

# Head And Neck Cancer In The Northern Territory. A Cost Analysis Of Treatment For Regional And Remote Patients.

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## Citation

E Yeboah, M Thomas. *Head And Neck Cancer In The Northern Territory. A Cost Analysis Of Treatment For Regional And Remote Patients..* The Internet Journal of Head and Neck Surgery. 2009 Volume 4 Number 2.

## Abstract

**Background:** Head and Neck Cancer care has received recent attention in the Northern Territory. There is a steady growth in the numbers of newly diagnosed patients each year at The Royal Darwin Hospital. For Head and Neck cancer patients from the Northern Territory, there is the additional problem of travel to hospital and sometimes out of the territory for investigations or radiotherapy treatment. **Aim and Objectives** This study, a retrospective study over eighteen months, aimed to review all new head and neck cancer patients seen between January 2007 and June 2008, with the objective of analyzing the costs of their treatment, manpower and other resources involved. This study also sought to analyze the cost of treatment related to the stage of disease and also to identify which factors could be influenced to provide a cost effective head and neck cancer service. **Methodology:** All patients with head and neck cancer who had a tissue diagnosis between Jan 2007 and June 2008 were used for this study. Data was retrieved from medical records and was entered directly onto Microsoft Vista excel spreadsheet. Data analysis and tests of significance was done using statistical software XLSTAT version 2008.6.8 Copyright Addinsoft 1995-2008 software. Patient travel to out patients department (OPD) or interstate for radiotherapy was based on airfares for that period of travel, patient travel to OPD from remote communities was by coach for which fares for that period of travel were used. Travel cost within Darwin was calculated using a taxi flag fall of \$A4.10 + \$A 1.357 per kilometer<sup>6</sup>. Theatre costs were computed from the hospital hourly theatre rates and theatre staff hourly rates paid by the hospital. Staff charges for consultants were based on L24 salary 2008 with an hourly rate of \$A 83.77, and for registrars, L16 at \$A56.43 per hour. For theatre staff, RN1 for anesthetic nurse and RN3 for theatre nurse were used. The associated hourly rates of \$A29.18 and \$A32.48 respectively were used. The theatre team was made up of one surgical consultant, one anesthetist, two registrars, one scrub nurse and one scout nurse. The pan endoscopy team was made up of one registrar or consultant (mean of their hourly rate was used), one anesthetist registrar or consultant (mean of their hourly rate was used), one anesthetic nurse and one scrub nurse. Radiotherapy costs were projected from data published by Stevens and Firth<sup>7</sup>, using inflation calculator from the Reserve Bank of Australia<sup>8</sup>. Bed day costs were calculated using intensive care unit /high dependency unit (ICU/HDU) daily bed occupancy of \$A1000 and acute surgical ward bed of \$A600 per day. **Results:** Medical records of 67 consecutive newly diagnosed head and neck cancer patients between January 2007 and June 2008 were analyzed for this study. Stages I (n=9) and II (n=4) made up 19 %, and were classified early stage disease. Stages III and IV (n=40, and n=14 respectively) together comprised 71 % (n=54) of all newly diagnosed. These were classified late stage disease .Sixty percent of these patients (n=40) were classified stage IV disease.. See Table 1.

## BACKGROUND

Head and Neck Cancer care has received recent attention in the Northern Territory. There is a steady growth in the numbers of newly diagnosed patients each year at The Royal Darwin Hospital. For Head and Neck cancer patients from the Northern Territory, there is the additional problem of travel to hospital and sometimes out of the territory for investigations or radiotherapy treatment.

## AIM AND OBJECTIVES

This study, a retrospective study over eighteen months, aimed to review all new head and neck cancer patients seen between January 2007 and June 2008, with the objective of analyzing the costs of their treatment, manpower and other resources involved. This study also sought to analyze the cost of treatment related to the stage of disease and also to identify which factors could be influenced to provide a cost effective head and neck cancer service.

**METHODOLOGY**

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**RESULTS**

Medical records of 67 consecutive newly diagnosed head and neck cancer patients between January 2007 and June 2008 were analyzed for this study. Stages I (n=9) and II (n=4) made up 19 %, and were classified early stage disease. Stages III and IV (n=40, and n=14 respectively) together comprised 71 % (n=54) of all newly diagnosed. These were classified late stage disease .Sixty percent of these patients (n=40) were classified stage IV disease.. See Table 1.

**Figure 1**

Table I. Patients according to stage of presentation.

<b>Stage</b>	<b>%(n)</b>
<b>I</b>	<b>13(9)</b>
<b>II</b>	<b>6(4)</b>
<b>III</b>	<b>21(14)</b>
<b>IV</b>	<b>60(40)</b>

Cancer treatments offered were surgery only, Chemoradiation only, or a combination of both. 51%(n=34) of patients recieved chemoradiation alone, followed by 27%(n=18) who received a combination of surgery and chemoradiation. 22%(n=15) had surgery only .See Table 2 .

**Figure 2**

Table 2. Treatments received by patients.

Treatment	Number (%)
Surgery only	15( 22)
Chemo radiation only	34( 51)
Surgery and Chemo radiation	18(27 )

The total cost of patient care was \$A1,574,816 over eighteen months for services offered to our patients. These were travel, outpatients' consultation, theatre visits, radiological and pathological investigations, and radiotherapy and hospital admissions. Stage IV disease had the highest cost with an absolute figure of \$A 1,070,376 (\$US844,012) .This made up 67.98% of the total costs. Stage III and IV, classified as late stage disease, made up 86.22% of the costs. Travel costs of \$ 641,646 made up 46.6% of total costs out of which \$A599,466 was spent on 48 patients sent interstate, followed by hospital admissions which made up 32%. These differences between the stage of the disease and the costs involved in treatment were statistically significant with p value <0.0001 at 95% confidence intervals. See table 3.

