Distribution Agreement

In presenting this thesis or dissertation as a partial fulfillment of the requirements for an advanced degree from Emory University, I hereby grant to Emory University and its agents the non-exclusive license to archive, make accessible, and display my thesis or dissertation in whole or in part in all forms of media, now or hereafter known, including display on the world-wide web. I understand that I may select some access restrictions as part of the online submission of this thesis or dissertation. I retain all ownership rights to the copyright of the thesis or dissertation. I also retain the right to use in future works (such as articles or books) all or part of this thesis or dissertation.

Signature:

_____ _____

Robyn Fernando Date

Commission on Cancer Accreditation and Receipt of Guideline-Consistent Care among Non-Hodgkin Lymphoma Patients with an HIV Diagnosis: A Population-based Study in Georgia, 2004 – 2012

By

Robyn Fernando
Master of Public Health
Epidemiology

_____

Kevin C. Ward, PhD, MPH
Committee Chair

_____

Joseph Lipscomb, PhD
Committee Member

_____

Jeffrey Switchenko, PhD, MS
Committee Member

Commission on Cancer Accreditation and Receipt of Guideline-Consistent Care among Non-Hodgkin Lymphoma Patients with an HIV Diagnosis: A Population-based Study in Georgia, 2004 – 2012

By

Robyn Fernando
B.S., University of Washington, 2014

Thesis Committee Chair: Kevin C. Ward, PhD, MPH

An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University in
partial fulfillment of the requirements for the degree of
Master of Public Health in
Epidemiology
2019

Abstract

Commission on Cancer Accreditation and Receipt of Guideline-Consistent Care among Non-Hodgkin Lymphoma Patients with an HIV Diagnosis: A Population-based Study in Georgia, 2004 – 2012

By Robyn Fernando

Background: The Commission on Cancer (CoC) is one of the main accrediting bodies for cancer care. Accreditation promotes the principle that adherence to well-defined standards translates to higher quality healthcare services, and, therefore, improved patient care and outcomes. To date, no studies to our knowledge have investigated the association between accreditation and any quality indicators among cancer patients with human immunodeficiency virus (HIV).

Objectives: The relationship between accreditation and receipt of guideline-consistent care in the US has not been well studied, particularly among patients with both cancer and HIV. This study assesses the association between CoC accreditation and receipt of guideline-consistent care among non-Hodgkin lymphoma patients with HIV (NHL/HIV) in Georgia (GA).

Methods: Data collected by the GA Cancer Registry, GA HIV/AIDS Surveillance Registry, and GA Hospital Discharge Database were linked to identify all patients in GA with NHL and HIV from 2004 – 2012. Bivariate and multivariate logistic regression models were constructed to examine the association between CoC accreditation and receipt guideline-consistent care.

Results: Between January 2004 and December 2012, 328 patients met inclusion criteria for the study. Receipt of guideline-consistent care among NHL patients with HIV who were either diagnosed and/or treated at a CoC-accredited program did not significantly differ from those who were not diagnosed and/or treated at a CoC-accredited program ($p = 0.62$), even after adjusting for additional predictors ($p = 0.60$).

Conclusion: CoC accreditation was determined to be not significantly associated with receipt of guideline-consistent care among NHL/HIV patients. This indicates that, in GA, NHL/HIV patients are being handled similarly in terms of receiving guideline-consistent care across facilities, regardless of CoC accreditation status. Additional research should be conducted to establish the relationship between CoC standards and quality indicators to determine if they truly equate to enhanced patient care and outcomes or if they more accurately reflect other differences between CoC and non-CoC facilities, such as structural and patient demographic distinctions. Additionally, research pertaining to patients with both cancer and HIV is limited. As cancer patients with HIV substantially differ from those without HIV, more research is needed to ensure they receive the highest quality care possible.

Commission on Cancer Accreditation and Receipt of Guideline-Consistent Care among Non-Hodgkin Lymphoma Patients with an HIV Diagnosis: A Population-based Study in Georgia, 2004 – 2012

By

Robyn Fernando
B.S., University of Washington, 2014

Thesis Committee Chair: Kevin C. Ward, PhD, MPH

A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University in
partial fulfillment of the requirements for the degree of
Master of Public Health in
Epidemiology
2019

Table of Contents

CHAPTER I: LITERATURE REVIEW

Non-Hodgkin Lymphoma

Non-Hodgkin Lymphoma (NHL) is one of the most common cancers in the United States (1). In 2018, there were an estimated 74,860 newly diagnosed cases, representing 4.3% of all new cancer cases in the US, and 19,910 deaths, representing 3.3% of deaths from all types of cancer in the US (2). Both NHL incidence and mortality rates have been declining over recent years, with incidence rates dropping, on average, 0.7% per year, and mortality rates, about 2.2% per year from 2006 to 2015. Additionally, the 5-year survival of a patient diagnosed with NHL has increased yearly over the last decade, with current 5-year survival at just over 71% (3).

NHL is a cancer that begins in white blood cells, known as lymphocytes. Lymphocytes are part of the immune system, which protects the body from infections, diseases, and other harmful environmental risks and also filters wastes and toxins from the bloodstream. A healthy immune system is essential for survival and overall well-being (4). There are two main types of lymphocytes: B lymphocytes (B cells) and T lymphocytes (T Cells). B cells produce antibodies that fight off infection and pathogens, and T cells attack foreign invaders and help stimulate B cells (5). In NHL, these cells are mutated and do not function properly, resulting in an impaired immune system. B cell NHL is more common than T cell, accounting for about 90% of all NHL cases (1).

NHL Symptoms, Treatment, and Risk Factors

NHL can cause a variety of symptoms that are often similar to those caused by other diseases and infections, and they can differ depending on the type of lymphoma and where it is located in the body (5). Common symptoms can include: enlarged lymph nodes, chills,

fatigue, severe or frequent infections, and the presences of B symptoms, which include fever without infection, drenching night sweats, and unintentional weight loss.

Treatment for NHL depends on type, stage of disease, a patient's current health, and whether or not the lymphoma is aggressive or causes symptoms (5). It can consist of either single- or multi-agent chemotherapy, radiation therapy, bone marrow transplant, biological therapy, and radioimmunotherapy drugs or, possibly, a combination of multiple treatments.

NHL can affect both children and adults, however, there are certain individuals who are more likely to develop the disease than others. The lifetime risk of developing NHL is slightly higher in men (1 in 42) than in women (1 in 54) (3). Reasons for this gender difference are unknown, but research has identified several other factors that increase a person's likelihood of developing NHL. These include: age (most cases of NHL occur in people who 60 years or older, however, some types are more common in children), race (those of white race are more likely to develop NHL in the US than African Americans and Asian Americans), obesity or having a diet high in fat, living in a developed country, and having an immediate family member with NHL. Additionally, being exposed to certain chemicals and drugs, such as benzene, herbicides, tumor necrosis factor inhibitors, chemotherapy for other types of cancers, and radiation, have been correlated with development of NHL, however, research regarding these associations is limited and inconclusive (1). Infection with certain viruses and bacteria, such as human immunodeficiency virus (HIV), Epstein Barr virus, and Helicobacter pylori, may increase risk of NHL, as well.

Human Immunodeficiency Virus

Human immunodeficiency virus (HIV) is a viral infection that can compromise an individual's immune system. There are an estimated 1.1 million people living with HIV in the US; however, about 1 in 7 (or 14%) are unaware that they are infected with the virus (6). In 2017, there were 38,739 new diagnoses of HIV and 15,807 HIV-related deaths in the US. Over the last decade, US-HIV rates have decreased by about 20% overall, with steady declines in all populations except men who engage in sexual activity with other men (MSM), while HIV testing rates among all groups have increased (7).

In individuals with HIV, CD4 cells (T cells), are attacked and destroyed, which makes the body less likely to fight off infection over time (8). This increases a person's likelihood of developing an opportunistic infection, such as tuberculosis, meningitis, and certain cancers and death from a weakened immune system. Those with a very weakened immune system, usually defined as having a CD4 count of less than 200 cells/mm^3, are in the last stage of HIV, known as acquired immune deficiency syndrome (AIDS).

HIV Symptoms, Risk Factors, and Treatment

A diagnosis of HIV requires a HIV antibody test and cannot be made from the presence of symptoms alone (9). Symptoms of early stage HIV can include: fever, chills, rash, night sweats, muscle aches, sore throat, fatigue, swollen lymph nodes, and mouth ulcers. Symptoms of late-stage HIV or AIDS may comprise: rapid weight loss, prolonged swelling of lymph nodes, prolonged diarrhea, pneumonia, recurrent fever, abundant night sweats, and memory loss or depression.

HIV is transmitted through bodily fluids, such as blood, semen, pre-seminal fluid, breast milk, and rectal and vaginal fluids (8). Any individual can be infected with HIV, but there are certain risks and behaviors that increase a person's likelihood of being transmitted the virus in the US. These include: living in an area where there is a high HIV prevalence, engaging in unprotected sex (particularly unprotected anal sex), and injection drug use with needle sharing (10). HIV disproportionately affects gay and bi-sexual MSM, accounting for the largest number of new US-HIV cases annually, with 66% (25,748) of all US-HIV cases being MSM-related (6). Similarly, HIV disproportionately affects those of Black/African American or Hispanic/Latino decent, with 26,602 incident cases diagnosed in 2017, representing 69% of all US-HIV cases in 2017.

Unfortunately, there is no cure for HIV; however, quality of life and prognosis can greatly be improved through use of antiretroviral therapy (ART) (11). ART is a combination of anti-HIV drugs that aim to reduce a person's HIV viral load. People with a lower viral load are less likely to transmit the virus to others. The ART regimen prescribed depends on many factors, particularly drug-drug interactions with other medications a person might be taking for any other reason. It is recommended that all people with new HIV diagnoses start ART as soon as possible.

Due to the introduction of ART, targeted prevention efforts, development of pre- and post-exposure prophylaxis, and increased testing and treatment options, HIV-related morbidity and mortality have greatly decreased over the last 10 years (6, 12-14). However, these changes in morbidity and mortality have affected the prevalence and incidence of comorbidities among these patients, such as the presence of non-AIDS-defining and AIDS-

defining malignancies and cancers, including NHL, which is considered an AIDS-defining cancer.

