Oral Oncology 83 (2018) 107–114

Contents lists available at ScienceDirect

Oral Oncology

journal homepage: www.elsevier.com/locate/oraloncology

Emergency department visits and unplanned hospitalizations in the treatment period for head and neck cancer patients treated with curative intent: A population-based analysis

A. Eskander[a,b,c], M.K. Krzyzanowska[c,d,e], H.D. Fischer[c], N. Liu[c], P.C. Austin[c], J.C. Irish[a,f,g], D.J. Enepekides[a,b,g], J. Lee[h], E. Gutierrez[g], E. Lockhart[g], M. Raphael[d], S. Singh[c,d,g,*]

[a] University of Toronto, Department of Otolaryngology - Head & Neck Surgery, Canada
[b] Department of Surgical Oncology, Odette Cancer Centre, Sunnybrook Health Sciences Centre, Canada
[c] Institute for Clinical Evaluative Sciences, Canada
[d] Division of Medical Oncology, Department of Medicine, University of Toronto, Canada
[e] Division of Medical Oncology & Hematology, Princess Margaret Cancer Centre, University Health Network, Canada
[f] Department of Surgical Oncology, Princess Margaret Hospital, University Health Network, Canada
[g] Cancer Care Ontario, Canada
[h] Department of Radiation Oncology, Odette Cancer Centre, Sunnybrook Health Sciences Centre, Canada

ARTICLE INFO

Keywords:
Head and neck cancer
Readmission
Hospitalization
Adverse events
Emergency department quality of care
Quality metrics

ABSTRACT

Background: Mucosal head and neck squamous cell cancers are often managed with multimodality treatment which can be associated with significant toxicity. The objective of this study was to assess emergency department visits and unplanned hospitalizations for these patients during and immediately after their treatment.

Methods: A cohort of patients treated for head and neck squamous cell carcinoma was developed using administrative data. Emergency department visits and hospitalizations in the 90-day post-treatment period was determined. If a second treatment was initiated prior to the completion of 90 days, the attributable risk period was changed to the second treatment.

Results: Cohort of 3898 patients (1312 larynx/hypopharynx; 2586 oral cavity/oropharynx) from 2008 to 2012. The number of unplanned hospitalizations or ED visits (per 100 patient days) were 0.69 for surgery, 0.78 for surgery followed by concurrent chemoradiotherapy (CCRT), 0.55 for surgery followed by radiotherapy, 0.86 for CCRT, and 0.50 for radiation. Patients receiving CCRT had a statistically higher likelihood of treatment period events. The larynx/hypopharynx cancer subsite, higher comorbidity and more advanced stage of disease were all independent predictors of events.

Conclusions: Patients undergoing treatment for head and neck cancer have significant unplanned hospitalizations and visits to the emergency department in the treatment period. Rates are higher in patients receiving CCRT. Quality improvement interventions should be used to improve these rates.

Introduction

With the epidemic rise in the incidence of head and neck cancers, particularly HPV-related oropharyngeal squamous cell carcinoma [1,2], and a growing elderly population which is more susceptible to head and neck cancers [2], more patients will require treatment in an already strained healthcare environment. Since the Institute of Medicine 'Quality Chiasm' report in 2001 many health care systems are dedicated to a process of ongoing quality improvement and to close the performance gap in areas where current state and ideal care are wide [3–5]. Healthcare quality has traditionally been studied using the Donabedian structure-process-outcome model [6]. The importance of structure measures, such as cancer center designation, health care provider and hospital case volume have been associated with improved outcomes [7]. In the province of Ontario, head and neck cancer services have been regionalized to nine centres based on better outcomes being achieved in higher volume centres [7]. An initial step after the implementation of regionalized care to high volume centres, is to

* Corresponding author at: Sunnybrook Health Sciences Centre, 2075 Bayview Ave., Room T2 047, Toronto, Ontario M4N 3M5, Canada.
E-mail addresses: antoine.eskander@mail.utoronto.ca (A. Eskander), monika.krzyzanowska@uhn.ca (M.K. Krzyzanowska), hadas.fischer@ices.on.ca (H.D. Fischer), ning-liu@ices.on.ca (N. Liu), peter.austin@ices.on.ca (P.C. Austin), jonathan.irish@uhn.ca (J.C. Irish), danny.enepekides@sunnybrook.ca (D.J. Enepekides), leejus@hhsc.ca (J. Lee), eric.gutierrez@cancercare.on.ca (E. Gutierrez), elizabeth.lockhart@cancercare.on.ca (E. Lockhart), mraphael@qmed.ca (M. Raphael), simron.singh@sunnybrook.ca (S. Singh).

https://doi.org/10.1016/j.oraloncology.2018.06.011
Received 8 January 2018; Received in revised form 10 June 2018; Accepted 13 June 2018

determine baseline measurements of key indicators to better characterize gaps in care [8]. Examination of the patient journey including emergency visits and hospitalizations during cancer treatment is a natural extension of this.

Patients with head and neck squamous cell carcinoma (HNSCC) are often elderly, with many comorbidities and historically have a high incidence of smoking and alcohol use [9]. HNSCC patients are often higher risk patients who require complex multi-disciplinary treatment to both extend their life while minimizing functional impairment, namely, speech, swallowing and airway function. Such cancers often require lengthy treatment including surgery, radiation, chemotherapy or a combination of these modalities depending on the stage at presentation. Morbidity associated with the treatment of HNSCC is well documented [10]. It is therefore not surprising that patients with HNSCC have been reported to have high levels of post-operative readmission (10–30%), unexpected hospitalizations and emergency department visits [2]. Few studies have evaluated factors associated with these readmissions, unexpected hospitilizations and ER visits in the HSNCC populations. Furthermore, little is known about the effect of treatment modality on these adverse outcomes. Better assessment of the factors associated with a higher risk of unplanned visits may lead to targeted interventions to help decrease these adverse outcomes thereby improving the patient experience during treatment of HNSCC.

