Factors associated with the Likelihood of Undergoing Transoral Robotic Surgery for Head and Neck Cancer

Lane Squires, MD1; Toby Steele, MD1; Quang Luu, MD1; D. Gregory Farwell, MD, FACS1; Arnaud F. Bewley, MD1

1University of California Davis Department of Otolaryngology – Head and Neck Surgery

ABSTRACT

Outcome Objectives: Evaluate whether patient and hospital characteristics are associated with the likelihood of undergoing transoral robotic surgery (TORS) for head and neck cancer.

Methods: A cross-sectional analysis of 19,395 admissions to U.S. hospitals in 2009, 2011 and 2012 with a primary diagnosis of head and neck cancer was performed using data from the Nationwide Inpatient Sample (NIS). A multinomial logistic regression model was used to calculate the likelihood of undergoing TORS based on age, sex, race, household income quartile, primary tumor site, hospital ownership, hospital size, hospital region and hospital teaching status.

Results: There were a total of 1872 hospital admission following TORS for head and neck cancer in the years 2009, 2011 and 2012 with a dramatic increase in the number of admissions per year. Black patients were less likely to undergo TORS for head and neck cancer (HNC) than white patients (OR 0.58 [0.37 – 0.91], and those within the highest two income quartiles were more likely to undergo TORS than those from the lowest income quartile (OR 1.82 [1.29 – 2.57], OR 1.49 [1.05 – 2.11]). Patients with oropharyngeal cancer were far more likely to undergo TORS than those with other types of HNC (OR 7.64 – 32.36 [4.26 – 47.60]). Finally, patients treated at urban teaching hospitals in the west were more likely to undergo TORS for HNC than patients treated at rural hospitals and hospitals in the northeast (OR 4.89 [1.55 – 15.45], OR 1.41 [1.03 – 1.95]).

Conclusions: Racial, socioeconomic and regional disparities exist in the use of TORS for the treatment of head and neck cancer.

INTRODUCTION

Since the Food and Drug Administration’s (FDA) approval of TORS for the treatment of T1 and T2 oropharyngeal cancer in 2009, it has gained broad acceptance as an effective method of treating selected head and neck tumors. Concomitant with this, there has been a rise in the incidence of Human papilloma virus (HPV)-associated oropharyngeal cancer, which often presents with an early T-stage primary tumor. This has created an opportunity for widespread use of this novel technique.

We used the National Inpatient Survey (NIS), to perform a population-level investigation of national usage patterns of TORS for HNC in the United States. The NIS is the largest inpatient care database in the United States, containing information on hospital admissions from 20% of non-federal hospitals in participating states.

We hypothesized that as the use of TORS becomes more widespread, disparities in access will exist. We evaluate whether certain patient characteristics (age, sex, income, race, diagnosis) and hospital characteristics (ownership, bedsize, teaching status, and region) are associated with a patient’s likelihood of undergoing TORS for HNC.

METHODS

• Cross-sectional analysis was performed using discharge data from the Nationwide Inpatient Sample (NIS) from 2009, 2011 and 2012 to evaluate use of TORS for HNC.

• Multinomial logistic regression model was used to calculate the likelihood of undergoing TORS based on the multiple patient and hospital characteristics.

• Statistics and figures obtained using Statistical Package for the Social Sciences (SPSS) software (version 21.0; SPSS Inc, Chicago, Illinois).

RESULTS

Table 1: Patient and Hospital Characteristics of admissions following TORS for HNC, 2009, 2011, 2012.

<table>
<thead>
<tr>
<th>Patient Characteristics</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;62</td>
<td>1161</td>
<td>62%</td>
</tr>
<tr>
<td>&gt;=62</td>
<td>712</td>
<td>38%</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1478</td>
<td>79.1%</td>
</tr>
<tr>
<td>Female</td>
<td>394</td>
<td>21.1%</td>
</tr>
<tr>
<td>Income Quartile</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest</td>
<td>364</td>
<td>19.8%</td>
</tr>
<tr>
<td>Low Middle</td>
<td>361</td>
<td>19.6%</td>
</tr>
<tr>
<td>High Middle</td>
<td>514</td>
<td>28.0%</td>
</tr>
<tr>
<td>Highest</td>
<td>597</td>
<td>32.5%</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>1330</td>
<td>81.0%</td>
</tr>
<tr>
<td>Black</td>
<td>114</td>
<td>6.9%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>82</td>
<td>5.0%</td>
</tr>
<tr>
<td>Asian</td>
<td>43</td>
<td>2.6%</td>
</tr>
<tr>
<td>Other</td>
<td>73</td>
<td>4.5%</td>
</tr>
<tr>
<td>Primary Diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base of Tongue Cancer</td>
<td>720</td>
<td>38.4%</td>
</tr>
<tr>
<td>Tonsil Cancer</td>
<td>712</td>
<td>38.0%</td>
</tr>
<tr>
<td>Supraglottis Cancer</td>
<td>150</td>
<td>8.0%</td>
</tr>
<tr>
<td>Other oropharynx cancer</td>
<td>83</td>
<td>4.5%</td>
</tr>
<tr>
<td>Other</td>
<td>208</td>
<td>11.1%</td>
</tr>
</tbody>
</table>