Non-Hodgkin Lymphoma and HIV

Some forms of NHL, including diffuse large b-cell (DLBCL), Burkitt, and plasmablastic lymphomas, are AIDS-defining illnesses, meaning that, when an individual with HIV develops one of these, they are diagnosed with AIDS (15, 16). NHL/HIV patients have poorer all-cause survival and are less likely to receive cancer treatment (any or guideline-consistent) compared to cancer patients who are HIV-negative (17, 18). Reasons for differences in survival may include AIDS-related complications, advanced stage at cancer diagnosis, and decreased efficacy or increased toxicity from cancer therapy (18, 19). Lack of any treatment, let alone guideline-consistent treatment, could be attributed to the absence of evidence-based treatment guidelines for cancer patients with HIV, due partly to HIV-positive patients being excluded from cancer clinical trials (20). In turn, nonexistent treatment guidelines may influence provider decisions regarding treatment, possibly due to the belief that cancer patients with HIV have lower performance, efficacy of cancer treatment, and threshold of treatment toxicity; though, cancer-HIV treatment prognoses have been more favorable since the introduction of ART in 1995 (18).

Fortunately, there are clinical trial data available to inform treatment decisions of HIV patients with some types of cancer, including lymphoma. Chemotherapy for lymphoma was once associated with complications of toxicity and repeated opportunistic infections; however, in the era of ART, it was discovered that full-dose chemotherapy can be safely administered to lymphoma-HIV patients, which has led to decreased mortality among these

patients (18, 21). Using this information and standard-of-care treatment recommendations set in place by the National Comprehensive Cancer Network (NCCN) for general NHL patients, a definition of guideline-consistent care for NHL patients with HIV was developed (22, 23). Guideline-consistent care for NHL/HIV patients can be defined as following: multi-agent chemotherapy; radiation therapy may also be indicated in individual cases but does not qualify as necessary or sufficient when given alone for guideline-consistent care.

Factors that influence healthcare quality indicators, which are standardized, evidence-based measures of healthcare quality that track clinical performance and patient outcomes, including the receipt of guideline-consistent care, among NHL/HIV patients, have not been well studied (24). However, hospital accreditation status and clinical and sociodemographic characters, such as cancer stage, race, presence of comorbidities, and rural-urban classification, have been investigated and found to be significant predictors of receipt of guideline-consistent care among patients with other types of cancer.

Accreditation and Receipt of Guideline-Consistent Care

In the United States, there are two main accrediting bodies when it comes to cancer. The Commission on Cancer (CoC) and the National Cancer Institute (NCI). The CoC is a program created by the American College of Surgeons in 1922 that recognizes cancer care programs through accreditation for their commitment to providing comprehensive, high-quality, and multidisciplinary patient-centered care (25). It strives to improve cancer care and quality of life for cancer patients through prevention, research, education, monitoring, and by setting standards that promote patient-centered care. The CoC designates hospitals

as accredited cancer centers on the basis of 36 well-defined standards, and in order to qualify for and maintain accreditation status, facilities must meet all of these standards (26). Examples of CoC standards include: options for genetic assessment and counseling, palliative care services, clinical trials and new treatment options, and follow-up care, including survivorship care plan development. A facility's accreditation status and compliance to CoC standards are reevaluated every 3 years through on-site visits and surveys conducted by the CoC.

There are currently more than 1,500 CoC-accredited cancer programs in the US and Puerto Rico, and these facilities diagnose and/or treat more than 70% of all newly diagnosed cancer patients each year (25).

Pursuing and maintaining accreditation status is a completely voluntary commitment on behalf of cancer facilities. CoC accreditation provides valuable benefits that are not available to non-CoC accredited facilities, including being nationally recognized as an accredited facility by organizations, such as the American Cancer Society, National Cancer Institute, and the Joint Commission (27). This, in turn, creates good press for the facility and prompts promotion and exposure through CoC marketing efforts. Additionally, CoC-accredited facilities are required to report all cancer occurrences to the National Cancer Data Base (NCDB), which provides a valuable resource to monitor and report outcomes, determine patterns of care, identify cancer disparities, and focus on areas for quality improvement initiatives (28). The NCDB is only available to facilities that are CoC-accredited.

From surveying all currently accredited CoC programs in 2014, Knutson et el. explored reasons why many facilities pursue CoC-accreditation, what they think it means for patient outcomes, and opinions of the CoC-accreditation process and maintaining accreditation status (29). Nearly 90% of respondents stated that their top reason for seeking accreditation was to achieve "validation of the cancer program quality". Additionally, 90% of respondents strongly agreed that CoC-accreditation correlates with the improvement of patient care and outcomes, confirming the value physicians and administrators place on accreditation.

Though there are many benefits to being CoC-accredited, drawbacks have also been reported. The path to become accredited is tedious, time-consuming, expensive, and the lack of reimbursement for non-profitable services that are required as a result of CoC standards, create budget concerns for CoC-facilities, particularly those that have less structural capability and provide services to patients of low sociodemographic status (29-32). Further, some providers feel overwhelmed from the numerous mandatory reporting requirements set in place by CoC, claiming that it diverts valuable time away from direct patient care (33). Additionally, Antunez et el. revealed concerns that accreditation might come at the expense of creating barriers in access to high-quality care for socioeconomically-disadvantaged cancer patients (32).

Slightly similar to the CoC, the NCI designates cancer centers (NCI-CCs) as regional centers of excellence in research and patient care. Where CoC approves accreditation on solely the basis of delivery of cancer care, the NCI assigns designation on a more comprehensive basis, including: demonstration of excellence in the areas of research, teaching, cancer prevention, breadth of clinical services and delivery, and impact in the

community (34). There are currently 70 NCI-CCs in the US, and most NCI-CCs are also CoC-accredited (35).

Healthcare providers and patients seeking cancer treatment often use accreditation status as an indication of quality care (27, 36, 37). Though accreditation promotes the principle that adherence to standards set in place by accrediting body translates to higher quality healthcare services, and, therefore, improved patient care and outcomes, this conclusion has not been firmly established (29, 35, 38). The relationship between quality care indicators (including receipt of guideline-consistent care) among cancer patients and hospital accreditation status is inconsistent across the very limited research available.

To date, no studies have been conducted that investigate the association between a facility being accredited and any indicators of quality care among NHL patients, either HIV-positive or HIV-negative, or any other type of cancer patient who is also infected with HIV. However, there are a few studies that have examined the association among a variety of other common cancers, including breast, lung, colon, and rectal cancers.

Prior Research Investigating Accreditation and Quality Indicators

Several prior studies have determined, to some degree, that accreditation is positively associated with quality indicators.

Using data from the South Carolina Central Cancer Registry and NCI State Cancer Profiles, Samson et el. found that CoC-accredited facilities in South Carolina had higher rates of all-measure cancer treatment quality indicators, such as needle biopsy utilization, breast-conserving surgeries, and appropriate and timely use of radiation when compared to non-CoC facilities, indicating that accreditation played a major role in receipt of standard care

among breast cancer patients (39). They also discovered that rate of treatment and diagnosis by CoC-accreditation differed by race.

In another breast cancer-related study, Miller et el. queried the NCDB to determine whether accreditation was associated with improved performance on breast cancer quality measures, including receipt of standard care (40). They found that accreditation was significantly and positively associated with higher performance on almost all of the indicators they measured, and that the majority of patients treated at CoC facilities were likely to receive guideline-concordant care.

In another study that used breast cancer data from the NCDB, Berger et el. investigated the relationship between length of CoC accreditation status on rate of post-mastectomy radiation therapy quality measures (PMRT) (41). They found that rate of PMRT and adherence to PMRT quality measures significantly increased the longer a facility held accreditation status.

Shulman et el. used unadjusted and adjusted survival analyses to determine that patients with stage III breast cancer and stage IIIB or IV non-small-cell lung cancer who were treated at either NCI or CoC accredited facilities had, overall, significantly better survival than patients treated at non-accredited facilities (42).

Using the American Hospital Association Annual Survey 2006 Database, Bilimoria et el. compared CoC-accredited programs to non-CoC-accredited programs to determine if there were significant differences in various quality indicators, such as being accredited by another institution, geography, and oncological services provided (35). They found that CoC-accredited programs were more likely to be accredited by other accrediting bodies,

including the Joint Commission and NCI. It was also determined that CoC-accredited facilities were less likely to be critical access hospitals, rural referral centers, sole community providers, have more patient beds, and perform more total operations. Additionally, they found that CoC facilities had more breast cancer screening programs and chemotherapy and radiation therapy services available.

Using the Medicare Coverage Database, Birkmeyer et el. compared NCI-CCs to non-NCI-CCs to see if lung, esophageal, gastric, pancreatic, bladder, and colon cancer patients had differing mortality rates after major cancer surgery (43). They found that NCI-CCs had significantly lower adjusted surgical mortality rates after 4 of the 6 procedures they examined, including colectomy, pulmonary resection, gastrectomy, and esophagostomy. They also found there was no difference in year-to-year mortality among patients who survived surgery between NCI-CCs and non-NCI-CCs.

Though not specific to cancer patients, a retrospective, longitudinal study conducted by Telem et el. using 2004 – 2010 data from the New York Statewide Planning and Research Cooperative Longitudinal Administrative Database discovered that risk of perioperative morbidity and mortality and all-cause long-term mortality following bariatric surgery was significantly increased in unaccredited (vs accredited) hospitals (44). The study also found that underserved and at-risk populations, such as those of black or Hispanic decent, Medicare patients, and low socioeconomic status, significantly impacted risk differences between accredited and non-accredited facilities.

The aforementioned studies suggest that accreditation is positively associated with quality indicators; however, there are several studies that were not able to reach the same conclusion.

Merkow et el. assessed the association between quality indicators and CoC accreditation by merging data from Medicare's Hospital Compare and the American Hospital Association (38). They discovered that CoC-accredited facilities performed better on most process and patient experience measures but demonstrated significantly worse performance on outcome measures, including death after serious morbidity and surgical site infections. The study also highlighted that many CoC accreditation standards reflect structural characteristics, such as volume size, rather than direct patient care.