The objectives of this study were to: (1) assess the rate of unplanned hospitalizations and emergency department visits in the treatment period for patients with HNSCC being treated with curative intent, (2) to assess whether the rate differed by primary treatment modality; and (3) to identify patient, clinical and treatment factors associated with higher rate of unplanned visits.

Methods

Cohort creation and data sources

Adult patients aged > 18 years, and diagnosed with malignancies of the oral cavity, oropharynx, larynx and hypopharynx between January 1, 2008 and December 31, 2012 in Ontario, Canada were included in the study. Patients were identified from the *Ontario Cancer Registry* (OCR) using ICD-9 diagnosis codes (oral cavity/oropharynx: 140.3, 140.4, 141, 143, 144, 145, 146 (except 146.4); larynx/hypopharynx: 146.4, 148, 161). The OCR has previously demonstrated 98% sensitivity in ascertaining overall cancer cases in the province of Ontario [11]. When examined to determinine the specificity of individual cancer sub-sites (eg oropharynx, oral cavity, larynx, hypopharyx) the OCR has been shown , to only identify these accurately in 91% of HNSCC primary cases [12]. Accordingly, we combined the oral cavity and oropharynx subsites and the larynx and hypopharynx subsites together for the purposes of our study.

Cancer care in Ontario, Canada is delivered via a single payer public health system. Ontario residents have access the Ontario Health Insurance Plan (OHIP) in a single payer healthcare system. Private care for HNSCC does not occur in the Ontario system so case capture is complete. The OCR was linked to the other databases to determine date and type of first treatment modality and subsequent adjuvant treatments. Head and neck cancer surgery, medical oncology and radiation oncology event codes have been previously outlined in an Institute for Clinical Evaluative Sciences (ICES) cancer atlas [2]. The *Canadian Institute for Health Information* Discharge Abstract Database (CIHI DAD) was used to identify date of surgery and discharge dates for surgery patients. For radiation therapy, we also used Cancer (ALR) Activity Level Reporting for radiation which provides further detail about first and last date of radiotherapy. Similarly, for date of first chemotherapy we used the earlier of either OHIP or ALR systemic therapy. A combination of NACRS; National Ambulatory Care Reporting System) and CIHI DAD were used to determine emergency department visits and unplanned hospitalizations. These datasets were linked using unique encoded identifiers and analyzed at the Institute for Clinical Evaluative Sciences (ICES).

Non-squamous cell carcinomas using ICD-O-3 histology codes were excluded from the cohort. Patients who did not receive treatment within 180 days after diagnosis, received chemotherapy only, received surgery followed by chemotherapy without radiotherapy, received radiation or chemotherapy in the year before diagnosis, any patient in whom the intention of radiotherapy was palliative, and patients with metastasis codes in the 6 months preceding diagnosis and until 1 year after diagnosis, were all excluded in order to create a homogenous cohort of patients treated with conventional and established curative intent HNSCC. Patients who did not have any overlap between their chemotherapy and radiotherapy, received radiotherapy but for less than 5 days, and those with a second cancer diagnosis before treatment or in the 5 years preceding head and neck cancer diagnosis date were also excluded. These exclusions were performed to avoid including palliative patients who may have higher healthcare utilization as well as alternate causes for ER visits and hospitilizations. Patients who received Cetuximab as their systemic therapy were also excluded given that it has a very different toxicity profile and is seldomly used in Ontario. Patients who died during their hospitalization for surgery were also excluded as they are not eligible for the outcome. Patients not eligible for OHIP in the year prior to diagnosis were also excluded.

The study was approved by the Institutional Review Board at Sunnybrook Health Sciences Centre, Toronto, Canada.

Exposures

Patients' at risk time periods were categorized into five mutually exclusive exposure or treatment risk periods; (1) surgery, (2) radiotherapy, (3) concurrent chemoradiotherapy, (4) surgery followed by radiotherapy, and (5) surgery followed by concurrent chemoradiotherapy (Fig. 1). These exposures were chosen to capture the common treatment protocols for HNSCC as well as potential higher toxicities associated with multi-modality treatment. Although the risk periods are mutually exclusive, a patient can be included in more than one exposure period depending on the adjuvant treatments they received. The index date was the date of initiation of the first treatment modality. Each patient was followed for up to 90 days from the date when the last treatment modality was completed to assess the outcomes of interest (ie ER visits, unplanned hospitilizations). If a second treatment was initiated prior to the completion of 90 days from the prior treatment modality, the attributable risk period was changed to the subsequent or second treatment (Fig. 1). For instance, a patient has surgery and has an emergency department (ED) visit on day 40 after surgery and then receives concurrent chemoradiotherapy starting on day 45 but has an unexpected hospitalization on day 65. The event on day 40 would be counted in the surgery only exposure period while the event on day 65 would be counted in surgery followed by concurrent chemoradiotherapy at risk period.

Outcome definition

The primary outcome was the total number of emergency department visits and unplanned hospitalizations from the initiation of the treatment to 90 days after the last treatment modality was completed, enumerated for each of the five mutually exclusive treatment periods, described in the 'exposure' section of the methods. Emergency department visits and hospitalizations are very accurately coded in both the NACRS and CIHI DAD databases. These two outcomes were not doubly coded and therefore ultimately treated as mutually exclusive additive outcomes. For instance, if a patient had an emergency department visit, which led to a hospitalization, this was counted as a single event under hospitalization. We also assessed the ED visit time looking at after hours (5pm to 8am) and holidays (including weekends and statutory holidays) visits separately. Direct admissions to the ward or ICU are rare in