**Figure 3**

TABLE 3: Cost of patient care.

STAGE	COST IN AUSTRALIAN DOLLARS (\$A)								TOTAL (%)	Mean \$A (\$US)
	TRAVEL	RADIOT HERAPY	OPD	THEATRE	PATHOLOGY	RADIOLOGY	INPATIENT			
I	37,726	13956	4830	25,644	2129	4314	20,200	108799	12,088	
								(6.9)	(9,576)	
II	32,238	13956	4130	15,167	1205	1599	40,000	108295	27,073	
								(6.88)	(21,446)	
III	86,754	46444	10,500	26,798	4139	10,511	102,200	287346	20524	
								(18.24)	(16,241)	
IV	484,928	123887	28,770	111,040	10,652	30,499	280,600	1070376	39370	
								(67.98)	(29,549)	
	641,646	198243	48,230	178,649	18,125	46,923	443,000	1574816		

(p<0.0001 at 95% CI)

Out of 67 patients, 50(71.6%) were sent interstate. 6 (9%) were for Positron Emission Tomography (PET) scans, and 44(91%) for chemo radiation therapy at a total travel cost of \$A599,466. This did not include the staff costs interstate including allied services.

Hospital stay and number of admissions were also related to the stage of disease. Stage III and stage IV patients spent significantly more days in hospital and also had a greater number of admissions as a result of treatment, investigations, or due to complications of their disease or

treatment (p< 0.0001, CI 95%).

**Figure 4**

TABLE 4. Admissions and hospital stay

STAGE	Mean HOSPITAL STAY(days)	No OF ADMISSIONS
I	27	16
II	33	6
III	16	36
IV	434	67
<b>Total</b>	<b>510 days</b>	<b>125</b>

X<sup>2</sup>test (p value < 0.0001 at 95% CI)

Manpower hours were calculated on the number of hours spent by the health worker on the patients. This includes theatre time, clinics, admissions and Multi disciplinary meetings. See Table3.

Physicians (surgeons, pathologists and anaesthetists) spent the most time in patient care. Nursing care was next with 377 hours over the study period followed by nutritionists 202 hours.

**Figure 5**

Table 5 Manpower hours

Category	Total no of hours
Physician*	692
Nurse	377
Physiotherapy	191
Speech therapist	174
Nutritionist	202
<b>TOTAL</b>	<b>1636**</b>

\* includes surgeons, pathologists and anesthetists

\*\* comprises time spent in theatre, wards, clinics and MDT meetings

## DISCUSSION

Head and neck cancer treatment is multidisciplinary, expensive and to a large extent is dictated by the stage at which the disease presents. As shown by the result of this study, stages I and II are much cheaper to treat than stages III and IV with stage IV being the most expensive. Cost analysis of head and neck cancers have been performed by a

few groups of researchers. Zavras et al in Greece put the mean cost of stage I at \$US 3,662, stage II at \$US5,867, stage III at \$US10,316 and stage IV \$US11,467<sup>2</sup>. Comparing this to our study results of \$A12,088 (\$US9,576) for stage I, \$A27,073 (\$US21,446) for stage II, \$A20,524 (\$US16,241) stage III and \$A39,370 (\$US29,549) for stage IV. As noted in the results, patient travel was a significant proportion of the total cost, about half of the total cost of treatment. Epstein et al conducted their cost analysis in a California Medicaid population. Their findings with respect to the relationship between stage and cost followed a similar trend; late stage disease was more expensive to treat and also had increased hospital stay<sup>3</sup>. In our study, late stage disease (III and IV) spent significantly more time in hospital than early stage (I and II).

The Northern territory of Australia presents unique challenges when it comes to head and neck cancer care and treatment. The territory does not have a radiotherapy unit and thus patients had to travel considerable distances interstate for treatment at a cost of \$A641,646 (\$US481,585) over the study period. Patients also had to travel to The Royal Darwin hospital for outpatient consultation from very remote communities.

The stage of presentation is a determinant of the type of treatment and also the morbidity and survival of patients<sup>9</sup>. We found 71.8% of patients presented with late stage (III, IV) disease. Zavras et al had 59% late stage, Quer et al had 59% presenting in late stage<sup>4</sup>. The geographical distribution of our population with many patients living in remote communities and also the absence of any comprehensive early detection/screening programme may be implicated in these high percentage of late presentations.

The manpower projection was an attempt to estimate the minimum number of health personnel required based on the 67 new presentations. The average number of surgeons required was three. This appeared to be the minimal requirement for a head and neck team in our region with our

current patient numbers.

## CONCLUSIONS

This study has been able to determine that Northern territory head and neck cancer patient present much later with late stage disease compared to patients in Greece and the United States of America. We have also been able to determine the cost per stage and show that this is also higher than other comparable studies. This could be attributed to the increased cost of patient travel. There is a need for an early detection /screening programme in head and neck cancers to reduce the high numbers of late presentations. This will reduce costs in treatment and also patients will have a better quality of life with less aggressive surgery and radiotherapy resulting in lower hospital admissions and better prognosis<sup>9</sup>. There is also a need for a regional radiotherapy service in the northern territory to serve regional Darwin and the rural and remote communities to reduce travel costs interstate.

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