In a different study. Merkow et el. investigated differences in patient demographics, surgical complexity, and risk-adjusted 30-day outcomes following major cancer surgery at NCI-CCs vs non-NCI-CCs (45). They found that NCI-CCs were positively associated with young patients, white race, and fewer comorbidities and negatively associated with surgeries that are more complex. Additionally, NCI-CCs had lower mortality rates but higher surgical-site infections.

In a retrospective cohort study that queried the California Cancer Registry for CoC differences among cases of Stage I non-small cell lung cancer (NSCLC) from 2004 – 2011, David et el. found that CoC accreditation was not a significant predictor for cancer-specific survival, even when controlling for hospital procedural volume (46).

Kiernan et el. examined the relationship between CoC accreditation and data entry accuracy among thyroid cancer data from the Tennessee Cancer Registry from 2004 – 2011

and found that incorrect coding of the main variable examined (surgery of the primary site) was significantly associated with CoC accreditation status, with CoC facilities containing more incorrect codes than non-CoC facilities (47). This suggests that CoC accreditation is negatively associated with data quality, an interesting discovery since CoC facilities are required to review data for clinical quality improvement measures as per CoC standards (26).

While investigating differences in US rectal cancer patients and hospital demographics to characterize hospitals' readiness for accreditation, Antunez et el. found that hospitals that were least likely to receive CoC accreditation were those that were community-based, in rural areas, with significantly worse survival outcomes, and serving patients with lower socioeconomic statuses (32). The study also noted that the majority of rectal cancer patients in the US are likely to have the aforementioned characteristics and not receive guideline-consistent care. The authors warned that differences in quality indicators between accredited and non-accredited programs may be due to differences in sociodemographic characteristics, as those who are better resourced tend to live closer to and be able to afford care at facilities that are likely to be accredited. This echoes Telem et el.'s concern that accreditation differences might actually be due to varying patient demographics, rather than the accreditation program itself (44).

In an Australian blinded, random, and stratified study, Braithwaite et el. examined whether hospital accreditation was associated with self-reported clinical and organizational performance (48). They found that accreditation was significantly and positively associated with organization structure and leadership, but no significant relationship between accreditation and clinical performance was discovered. This finding correlates with

findings from other studies in similar populations that found the relationship between accreditation and quality indicators, including care and patient outcomes, were inconclusive (33, 49-51). Though not exactly the same as the accreditation process in the United States, accreditation in Australia follows a similar model of assessment of organizational and clinical performance against a set of predetermined standards aimed at providing high-quality care (52).

Almost all of the very limited and inconsistent literature available acknowledged that more research needs to be conducted on the topic.

Additional Factors Associated with Receipt of Guideline-Consistent Care

Research pertaining to biological and sociodemographic factors related to receipt of guideline-consistent care among NHL/HIV patients is also limited but very informative.

To our knowledge, no studies have been conducted to date that examine the association between patient rural-urban classification and receipt of guideline-consistent care among cancer patients with HIV, specifically NHL. However, several studies have examined the effect among several other types of cancers, including colorectal, breast, lung, and prostate—though none concurrently considered HIV status. Conclusions were mixed. Several studies found that being located in a rural neighborhood was correlated with poorer outcomes, including lack of standard treatment, decreased survival, higher risk of cancer incidence, higher risk of being diagnosed with late stage cancer, and lack of accreditation status (32, 35, 40, 53-58). However, studies in similar magnitude found that residing in an urban dwelling was associated with poorer outcomes (59-61). McLafferty et el., who determined that risk of late stage diagnosis of and treatment disparities for breast,

colorectal, lung, and prostate cancers were greater in urban populations, argued that many studies that find that rurality is negatively correlated with health outcomes fail to properly control for socioeconomic deficiency (60). Other studies that concluded there were no differences between rural and urban cancer patients also echoed this concern (62-64). It is uncertain whether or not these findings are applicable to patients with both cancer and HIV.

Using HIV and cancer registry data from Connecticut, Michigan, and Texas, Suneja et el. explored associations between cancer treatment and HIV status among NHL, Hodgkin's Lymphoma, cervical, lung, anal, prostate, colorectal, and breast cancers from 1996 – 2010 (18). They found that being HIV-positive was correlated with no cancer treatment or lack of guideline-consistent care among those with DLBCL, lung cancer, Hodgkin's lymphoma, prostate cancer, colorectal cancer, and colon cancer. They also found that low CD4 count, male sex with injection drug use as mode of HIV exposure, age of 45-64 years, black race, and unknown cancer stage were also independently and significantly associated with lack of cancer treatment. Sex, cancer stage at diagnosis, year of diagnosis, and US state were found to be not significantly associated with cancer treatment.

Expanding upon their previous study to include medical comorbidities and insurance status, using the NCDB, Suneja et el. investigated associations between HIV status and lack of cancer treatment among nonelderly adults with common types of cancer from 2003 – 2011 (65). They found that significant predictors of lack of cancer treatment included tumor type (solid tumor vs lymphoma), black race, lack of private health insurance, advanced cancer stage, high Charlson-Deyo comorbidity score, and older age. They also found that individuals with HIV were significantly more likely than those without HIV to not receive treatment (any or guideline-consistent) for 9/10 cancers examined.

Building off both previously mentioned Suneja studies, Lipscomb et al. determined that, in bivariate analyses, receipt of guideline-consistent care among NHL/HIV patients was significantly and positively associated with an advanced Ann Arbor stage (III/IV) diagnosis, being male and being transmitted HIV via MSM (male-MSM), a CD4 count greater than or equal to 200 cell/mm^3, and a viral load count of less than 400 copies/mL (23). Additionally, they found that having extranodal (compared to nodal) disease and DLBCL were significantly and negatively associated with receipt of guideline-consistent care. Insurance type, race, sex, year of diagnosis, age, presence of B-symptoms, and Charlson-Deyo comorbidity score were also considered in bivariate analyses but were not found to be significant at an alpha level of 0.05. In multivariate analysis including bivariate associations found to be significant and variables included for a priori reasons, receipt of guideline-consistent care was positively and significantly associated with advanced Ann Arbor stage diagnosis, male-MSM transmission category, and a CD4 count of greater than or equal to 200 cells/mm^3.

The three proceeding studies found consistent patterns regarding factors associated with receipt of guideline-consistent care. They also concluded that those with both cancer and HIV are often neglected by cancer management guidelines and clinical trial research and urged that more studies be conducted, including clinical and observational research, in the area.

This study aims to expand on both Suneja et al. and Lipscomb et al. studies by further investigating factors associated with receipt of guideline-consistent cancer care. To our knowledge, this will be the first study to date to examine the effects of CoC accreditation

status and rural-urban classification on receipt of guideline-consistent care among patients with NHL and HIV.

CHAPTER II: MANUSCRIPT

Commission on Cancer Accreditation and Receipt of Guideline-Consistent Care among Non-Hodgkin Lymphoma Patients with an HIV Diagnosis: A Population-based Study in Georgia, 2004 – 2012

Robyn Fernando[1], Joseph Lipscomb, PhD[2, 3], Jeffrey M. Switchenko, PhD, MS[4, 2], Kevin C. Ward, PhD, MPH[5, 1]

April 2019

[1] Department of Epidemiology, Rollins School of Public Health, Emory University, Atlanta, GA

[2] Department of Health Policy and Management, Rollins School of Public Health, Emory University, Atlanta, GA

[3] Winship Cancer Institute of Emory University, Atlanta, GA

[4] Department of Biostatistics & Bioinformatics, Rollins School of Public Health, Emory University, Atlanta, GA

[5] Georgia Center for Cancer Statistics, Rollins School of Public Health, Atlanta, GA

This work was supported in part by NIH grant P30A1050409, with additional funding from the Winship Cancer Institute of Emory University. Research reported in this paper was supported in part by the Biostatistics and Bioinformatics Shared Resource of the Winship Cancer Institute and the National Cancer Institute under award number P30CA138292. The contents are solely the responsibilities of the authors and do not necessarily represent the official views of the NCI.

Abstract

Background: The Commission on Cancer (CoC) is one of the main accrediting bodies for cancer care. Accreditation promotes the principle that adherence to well-defined standards translates to higher quality healthcare services, and, therefore, improved patient care and outcomes. To date, no studies to our knowledge have investigated the association between accreditation and any quality indicators among cancer patients with human immunodeficiency virus (HIV).

Objectives: The relationship between accreditation and receipt of guideline-consistent care in the US has not been well studied, particularly among patients with both cancer and HIV. This study assesses the association between CoC accreditation and receipt of guideline-consistent care among non-Hodgkin lymphoma patients with HIV (NHL/HIV) in Georgia (GA).

Methods: Data collected by the GA Cancer Registry, GA HIV/AIDS Surveillance Registry, and GA Hospital Discharge Database were linked to identify all patients in GA with NHL and HIV from 2004 – 2012. Bivariate and multivariate logistic regression models were constructed to examine the association between CoC accreditation and receipt guideline-consistent care.

Results: Between January 2004 and December 2012, 328 patients met inclusion criteria for the study. Receipt of guideline-consistent care among NHL patients with HIV who were either diagnosed and/or treated at a CoC-accredited program did not significantly differ from those who were not diagnosed and/or treated at a CoC-accredited program ($p = 0.62$), even after adjusting for additional predictors ($p = 0.60$).

Conclusion: CoC accreditation was determined to be not significantly associated with receipt of guideline-consistent care among NHL/HIV patients. This indicates that, in GA, NHL/HIV patients are being handled similarly in terms of receiving guideline-consistent care across facilities, regardless of CoC accreditation status. Additional research should be conducted to establish the relationship between CoC standards and quality indicators to determine if they truly equate to enhanced patient care and outcomes or if they more accurately reflect other differences between CoC and non-CoC facilities, such as structural and patient demographic distinctions. Additionally, research pertaining to patients with both cancer and HIV is limited. As cancer patients with HIV substantially differ from those without HIV, more research is needed to ensure they receive the highest quality care possible.