Table 2: Likelihood of undergoing TORS for HNC

<table>
<thead>
<tr>
<th>Patient Characteristics</th>
<th>OR</th>
<th>CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &lt; 62</td>
<td>1.23</td>
<td>0.96 - 1.57</td>
<td>0.10</td>
</tr>
<tr>
<td>Male Sex</td>
<td>1.16</td>
<td>0.88 - 1.54</td>
<td>0.30</td>
</tr>
<tr>
<td>Income Quartile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest</td>
<td>1.82</td>
<td>1.29 - 2.57</td>
<td>0.001</td>
</tr>
<tr>
<td>High Middle</td>
<td>1.49</td>
<td>1.05 - 2.11</td>
<td>0.003</td>
</tr>
<tr>
<td>Low Middle</td>
<td>1.1</td>
<td>0.75 - 1.61</td>
<td>0.185</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>0.58</td>
<td>0.37 - 0.91</td>
<td>0.029</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.76</td>
<td>0.44 - 1.33</td>
<td>0.195</td>
</tr>
<tr>
<td>Asian</td>
<td>1.04</td>
<td>0.50 - 2.17</td>
<td>0.641</td>
</tr>
<tr>
<td>Other</td>
<td>1.3</td>
<td>0.71 - 2.35</td>
<td>0.454</td>
</tr>
<tr>
<td>Primary Diagnosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base of Tongue Cancer</td>
<td>24.63</td>
<td>17.06 - 35.56</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Tonsil Cancer</td>
<td>32.36</td>
<td>22.00 - 47.60</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Supraglottis Cancer</td>
<td>7.48</td>
<td>4.54 - 12.3</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Other oropharynx cancer</td>
<td>7.64</td>
<td>4.26 - 13.69</td>
<td>&lt; 0.002</td>
</tr>
</tbody>
</table>

Hospital Characteristics

<table>
<thead>
<tr>
<th>Control</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Govt, nonfederal</td>
<td>411</td>
<td>22.1%</td>
</tr>
<tr>
<td>Private non-profit</td>
<td>1402</td>
<td>75.2%</td>
</tr>
<tr>
<td>Private investor owned</td>
<td>50</td>
<td>2.7%</td>
</tr>
<tr>
<td>Bedsize</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small</td>
<td>319</td>
<td>17.1%</td>
</tr>
<tr>
<td>Medium</td>
<td>370</td>
<td>19.9%</td>
</tr>
<tr>
<td>Large</td>
<td>1174</td>
<td>63.0%</td>
</tr>
<tr>
<td>Location / Teaching Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>15</td>
<td>0.8%</td>
</tr>
<tr>
<td>Urban non-teaching</td>
<td>85</td>
<td>4.5%</td>
</tr>
<tr>
<td>Urban Teaching</td>
<td>1764</td>
<td>94.7%</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>407</td>
<td>21.7%</td>
</tr>
<tr>
<td>Midwest</td>
<td>570</td>
<td>30.4%</td>
</tr>
<tr>
<td>South</td>
<td>441</td>
<td>23.5%</td>
</tr>
<tr>
<td>West</td>
<td>455</td>
<td>23.3%</td>
</tr>
</tbody>
</table>

CONCLUSIONS

• The use of TORS for HNC has increased dramatically without significant changes in median length of stay or median hospital charges.

• Racial, socioeconomic, and regional disparities exist in the use of TORS for HNC patients.

• Though variations in HPV prevalence and tumor stage likely contribute to these disparities, further investigation is needed into the availability of TORS to minorities and low-income individuals.

REFERENCES


