). In patients with increased risk for ACA (males, age >50, white race, GERD, elevated BMI, hiatal hernia, intra-abdominal distribution of fat), screening for Barrett’s esophagus is recommended (53). SCC, on the other hand, has no established screening guidelines. African American men with exposure to alcohol and tobacco have squamous cell carcinoma rates approaching those of esophageal adenocarcinoma in non-Hispanic white men with reflux, a population for whom screening is advocated by AGA guidelines (20). It is possible that this lack of screening also contributes to later detection and therefore poorer prognosis of EC in African Americans.

Clinical care & quality

Treatment selection in patients with newly diagnosed EC is highly personalized, best made by a multidisciplinary team due to its complexity (1). Treatment options include surgery, chemoradiation, and multimodality treatment (54). Treatment selection is highly dependent upon the stage at presentation, histology and fitness of the patient, among other factors; however, it is also dependent upon age, race and SES (55,56).

Chemoradiation is part of the multimodal definitive therapy for locally advanced EC (54,57,58). However, access to chemoradiation is not uniform. McClellaand et al. noted African Americans, American Indians, Hispanic Americans and Appalachian patients all had decreased access to radiation for across many different malignancies (59,60). Decreased access to radiation therapy among African-
Americans was independent of SES. Specifically in EC, Merkow et al. demonstrated lower utilization of neoadjuvant chemoradiation in patients greater than 75 years old, Medicare insurance status, increased comorbidities and stage II disease (61).

Disparities within surgery have been well described. African Americans undergo surgery at significantly lower rates than NHW patients in the SEER database (18,62) and the National Cancer Database (NCDB). (12,13,63) Savitch et al. found that matched African American patients were less likely to undergo surgery for all stages than NHW patients (12). Dong et al. demonstrated that only 10.8% of African American patients underwent surgery compared to 22.8% of non-Hispanic whites (P<0.001), after correction for stage of presentation (62). African American patients with locoregional disease more likely received radiation as sole therapy and were less likely to undergo surgery, leading to negative effects on survival (18). Furthermore, single African American patients were the least likely to receive esophagectomy and the most likely to refuse treatment in one study of the Michigan Cancer Registry, highlighting a need for improved patient centered education (46). Patients with EC studied in the NCDB who were uninsured or living in areas with lower education levels were also less likely to undergo surgery (13).

Decreased rates of surgical management of localized EC is also a major contributor to lower overall survival in African American patients (63-65). Several suggestions have been made for this disparity including unequal access to healthcare, and practice patterns resulting in decreased evaluation by qualified surgeons (18,63,64). In addition, many of the recently performed studies utilizing the SEER registry have shown that the difference in survival rates disappeared after adjusting for receipt of a cancer-directed surgery (18,63-65). This further supports the theory that decreased rate of surgery in non-white populations is a major contributor to higher mortality rates. Interestingly, Taioli et al. utilizing the SEER database, concluded that the 1-year mortality for African Americans who received a cancer-directed surgery was significantly worse than NHW patients. This highlights differences in quality of health care delivered to minority patients and could be related to several factors affecting access to high volume centers (66).

**Postoperative outcomes, care and rehabilitation**

Operative outcomes are worse when complex cancer is performed at low volume centers (51,67). Several studies have shown that esophagectomy at high-volume hospitals (≥20 esophagectomies/year) are associated with a significant reduction in mortality when compared to esophagectomy at low-volume hospitals (4.9% vs. 18%) (67,68). Several patient-related factors have been shown to be associated with receiving cancer-surgery at a low volume hospitals and these include non-white status, non-private insurance, increased comorbidities, and nonelective admission (67). In particular, African American patients have been shown to be less likely to receive care at high volume centers (69). Al-Refaie et al. showed almost 90% of African American patients received esophagectomy at a low-volume hospital (67). Following esophagectomy, Rehmani et al. showed that African American patients had higher mortality rates at both low and high-volume centers when compared with NHWs. Furthermore, failure to rescue was higher for African Americans compared to NHW patients, and this was related to esophagectomy at low-volume hospitals (16,70).

When assessing disparities in neoadjuvant chemoradiation (CRT), a recent paper by Levinsky et al. found that patients undergoing delayed esophagectomy (defined as esophagectomy after 90 days from CRT) were more likely to be African American and of lower SES. This is likely owing to healthcare systems and social barriers to access affecting timely EC treatment in African American patients (71).

**Where we go from here**

EC is associated with significant disparities in care, and meaningful progress in reducing them has been limited (2,72). It is evident that there are significant contributions from patient, provider, system, clinical care, and postoperative care in the delivery of health care to minority patients. Moving forward, we should focus on developing effective interventions to mitigate disparities, policies linking disparities to quality of care metrics, and delivery system change to enable minority patients to more easily access high volume centers (73). Specifically, further qualitative research into provider-level factors such as patient and provider communication, and policies to reward and incentivize high-quality care for minority patients are actionable directions for the future.

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