Introduction

Since the introduction of anti-retroviral therapy (ART) for treatment of human immunodeficiency virus (HIV) and acquired immune deficiency syndrome (AIDS), targeted prevention efforts, development of HIV pre- and post-exposure prophylaxis, and increased testing and treatment options, HIV-related morbidity and mortality have greatly decreased over the last ten years (6, 12-14). However, these changes in morbidity and mortality have affected the prevalence and incidence of comorbidities among these patients, such as the presence of non-AIDS-defining and AIDS-defining malignancies and cancers, including non-Hodgkin lymphoma (NHL), which is considered an AIDS-defining cancer. Non-Hodgkin lymphoma patients with HIV (NHL/HIV) have poorer all-cause survival and are less likely to receive cancer treatment (any or guideline-consistent) compared to cancer patients who are HIV negative (17, 18).

Factors that influence quality indicators, including the receipt of guideline-consistent care, among NHL/HIV patients have not been well studied. However, hospital accreditation status and clinical and sociodemographic characters, such as cancer stage, race, presence of comorbidities, and rural-urban classification, have been investigated and found to be significant predictors of receipt of guideline-consistent care among patients with other types of cancer.

The Commission on Cancer (CoC) is one of the main accrediting bodies for cancer care. The CoC is a program created by the American College of Surgeons in 1922 that recognizes cancer care programs for their commitment to providing comprehensive, high-quality, and multidisciplinary patient-centered care (25). It strives to improve cancer care and quality

of life for cancer patients through prevention, research, education, monitoring, and by setting standards that promote patient-centered care. The CoC designates hospitals as accredited cancer centers on the basis of 36 well-defined standards; and in order to qualify for and maintain accreditation status, facilities must meet all of these standards (26). There are currently more than 1,500 CoC-accredited cancer programs in the US and Puerto Rico, and these facilities diagnose and/or treat more than 70% of all newly diagnosed cancer patients each year (25).

Healthcare providers and patients seeking cancer treatment often use accreditation status as an indication of quality care (27, 36, 37). Though accreditation promotes the principle that adherence to standards set in place by accrediting body translates to higher quality healthcare services, and, therefore, improved patient care and outcomes, this conclusion has not been firmly established (29, 35, 38). The relationship between quality indicators (including receipt of guideline-consistent care) among cancer patients and hospital accreditation status is inconsistent and inconclusive across the very limited research available.

To date, no studies, to our knowledge, have been conducted that investigate the association between a facility being accredited and any quality indicators among NHL patients, either HIV-positive or HIV-negative, or any other type of cancer patient who is also infected with HIV. Additionally, research pertaining to clinical, biological, and sociodemographic factors related to receipt of guideline-consistent care among NHL/HIV patients is limited. This study aims to further investigate factors associated with receipt of guideline-consistent cancer care, including CoC accreditation status and rural-urban classification among patients with NHL and HIV.

Methods

Data Source and Study Population

The Georgia Department of Public Health (GDPH) identified all individuals in the state of Georgia who had a cancer diagnosis between 2004 – 2012 and a record of HIV-seropositivity and/or AIDS by linking data from the Georgia Cancer Registry and the Georgia HIV/AIDS Surveillance Registry. An individual diagnosed with HIV and/or AIDS qualified for linkage if their cancer diagnosis was made between the years of 2004 – 2012, and their HIV diagnosis was made either prior to or within 60 days of their cancer diagnosis. The earliest record of HIV-seropositivity and/or AIDS in the Georgia HIV/AIDS Surveillance Registry was documented in 1986.

GDPH performed the linkages via deterministic methods using SAS® software, version [9.4] (66). Variables matched on included: name, date of birth, and social security number (if available).

Sociodemographic and clinical variables at the time of the patient's NHL diagnosis were obtained from the GA Cancer Registry and included: age, sex, race/ethnicity, county of residence, insurance status, NHL diagnosis and treatment facility codes (if applicable), NHL subtype (indicated by histology code), NHL nodal type ("nodal" indicated the disease originated in the lymph nodes; "extranodal" indicated the disease originated in a different organ site), the presence of B-symptoms (fever, night sweats, and/or weight loss), Ann Arbor stage (I, II, III, or IV), year of diagnosis, survival status, and type of treatment received (if any). The cancer registry's 16-level "primary payer" variable to indicate an individual's insurance type was trichotomized, due to sample size limitations, as:

private/other (including those with "insurance NOS"), government (including Medicare, Medicaid, TRICARE, and military), and uninsured. Additionally, the race/ethnicity variable was collapsed into four levels: white, black or African American, American Indian/Alaska Native, and Asian, due to other/unknown racial groups representing only a small portion of the sample, and then further categorized as "Black or African American" and "Other" for analysis. Similarly, Ann Arbor stage was dichotomized as I/II vs. III/IV.

Using an individual's county of residence at time of NHL diagnosis and the 2013 Rural-Urban Continuum Codes, it was determined whether an individual resided in a rural or urban area. The 2013 Rural-Urban Continuum Codes use population size and degree of urbanization to create a classification system to distinguish metropolitan and nonmetropolitan counties (67). For the purpose of this analysis, the nine-category 2013 Rural-Urban Continuum Codes were collapsed into two levels: those with a 2013 Rural-Urban Continuum Code of 1-3 were designated as metropolitan areas, and those with a code of 4-9 (indicating small town and rural areas), were designated as non-metropolitan.

NHL-diagnosis and treatment facilities were determined to be CoC-accredited or non-CoC-accredited from facility codes captured at the GA Cancer Registry on all incoming records. Cancer is a reportable disease in Georgia and state law mandates reporting. The registry maintains a list of CoC reference dates for all hospitals in the state and can determine if an incoming record was from a CoC facility. The registry does not release facility data to researchers but can flag cancer cases in the registry as being either diagnosed and/or treated at a CoC facility. The cancer registry provided three variables on the analytic file to indicate CoC-accreditation status: one to designate if the NHL-diagnosing facility was CoC-accredited (yes/no), another to designate if the NHL-treatment (any portion of cancer

treatment) facility was CoC-accredited (yes/no), and one to designate if the individual was either diagnosed and/or treated at a CoC-accredited facility (yes/no). All study participants were diagnosed with NHL at either a CoC or Non-CoC facility. If a patient did not receive treatment (for any reason), they were marked as not having received treatment at a CoC-accredited facility.

Using the GA HIV/AIDS Surveillance Registry, a six-level HIV-transmission variable was extracted to determine the mode of transmission by which an individual was infected with HIV. Levels include: male-male sexual contact (MSM), intravenous-drug use (IDU), MSM + IDU, heterosexual contact, not identified/reported, and other. Using this transmission variable and a patient's a sex, two additional variables were created: 1) a sex-HIV-transmission variable with three levels: male-MSM, male-non-MSM, and female; and 2) a male-MSM indicator with two levels: male-MSM and male-non-MSM/female. The former was used in descriptive analysis, and the latter, in bivariate and multivariate analyses.

Lastly, all newly created, individual NHL-HIV records were linked to the Georgia Hospital Discharge Database (GHDD) to determine if an individual had one or more inpatient hospitalizations or outpatient hospital visits in Georgia during 2003 – 2012. Similar to the method described in Suneja et el., ICD-9 diagnosis codes from the hospital stay/visit that was closest in time and within one year prior to an individual's NHL diagnosis date were used to construct a modified Charlson-Deyo comorbidity index score, including setting weights for cancer, metastatic carcinoma, and HIV/AIDS to 0 (65). Deterministic and stepwise methods were used to link observations from the GHDD with last name, first name, date of birth, and sex as the main matching variables. Additionally, the GHDD was

used to identify insurance statuses that could not be determined from the cancer registry's primary payer variable.

The start of the study period, 2004, was selected as the result of the GA Cancer Registry's decision to begin collecting more-detailed disease stage data and primary payer data. Also, around 2004, there were improvements in the degree and accuracy of the Enhanced HIV/AIDS Reporting System (eHARS) laboratory data available to the GA HIV/AIDS Surveillance Registry. For analysis, year of NHL diagnosis was dichotomized as 2004-2008 and 2009-2012.

Determination of Guideline-consistent Care

Using the data available from the GA Cancer Registry and the standard-of-care treatment recommendations from the National Comprehensive Cancer Network (NCCN) for specific types of NHL (detailed below) as a template, we characterized receipt of guideline-consistent care in the following manner (22):

> *Guideline-consistent (GC):* record of receiving multi-agent chemotherapy; radiation therapy may also be indicated in individual cases but is not considered necessary or sufficient for GC care when considered alone.
>
> *Not guideline-consistent:* no record of receiving chemotherapy or only record of single-agent chemotherapy; chemotherapy was not recommended or administered because of patient risk factors; or chemotherapy was recommended but refused by the patient/family/guardian.

Indeterminate: record of chemotherapy but number and/or type of agents not documented; patient died before planned therapy; chemotherapy was part of the planned therapy but not given (with no reason indicated); or unknown if chemotherapy was recommended and/or given.

Inclusion and Exclusion Criteria

Of all cancer patients in GA, only those who were 18 years or older and had an initial cancer diagnosis between the years of 2004 – 2012 with one of the following NHL-subtypes: diffuse large B-cell lymphoma (DLBCL), Burkitt lymphoma, plasmablastic lymphoma, peripheral T-cell lymphoma were included in the study. DLBCL, Burkitt lymphoma, and plasmablastic lymphoma were chosen as included subtypes because they are generally regarded as AIDS-defining cancers (15). Peripheral T-cell lymphoma is not viewed as AIDS-defining; however, its treatment is chemotherapy-oriented, as with the other three subtypes, which corresponded to our approach used to define guideline-consistent care. For analysis, NHL-subtype was dichotomized as DLBCL vs non-DLBCL. Further, only individuals who had a reported diagnosis of HIV/AIDS prior to or within ≤60 days of their initial NHL diagnosis were included. If a reported HIV diagnosis date was after the date of an AIDS diagnosis, the HIV diagnosis date was set to that of the AIDS. Individuals who were missing an NHL or HIV/AIDS diagnosis date were excluded.

Data Analysis

All analyses were conducted using SAS® software, version [9.4] (66). Univariate and frequency procedures were used to determine demographic characteristics for the total study population and by each level of the outcome, receipt of guideline-consistent care

status. Categorical variables were reported as counts and percentages (percentages exclude missing values) and continuous variables as means and standard deviations. Cells with less than five observations were suppressed for confidentiality. For all modeling procedures, the study outcome was limited to two levels: guideline-consistent care or non-guideline consistent care. Those whose receipt of guideline-consistent care was "indeterminate" were excluded from further bivariate and multivariate analyses.

Bivariate logistic regression models were fit to evaluate the unadjusted associations between the main exposure, diagnosis and/or treatment at a CoC-accredited facility, and each clinical and sociodemographic variable and our outcome. A model was fit with all covariates found to be significantly associated with the outcome in bivariate analyses and others included for a priori reasons. Collinearity, interaction, and confounding assessments were performed on all covariates and potential interaction terms to determine the model used in final analysis. The final model was fit using multivariate logistic regression. A goodness-of-fit test using a Hosmer and Lemeshow methodology was performed and a receiver operating characteristic (ROC) curve was produced to assess the final model's fit and measure of separability. Individuals who were missing values on any variables included in the final model were excluded from analysis.

All statistical analyses were conducted at a significance level of alpha = 0.05.

This study was approved by the Institutional Review Boards at Emory University and the Georgia Department of Public Health.

Results

By linking the Georgia Cancer Registry and the Georgia HIV/AIDS Surveillance Registry, GDPH identified 342 individuals who had a diagnosis of DLBCL, Burkitt lymphoma, T-cell lymphoma, or plasmablastic lymphoma between 2004 and 2012 and who also had documented HIV-seropositivity and/or AIDS. Of these, there were 328 NHL patients who had a confirmed date of HIV diagnosis within 60 days of their cancer diagnosis or earlier (Figure 1).

Among the 328 NHL/HIV patients who met inclusion criteria, 202 (61.6%) received guideline-consistent care, 99 (30.1%) did not receive guideline-consistent care, and 27 (8.2%) were classified as indeterminate (Table I). Furthermore, 266 (81.1%) patients had been diagnosed and/or treated at a CoC-accredited program, and 62 (19.8%) were not. About half (54.3%) received an initial diagnosis between 2004 – 2008, and half (45.7%), between 2009 – 2012, indicating the average number of diagnoses remained consistent throughout the study period.

The majority of study participants were male (82.3%), black/African American (64.0%), and resided in metropolitan areas at the time of their NHL diagnosis (91.2%), with an average age of 42.6 years. Approximately half had a form of government health insurance (50.2%), 33.0% had private/other insurance, and 16.8% of patients were uninsured. Male-MSM was the leading HIV-transmission-sex category (44.2%).

Roughly two-thirds (66.1%) of patients were diagnosed with NHL-subtype DLBCL, followed by Burkitt lymphoma (24.4%), peripheral T-cell lymphoma (5.5%), and plasmablastic lymphoma (4.0%). Half (51.2%) had the presence of B symptoms, and

61.9% of patients had a Charlson-Deyo comorbidity score of 0 (after the removal of HIV-related codes), indicating that most patients had no other comorbidities at the time of their NHL diagnosis. Most patients were diagnosed at an advanced Ann Arbor stage of NHL (17.3% at stage III and 44.7% at stage IV) and classified as having nodal disease (64.0%), rather than extranodal disease (36.0%).

After excluding those who had a guideline-consistent care classification of "indeterminate", 301 patients were used in bivariate analyses (Table II). We determined that receipt of guideline-consistent care was positively and significantly associated with late Ann Arbor stage (III or IV) (OR = 2.37), non-DLBCL NHL-subtype (OR = 2.31), having private insurance at the time of cancer diagnosis (OR = 2.18), male-MSM HIV-transmission-sex category (OR=2.47), and year of NHL diagnosis between 2009 – 2012 (OR = 1.67). Extranodal (vs. nodal) disease was negatively and significantly associated with the outcome (OR = 0.36). Being of black or African American race was negatively associated with receipt of guideline-consistent care; however, this result was borderline significant (p = 0.07). Without controlling for other factors, we determined that receipt of guideline-consistent care among NHL patients with HIV who were either diagnosed and/or treated at a CoC-accredited program did not significantly differ from those who were diagnosed and/or treated at a non-CoC-accredited program (p = 0.62). Living in a metropolitan area was negatively associated with receipt of guideline-consistent care, but this result was not statistically significant (p = 0.82). All other clinical and sociodemographic characteristics were not significantly associated with the outcome.

Following a collinearity, interaction, and confounding assessment of all covariates found to be significantly associated with the outcome in bivariate analyses and those included for

a priori reasons, a multivariate logistic regression model was fit using 280 patients, representing 85.4% of the total sample (Table III). After adjusting for Ann Arbor Stage, insurance type, nodal type, HIV transmission-sex category, race, and year of diagnosis, we determined that receipt of guideline-consistent care among NHL patients with HIV who were either diagnosed and/or treated at a CoC-accredited program did not significantly differ from those who were diagnosed and/or treated at a non-CoC-accredited program ($p = 0.60$). A sensitivity analysis was conducted to determine if this relationship differed when B symptoms and Charlson-Deyo co-morbidity score were include in the final model; their inclusion did not change the null results.

Using a Hosmer and Lemeshow test for goodness of fit, it was determined that the final model used in analysis had no evidence of poor fit ($p = 0.74$). Using the same model, a ROC curve was produced, resulting in an area under the curve measurement, or C-statistic, of 0.73. This suggests the model performs with an acceptable degree of discrimination.

Discussion

Many cancer care providers and patients seeking cancer treatment use accreditation status as an indication of quality care when determining where to refer and receive treatment, and it is likely additional attention is given to treatment decisions if the cancer patient also has HIV (27, 36, 37). The CoC demonstrates their commitment to improving cancer care and patient outcomes through prevention, research, education, monitoring, and by setting 36 standards that promote patient-centered care that a facility must meet in order to qualify for and maintain accreditation status (25, 26). Hospitals often use accreditation to promote the principle that adherence to standards set in place by accrediting body translates to

higher quality healthcare services, and, therefore, improved patient care and outcomes; however, research investigating this claim is inconsistent.

By using data from 3 sources, the GA Cancer Registry, GA HIV/AIDS Surveillance Registry, and GA Hospital Discharge Database, we examined the association between Commission on Cancer accreditation and receiving guideline-consistent care among non-Hodgkin lymphoma patients with HIV. We determined that, in both bivariate and multivariate analyses among NHL patients with HIV, diagnosis and/or treatment at a CoC-accredited program was not significantly associated with receipt of guideline-consistent care. This indicates that, in GA, NHL/HIV patients are being handled similarly in terms of receiving guideline-consistent care across facilities, regardless of CoC accreditation status.

These null results echo findings of previous studies that also found no association between quality indicators, including standard of care, and accreditation status (33, 40, 46, 48-50).

We also investigated the relationship between guideline-consistent care and other clinical, biological, and sociodemographic factors. Discovered significant associations were consistent with previous studies; however, this study was the first to investigate rural-urban classification as a determinant of guideline-consistent care among NHL/HIV patients (18, 23, 65). We found that there was no significant difference between rural and urban patients regarding receipt of guideline-consistent care in this population. These results are comparable to studies conducted on other cancer populations (59-61).

Strengths

This study demonstrates how three population-based data sources that are readily available in all US states can be linked to evaluate cancer care delivered to patients who are also HIV

positive. Additionally, this study is the first, to the best of our knowledge, to explore the association between receipt of guideline-consistent care and rural-urban classification.

Limitations

This study had several limitations. The sample sizes used in bivariate (n = 301) and multivariate (n = 280) analyses were substantial; however, variation across multiple levels of some predictors, including the main exposure and rural-urban classification, was extremely limited. Null results may be due to insufficient power to detect possible true associations. The rural-urban classification codes used to develop our related variable were developed in 2013, and they might not reflect the rural-urban statuses of counties during our study period. Additionally, most of the NHL diagnosis years included in this study were prior to rollout of the Affordable Care Act. It is unknown how this could impact results, and generalizing these findings to later years should be done with caution.

This study also did not take into consideration CD4 count, viral load, or structural characteristics of facilities, which are factors that have been shown to affect receipt of care (23, 38). Their exclusion from this analysis might affect the measures observed.

Lastly, patients who did not receive treatment for any reason, whether it was attributed to not being an eligible candidate for treatment, patient death, refusal by the patient or respective guardian, or inappropriate decision on behalf of the patient's physician, were coded as not having received treatment at an CoC-accredited facility. We were unable to differentiate these patients in analysis, which could have impacted the observed results.

Conclusion

We observed no differences in receipt of guideline-consistent care by CoC accreditation status among these NHL patients with HIV, and to our knowledge, this study was the first to assess this association. Additional research should be conducted to establish the relationship between CoC standards and quality indicators to determine if they truly equate to enhanced patient care and outcomes or if they more accurately reflect other differences between CoC and non-CoC facilities, such as structural and patient demographic distinctions. Additionally, research pertaining to patients with both cancer and HIV is limited. As cancer patients with HIV substantially differ from those without HIV, more research is needed to ensure they receive the highest quality care possible.

References

1. What Is Non-Hodgkin Lymphoma? (https://www.cancer.org/cancer/non-hodgkin-lymphoma/about/what-is-non-hodgkin-lymphoma.html). (Accessed March 15, 2019).
2. Surveillance E, and End Results Program. Cancer Stat Facts: Non-Hodgkin Lymphom. (https://seer.cancer.gov/statfacts/html/nhl.html). (Accessed March 15, 2019).
3. Society AC. Non-Hodgkin lymphoma. (https://cancerstatisticscenter.cancer.org/?_ga=2.100994241.1722456025.1552412249-383928244.1552412249#!/cancer-site/Non-Hodgkin%20lymphoma). (Accessed March 15, 2019).
4. Thompson AE. The Immune SystemThe Immune SystemJAMA Patient Page. *JAMA* 2015;313(16):1686-.
5. Clinic M. Non-Hodgkin's lymphoma. (https://www.mayoclinic.org/diseases-conditions/non-hodgkins-lymphoma/symptoms-causes/syc-20375680). (Accessed March 15, 2019).
6. Prevention CfDCa. HIV Surveillance Report. 2017.
7. Hall HI, Song R, Tang T, et al. HIV Trends in the United States: Diagnoses and Estimated Incidence. *JMIR public health and surveillance* 2017;3(1):e8-e.
8. Prevention CfDCa. HIV/AIDS. (https://www.cdc.gov/hiv/basics/whatishiv.html). (Accessed March 15, 2019).
9. HIV.gov. Symptoms of HIV. (https://www.hiv.gov/hiv-basics/overview/about-hiv-and-aids/symptoms-of-hiv). (Accessed March 15, 2019).

10. Patel P, Borkowf CB, Brooks JT, et al. Estimating per-act HIV transmission risk: a systematic review. *AIDS (London, England)* 2014;28(10):1509-19.

11. Services UDoHaH. HIV Treatment. (https://aidsinfo.nih.gov/understanding-hiv-aids/fact-sheets/21/51/hiv-treatment--the-basics). (Accessed March 15, 2019).

12. Coquet I, Pavie J, Palmer P, et al. Survival trends in critically ill HIV-infected patients in the highly active antiretroviral therapy era. *Critical care (London, England)* 2010;14(3):R107-R.

13. Irvine MK, Chamberlin SA, Robbins RS, et al. Improvements in HIV care engagement and viral load suppression following enrollment in a comprehensive HIV care coordination program. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America* 2015;60(2):298-310.

14. Rihana N, Nanjappa S, Sullivan C, et al. Malignancy Trends in HIV-Infected Patients Over the Past 10 Years in a Single-Center Retrospective Observational Study in the United States. *Cancer control : journal of the Moffitt Cancer Center* 2018;25(1):1073274818797955-.

15. Prevention CfDCa. AIDS-Defining Conditions. *MMWR*, December 5, 2008.

16. Gibson TM, Morton LM, Shiels MS, et al. Risk of non-Hodgkin lymphoma subtypes in HIV-infected people during the HAART era: a population-based study. *AIDS (London, England)* 2014;28(15):2313-8.

17. Han X, Jemal A, Hulland E, et al. HIV Infection and Survival of Lymphoma Patients in the Era of Highly Active Antiretroviral Therapy. *Cancer Epidemiology Biomarkers & Prevention* 2017;26(3):303.

18. Suneja G, Shiels MS, Angulo R, et al. Cancer treatment disparities in HIV-infected individuals in the United States. *Journal of clinical oncology : official journal of the American Society of Clinical Oncology* 2014;32(22):2344-50.

19. Biggar RJ, Engels EA, Ly S, et al. Survival After Cancer Diagnosis in Persons With AIDS. *JAIDS Journal of Acquired Immune Deficiency Syndromes* 2005;39(3).

20. Persad GC, Little RF, Grady C. Including Persons With HIV Infection in Cancer Clinical Trials. *Journal of Clinical Oncology* 2008;26(7):1027-32.

21. Ratner L, Lee J, Tang S, et al. Chemotherapy for Human Immunodeficiency Virus–Associated Non-Hodgkin's Lymphoma in Combination With Highly Active Antiretroviral Therapy. *Journal of Clinical Oncology* 2001;19(8):2171-8.

22. Network NCC. NCCN Clinical Practice Guidelines in ONcology: Non-Hodgkin's Lymphomas. 2015.

23. Joseph Lipscomb JMS, Christopher R. Flowers, Theresa W. Gillespie, Pascale Wortley, A. Rana Bayakly, Lyn Almon, Kevin C. Ward. Clinical and Sociodemographic Predictors of Standard-of-Care Therapy for Non-Hodgkin Lymphoma Patients with an HIV Diagnosis: A Population-based Investigation in Georgia. *TBD* 2019.

24. Quality AfHRa. AHRQ Quality Indicators. (https://www.qualityindicators.ahrq.gov/). (Accessed March 16, 2019).

25. Surgeons ACo. Commission on Cancer. (https://www.facs.org/quality-programs/cancer/coc). (Accessed March 15, 2019).

26. Cancer Co. Cancer Program Standards: Ensuring Patient-Centered Care Manual. 2016.

27. Surgeons ACo. Commission on Cancer: Value and Benefits of Accreditation. (https://www.facs.org/quality-programs/cancer/coc/apply/benefitscoc). (Accessed March 15, 2019).

28. Bilimoria KY, Stewart AK, Winchester DP, et al. The National Cancer Data Base: a powerful initiative to improve cancer care in the United States. *Annals of surgical oncology* 2008;15(3):683-90.

29. Knutson AC, McNamara EJ, McKellar DP, et al. The role of the American College of Surgeons' cancer program accreditation in influencing oncologic outcomes. *Journal of Surgical Oncology* 2014;110(5):611-5.

30. Surgeons ACo. Commission on Cancer: Accreditation Survey Process. (https://www.facs.org/quality-programs/cancer/coc/apply/how). (Accessed March 15, 2019).

31. Hebert L. CoC Accreditation—Benefits for Patients and Families. *Journal of Ahima* Jan 1, 2016.

32. Antunez AG, Kanters AE, Regenbogen SE. Evaluation of Access to Hospitals Most Ready to Achieve National Accreditation for Rectal Cancer TreatmentEvaluation of Access to Hospitals Most Ready to Achieve National Accreditation for Rectal CancerEvaluation of Access to Hospitals Most Ready to Achieve National Accreditation for Rectal Cancer. 2019.

33. Braithwaite J, Greenfield D. Health sector accreditation research: a systematic review. *International Journal for Quality in Health Care* 2008;20(3):172-83.

34. Institute NC. NCI-Designated Cancer Centers. (https://www.cancer.gov/research/nci-role/cancer-centers). (Accessed March 15, 2019).

35. Bilimoria KY, Bentrem DJ, Stewart AK, et al. Comparison of Commission on Cancer–Approved and –Nonapproved Hospitals in the United States: Implications for Studies That Use the National Cancer Data Base. *Journal of Clinical Oncology* 2009;27(25):4177-81.

36. Dudley RA, Johansen KL, Brand R, et al. Selective Referral to High-Volume HospitalsEstimating Potentially Avoidable Deaths. *JAMA* 2000;283(9):1159-66.

37. Hollenbeck BK, Dunn RL, Miller DC, et al. Volume-Based Referral for Cancer Surgery: Informing the Debate. *Journal of Clinical Oncology* 2006;25(1):91-6.

38. Merkow RP, Chung JW, Paruch JL, et al. Relationship Between Cancer Center Accreditation and Performance on Publicly Reported Quality Measures. *Annals of Surgery* 2014;259(6).

39. Samson ME, Porter NG, Hurley DM, et al. Disparities in Breast Cancer Incidence, Mortality, and Quality of Care among African American and European American Women in South Carolina. *Southern medical journal* 2016;109(1):24-30.

40. Miller ME, Bleicher RJ, Kaufman CS, et al. Impact of Breast Center Accreditation on Compliance with Breast Quality Performance Measures at Commission on Cancer-Accredited Centers. *Annals of Surgical Oncology* 2019.

41. Berger ER, Wang CE, Kaufman CS, et al. National Accreditation Program for Breast Centers Demonstrates Improved Compliance with Post-Mastectomy

Radiation Therapy Quality Measure. *Journal of the American College of Surgeons* 2017;224(3):236-44.

42. Shulman LN, Palis BE, McCabe R, et al. Survival As a Quality Metric of Cancer Care: Use of the National Cancer Data Base to Assess Hospital Performance. *Journal of Oncology Practice* 2017;14(1):e59-e72.

43. Birkmeyer NJO, Goodney PP, Stukel TA, et al. Do cancer centers designated by the National Cancer Institute have better surgical outcomes? *Cancer* 2005;103(3):435-41.

44. Telem DA, Talamini M, Altieri M, et al. The effect of national hospital accreditation in bariatric surgery on perioperative outcomes and long-term mortality. *Surgery for Obesity and Related Diseases* 2015;11(4):749-57.

45. Merkow RP, Bentrem DJ, Chung JW, et al. Differences in Patients, Surgical Complexity, and Outcomes After Cancer Surgery at National Cancer Institute-designated Cancer Centers Compared to Other Hospitals. *Medical Care* 2013;51(7).

46. David EA, Cooke DT, Chen Y, et al. Surgery in high-volume hospitals not commission on cancer accreditation leads to increased cancer-specific survival for early-stage lung cancer. *American journal of surgery* 2015;210(4):643-7.

47. Kiernan CM, Whiteside MA, Solorzano CC. Cancer Registries: Can We Improve the Quality of Thyroid Cancer Data? *Annals of Surgical Oncology* 2017;24(5):1202-7.

48. Braithwaite J, Greenfield D, Westbrook J, et al. Health service accreditation as a predictor of clinical and organisational performance: a blinded, random, stratified study. *Quality and Safety in Health Care* 2010;19(1):14.

49. Lynn J. Lessons From the End of Life in the Program of All-Inclusive Care of the Elderly. *Medical Care* 2002;40(12).

50. Alkhenizan A, Shaw C. Impact of accreditation on the quality of healthcare services: a systematic review of the literature. *Annals of Saudi medicine* 2011;31(4):407-16.

51. Miller MR, Pronovost P, Donithan M, et al. Relationship Between Performance Measurement and Accreditation: Implications for Quality of Care and Patient Safety. *American Journal of Medical Quality* 2005;20(5):239-52.

52. Standards TACoH. What is Accreditation? (https://www.achs.org.au/about-us/what-we-do/what-is-accreditation/). (Accessed March 15, 2019).

53. Jemal A, Ward E, Wu X, et al. Geographic Patterns of Prostate Cancer Mortality and Variations in Access to Medical Care in the United States. *Cancer Epidemiology Biomarkers & Prevention* 2005;14(3):590.

54. Shugarman LR, Sorbero MES, Tian H, et al. An exploration of urban and rural differences in lung cancer survival among medicare beneficiaries. *American journal of public health* 2008;98(7):1280-7.

55. Liff J, Chow WH, Greenberg R. *Rural-urban differences in stage at diagnosis. Possible relationship to cancer screening*. 1991.

56. Campbell NC, Elliott AM, Sharp L, et al. Rural and urban differences in stage at diagnosis of colorectal and lung cancers. *British journal of cancer* 2001;84(7):910-4.

57. Service NCRaA. The effect of rurality on cancer incidence and mortality. 2010.

58. Keim-Malpass J, Mitchell EM, Blackhall L, et al. Evaluating Stakeholder-Identified Barriers in Accessing Palliative Care at an NCI-Designated Cancer Center with a Rural Catchment Area. *Journal of Palliative Medicine* 2015;18(7):634-7.

59. MacKinnon JA, Duncan RC, Huang Y, et al. Detecting an Association between Socioeconomic Status and Late Stage Breast Cancer Using Spatial Analysis and Area-Based Measures. *Cancer Epidemiology Biomarkers & Prevention* 2007;16(4):756.

60. McLafferty S, Wang F. Rural reversal? Rural-urban disparities in late-stage cancer risk in Illinois. *Cancer* 2009;115(12):2755-64.

61. Bradley C, Given C, Roberts C. *Race, Socioeconomic Status, and Breast Cancer Treatment and Survival*. 2002.

62. Blair SL, Sadler GR, Bristol R, et al. Early cancer detection among rural and urban Californians. *BMC public health* 2006;6:194-.

63. Kinney AY, Harrell J, Slattery M, et al. Rural-Urban Differences in Colon Cancer Risk in Blacks and Whites: The North Carolina Colon Cancer Study. *The Journal of Rural Health* 2006;22(2):124-30.

64. Parikh-Patel A, Bates JH, Campleman S. Colorectal cancer stage at diagnosis by socioeconomic and urban/rural status in California, 1988–2000. *Cancer* 2006;107(S5):1189-95.

65. Gita Suneja MD MCCLPEPSPXHPEAEMAJP. Disparities in cancer treatment among patients infected with the human immunodeficiency virus. *Cancer* 2016;122(15):2399-407.

66. SAS/ACCESS® 9.4 Cary, NC: SAS Institute Inc: SAS Institute Inc 2013.

67. Argriculture USDo. Rural-Urban Communting Area Codes. (https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes/). (Accessed March 17, 2019).

Tables

Table I. Demographic characteristics of Non-Hodgkin Lymphoma-HIV-positive patients in Georgia, 2004-2012[a]

Characteristic	Total (n=328)	Guideline care[b] (n=202)	Non-guideline care (n=99)	Indeterminate (n=27)
Patient diagnosis or treatment at Commission on Cancer (CoC)-accredited program[cd]				
Yes	266 (81.1%)	166 (82.2%)	79 (79.8%)	21 (77.8%)
No	62 (18.9%)	36 (17.8%)	20(20.2%)	6 (22.2%)
Patient diagnosis at CoC-accredited program				
Yes	250 (76.2%)	152 (75.2)	79 (79.8%)	19 (70.4%)
No	78 (23.8%)	50 (24.8)	20 (20.2%)	8 (29.6%)
Age (years)[e*]	42.6 (9.2)	42. 1 (9.0)	43.3 (9.5)	43.3 (9.3)
Ann Arbor Stage[*]				
I	75 (23.2%)	31 (15.5%)	37 (37.8%)	7 (26.9%)
II	48 (14.8%)	30 (15.0%)	13 (13.3%)	5 (19.2%)
III	56 (17.3%)	>40 (>20.0%)	12 (12.2%)	<5 (<19.2%)
IV	145 (44.7%)	>90 (>45%)	36 (36.7%)	>10 (>37.0%)
Missing	4	2	1	1
B symptoms[f*]				
Yes	143 (51.2%)	95 (52.8%)	42 (54.6%)	6 (27.3%)
No	136 (48.8%)	85 (47.2%)	35 (45.4%)	16 (72.7%)
Missing	49	23	23	5
Charlson co-morbidity score[g*]				
0	133 (61.9%)	71 (64.0%)	51 (60.0%)	11 (57.9%)
≥1	82 (38.1%)	40 (36.0%)	34 (40.0%)	8 (42.1%)
Missing	113	90	15	8
Histology[*]				
DLBCL	217 (66.1%)	119 (59.9%)	>75 (>75.8%)	>20 (>74.1%)
Burkitt lymphoma	80 (24.4%)	>60 (>29.7%)	12 (12.1%)	<5 (<18.5%)
Plasmablastic lymphoma	13 (4.0%)	11 (5.5%)	<5 (<5.1%)	<5 (<18.5%)
T-cell lymphoma	18 (5.5%)	>5 (>2.5%)	9 (9.1%)	<5 (<18.5%)
HIV transmission-sex category				
Male-MSM	145 (44.2%)	107 (53.0%)	31 (31.3%)	7 (25.9%)
Male-non-MSM	125 (38.1%)	59 (29.2%)	53 (53.5%)	13 (48.2%)

Female	58 (17.7%)	36 (17.8%)	15 (15.2%)	7 (25.9%)
Insurance*				
Not insured	52 (16.8%)	>25 (>13.1%)	20 (21.8%)	<5 (<19.2%)
Private/other insurance	102 (33.0%)	71 (37.2%)	21 (22.8%)	10 (38.5%)
Government insurance (Medicaid, Medicare, Tricare, military, etc)	155 (50.2%)	>80 (>41.9%)	51 (55.4%)	>10 (>38.5%)
Missing	19	11	7	1
Nodal type*				
Nodal	210 (64.0%)	146 (72.3%)	48 (48.5%)	16 (59.3%)
Extranodal	118 (36.0%)	56 (27.7%)	51 (51.5%)	11 (40.7%)
Race				
White/American Indian/Alaska Native/Asian	118 (36.0)	83 (41.1%)	30 (30.3%)	5 (18.5%)
Black or African American	210 (64.0%)	119 (58.9%)	69 (69.7%)	22 (81.5%)
Rural-Urban classification*				
Metropolitan	299 (91.2%)	>175 (>86.6%)	90 (90.9%)	>20 (>74.1%)
Non-metropolitan	29 (8.8%)	>10 (>5.0%)	9 (9.1%)	<5 (<18.5%)
Sex				
Female	58 (17.7%)	36 (17.8%)	15 (15.2%)	7 (25.9%)
Male	270 (82.3%)	166 (82.2%)	84 (84.8%)	20 (74.1%)
Year of diagnosis				
2004-2008	178 (54.3%)	99 (49.0%)	61 (61.6%)	18 (66.7%)
2009-2012	150 (45.7%)	103 (51.0%)	38 (38.4%)	9 (33.3%)

[a.] The Georgia Department of Public Health linked data from the Georgia Cancer Registry and the Georgia HIV/AIDS Surveillance Registry to identify all individuals with a Non-Hodgkin Lymphoma diagnosis during 2004-2012 who also had a diagnosis of HIV and/or AIDS on record during any portion of this period.
[b.] Guideline-consistent care was defined as a patient having receipt of multiagent chemotherapy for the listed NHL subtypes.
[c.] Accredited by the Commission on Cancer during the total study period.
[d.] Categorical variables are reported as n (%). Percentages do not include missing values. Cells with <5 observations have been suppressed for confidentiality.
[e.] Continuous variables are reported as mean (standard deviation).
[f.] B-symptoms include: fever, night sweats, and weight loss.
[g.] The Charlson Comorbidity Index is a method of categorizing comorbidities of patients based on the International Classification of Diseases (ICD) diagnosis codes. A score of zero indicates that no comorbidities were found.
* Variable measured at time of NHL diagnosis

Table II. Unadjusted associations of receipt of guideline-consistent care among Non-Hodgkin Lymphoma-HIV-positive patients in Georgia, 2004-2012[a]

Characteristic	Total (n=301)	Guideline consistent[b] (n=202)	Non-guideline consistent (n=99)	OR	Lower 95% CI	Upper 95%CI	p-value
Patient diagnosis or treatment at Commission on Cancer (CoC)-accredited program[c]							
Yes	245	166	79	1.17	0.64	2.15	0.620
No	56	36	20	Ref			
Patient diagnosis at CoC-accredited program							
Yes	231	152	79	0.77	0.43	1.38	0.380
No	70	50	20	Ref			
Age (years)[*]	302	202	99	0.99	0.96	1.01	0.280
Ann Arbor Stage[*]							
III/IV	187	139	48	2.37	1.44	3.90	0.001
I/II	111	61	50	Ref			
Missing	3	2	1	-	-	-	-
B symptoms[d*]							
Yes	137	95	42	0.93	0.55	1.59	0.795
No	120	85	35	Ref			
Missing	44	22	22	-	-	-	-
Charlson co-morbidity score[e*]							
≥1	74	40	34	0.85	0.47	1.51	0.571
0	122	71	51	Ref			
Missing	105	91	14	-	-	-	-
Histology[*]							
Non-DLBCL	106	83	23	2.31	1.34	3.97	0.003
DLBCL	195	119	76	Ref			
Insurance[*]							
Private/other insurance	92	71	21	2.18	1.03	4.59	0.040
Government insurance (Medicaid, Medicare, Tricare, military, etc)	140	89	51	1.13	0.58	2.18	0.720
Not insured	51	31	20	Ref			
Missing	18	11	7	-	-	-	-
Nodal type[*]							

Extranodal	107	56	51	0.36	0.22	0.60	<0.0001
Nodal	194	146	48	Ref			
Race							
Black or African American	188	119	69	0.62	0.37	1.04	0.071
Other	113	83	30	Ref			
Rural-Urban classification*							
Metropolitan	299	182	90	0.91	0.40	2.08	0.823
Non-metropolitan	29	20	9	Ref			
Sex							
Male	250	116	84	0.82	0.43	1.59	0.562
Female	51	36	15	Ref			
Sex-HIV-transmission category							
Male-MSM	138	107	31	2.47	1.49	4.10	0.001
Male-non-MSM/Female	163	95	68	Ref			
Year of diagnosis							
2009-2012	141	103	38	1.67	1.02	2.73	0.040
2004-2008	160	99	61	Ref			

[a.] The Georgia Department of Public Health linked data from the Georgia Cancer Registry and the Georgia HIV/AIDS Surveillance Registry to identify all individuals with a Non-Hodgkin Lymphoma diagnosis during 2004-2012 who also had a diagnosis of HIV and/or AIDS on record during any portion of this period.
[b.] Guideline-consistent care was defined as a patient having receipt of multiagent chemotherapy for the listed NHL subtypes.
[c.] Accredited by the Commission on Cancer during the total study period.
[d.] B-symptoms include: fever, night sweats, and weight loss.
[e.] The Charlson Comorbidity Index is a method of categorizing comorbidities of patients based on the International Classification of Diseases (ICD) diagnosis codes. A score of zero indicates that no comorbidities were found.
* Variable measured at time of NHL diagnosis

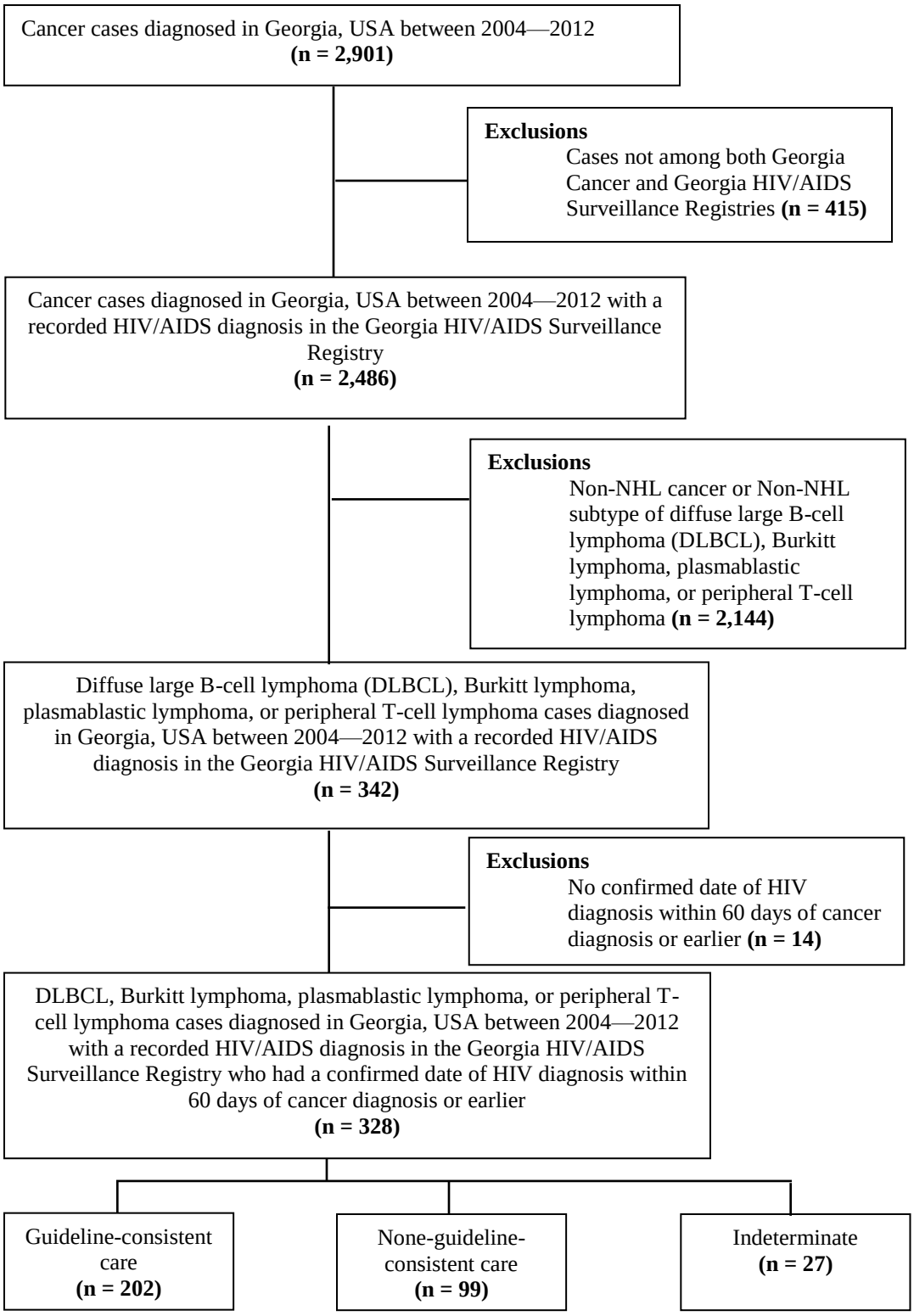
Table III. Adjusted associations of receipt of guideline-consistent care among Non-Hodgkin Lymphoma-HIV-positive patients in Georgia, 2004-2012[a]

Characteristic	Total (n=280)	Guideline consistent[b] (n=189)	Non-guideline consistent (n=91)	OR	Lower 95% CI	Upper 95% CI	P-value
Patient diagnosis or treatment at Commission on Cancer (CoC)-accredited program[c]							
Yes	229	157	72	1.21	0.60	2.44	0.602
No	51	32	19	Ref			
Ann Arbor Stage*							
III/IV	181	135	46	1.98	1.10	3.56	0.023
I/II	99	54	45	Ref			
Insurance*							
Private/other insurance	91	70	21	2.53	1.10	5.85	0.030
Government insurance (Medicaid, Medicare, Tricare, military, etc)	138	88	50	1.32	0.62	2.79	0.470
Not insured	51	31	20	Ref			
Nodal type*							
Extranodal	101	52	49	0.39	0.22	0.70	0.002
Nodal	179	137	42	Ref			
Sex-HIV transmission category							
Male-MSM	124	98	26	2.68	1.48	4.85	0.001
Male-non-MSM/Female	156	91	65	Ref			
Race							
Black or African American	179	113	66	0.86	0.46	1.61	0.642
Other	101	76	25	Ref			
Year of diagnosis							
2009-2012	140	103	37	1.83	1.03	3.23	0.039
2004-2008	140	86	54	Ref			

[a.] The Georgia Department of Public Health linked data from the Georgia Cancer Registry and the Georgia HIV/AIDS Surveillance Registry to identify all individuals with a Non-Hodgkin Lymphoma diagnosis during 2004-2012 who also had a diagnosis of HIV and/or AIDS on record during any portion of this period.
[b.] Guideline-consistent care was defined as a patient having receipt of multiagent chemotherapy for the listed NHL subtypes.
[c.] Accredited by the Commission on Cancer during the total study period.
* Variable measured at time of NHL diagnosis

Figure

Figure 1. Determination of Study Population



CHAPTER III: POSSIBLE FUTURE DIRECTIONS

The results of this study contribute to the exceptionally limited amount of research available on Non-Hodgkin lymphoma patients with HIV.

We did not find an association between CoC accreditation status and receipt of guideline-consistent care, and our study was the first, to our knowledge, to investigate this association among NHL/HIV patients. This indicates that, in GA, NHL/HIV patients are being handled similarly in terms of receiving guideline-consistent care across facilities, regardless of CoC accreditation status. Additional research should be conducted to establish the relationship between CoC standards and quality indicators to determine if they truly equate to enhanced patient care and outcomes or if they more accurately reflect other differences between CoC and non-CoC facilities, such as structural and patient demographic distinctions.

We also did not find an association between rural-urban classification and receipt of guideline-consistent care. However, only 29 (8.8%) patients from the total sample were classified as living in non-metropolitan areas at the time of their NHL diagnosis. It is possible that the Georgia HIV/AIDS Surveillance Registry is underreporting in rural areas, resulting in potential rural-NHL cases who are not linked in our combined dataset. It could be beneficial to improve surveillance measures to expand the capture of cases in rural areas and to perform HIV-related word searches in cancer datasets to locate any HIV cases missed during data linkage.

This study examined a very specific population in the state of Georgia. The three population-based data sources used are readily available in every state. This type of analysis could be repeated to determine its validity and extended to include additional cancer types to evaluate cancer care delivery to patients who are also HIV positive in other states. Additionally, these findings could be expanded to investigate differences in survival,

both disease-specific and overall, by receipt of guideline-consistent care among NHL/HIV patients.

Unlike cancer patients without HIV, there is an absence of evidence-based treatment guidelines for most types of cancer patients with HIV, due partly to HIV-positive patients being excluded from cancer clinical trials. There is need for clinical trial research and studies that examine detailed clinical data on patient HIV status and cancer diagnosis and treatment to develop more clinically-detailed predictors of quality of care, patient outcomes, and survival. As cancer patients with HIV substantially differ from those without HIV, more research is needed to ensure they receive the highest quality care possible.

Appendix

EMORY UNIVERSITY | Institutional Review Board

TO: Joseph Lipscomb, M.D.
Principal Investigator
*SPH: Health Policy and Mngmnt

DATE: May 23, 2018

RE: **Continuing Review Expedited Approval**
CR4_IRB00075284

IRB00075284
Linking State Level Data on Cancer and HIV/AIDS to Study Patient Care and Outcomes

Thank you for submitting a renewal application for this protocol. The Emory IRB reviewed it by the expedited process on **May 23, 2018**, per 45 CFR 46.110, the Federal Register expeditable category F5, and/or 21 CFR 56.110. This reapproval is effective from **May 23, 2018**, through May 22, 2019. Thereafter, the continuation of human subjects research activities requires the submission of another renewal application, which must be reviewed and approved by the IRB prior to the expiration date noted above. Please note carefully the following items with respect to this reapproval:

- Protocol Document
  - CFAR IRB Protocol

Any reportable events (e.g., unanticipated problems involving risk to subjects or others, noncompliance, breaches of confidentiality, HIPAA violations, protocol deviations) must be reported to the IRB according to our Policies & Procedures at www.irb.emory.edu, immediately, promptly, or periodically. Be sure to check the reporting guidance and contact us if you have questions. Terms and conditions of sponsors, if any, also apply to reporting.

Before implementing any change to this protocol (including but not limited to sample size, informed consent, and study design), you must submit an amendment request and secure IRB approval.

In future correspondence about this matter, please refer to the IRB file ID, name of the Principal Investigator, and study title. Thank you.

Sincerely,

Clarissa Dupree, BS
QA and Education Analyst Assistant
This letter has been digitally signed

CC: Chociemski Toni *SPH: Health Policy and Mngmnt

Gillespie Theresa *SOM: Surgery: Admin DeptApproval