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## A prospective study of the clinical impact of a multidisciplinary head and neck tumor board

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### Abstract

**OBJECTIVE**—No study has evaluated the effect of the multidisciplinary head and neck tumor board on treatment planning. The objective of this study is to determine the efficacy of the multidisciplinary tumor board in altering diagnosis, stage, and treatment plan in patients with head and neck tumors.

**STUDY DESIGN**—Case series with planned data collection.

**SETTING**—Comprehensive cancer center and tertiary academic hospital.

**SUBJECTS AND METHODS**—A prospective study of the discussions concerning 120 consecutive patients presented at a multidisciplinary head and neck tumor board was performed. As each patient was presented, record was made of the “pre-conference” diagnosis, stage, and treatment plan. After case discussion, the “post-conference” diagnosis, stage, and treatment plan were recorded. Results are compared between malignant and benign tumor cohorts.

**RESULTS**—The study population was comprised of 120 patients with new presentations of head and neck tumors - 84 malignancies and 36 benign tumors. Approximately 27% of patients had some change in tumor diagnosis, stage, or treatment plan. Change in treatment was significantly more common in cases of malignancy, occurring in 24% of patients versus 6% of benign tumors ( $p = 0.0199$ ). Changes in treatment were also noted to be largely escalations in management ( $p = 0.0084$ ), adding multi-modality care.

**CONCLUSION**—A multidisciplinary tumor board affects diagnostic and treatment decisions in a significant number of patients with newly diagnosed head and neck tumors. The multidisciplinary approach to patient care may be particularly effective in managing malignant tumors, in which treatment plans are most frequently altered.

### INTRODUCTION

Tumors of the head and neck represent a heterogeneous group of neoplasms. These tumors may differ in location, pathogenesis, tumor biology, treatment, prognosis, and effect on

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quality of life.<sup>1</sup> In treating these lesions, physicians are faced with difficult treatment decisions, often in the absence of randomized level I evidence. Patients with head and neck tumors are also at increased risk of treatment-related morbidity,<sup>2</sup> making their care even more complex. Multiple studies have shown that multimodal therapy increases disease-free and overall survival.<sup>3,4</sup> These issues reinforce the need for optimal treatment planning and multidisciplinary coordination.<sup>5</sup>

The notion that the multidisciplinary team approach improves medical management is becoming more prevalent, and many argue that the multidisciplinary approach presents a new standard of care for the diagnosis, classification, and treatment planning of head and neck tumors.<sup>6,7,8</sup> Whereas single studies in lung,<sup>8</sup> colorectal,<sup>9</sup> and genitourinary cancer<sup>10</sup> have demonstrated how tumor board meetings can improve and optimize treatment planning, none have evaluated the effect of the tumor board in head and neck tumor patients.

The literature has suggested theoretical benefits of the multidisciplinary approach, including improved patient survival and staging accuracy, greater likelihood of receiving care in accordance with clinical practice guidelines, increased access to clinical trials, improved communication, more cost-effective care, and improved clinician and patient satisfaction.<sup>11,12,13,14,15</sup> A review by Westin, et al. addresses many opinion papers and reviews the literature regarding the difficulties of establishing and optimizing a multidisciplinary tumor board.<sup>13</sup> This review supports the notion that multidisciplinary tumor boards have become a new standard, representing quality cancer treatment; however, there is a lack of evidence that tumor boards impact staging, workup, or treatment of head and neck tumors.

Nguyen, et al retrospectively evaluated 213 patients with locally advanced head and neck cancer over a 10-year period.<sup>16</sup> The authors compare the outcomes of these patients to published clinical trial outcomes, concluding that “multidisciplinary approaches provide optimal treatment outcomes for locally advanced head and neck cancer, with overall survival in these patients comparable to that reported in randomized clinical trials.” The authors suggest that the multidisciplinary tumor board played a role in these outcomes; however, they did not directly evaluate the impact or changes that the tumor conference made.

Despite the belief that tumor boards play an important role in the management of head and neck tumors, there is no data that examines the role of the multidisciplinary team conference in management of specific tumor types. Thus, it is unknown which patients maximally benefit from the multidisciplinary tumor board discussion. The primary goal of this project will be to quantify the impact of the multidisciplinary team in managing specific types of head and neck tumors. The long-term impact of this new perspective may lead to a more efficient use of multidisciplinary team resources – with a more acute focus on patients who are most likely to benefit. Our hypothesis is that higher-grade and higher-stage malignant tumors, which more often require multimodal therapy, will be more frequently impacted by the multidisciplinary tumor board. Primary outcomes are changes in diagnosis, stage, and escalations/de-escalations in treatment plan.

## PATIENTS AND METHODS

### Subject Population

The study cohort includes all 120 new patients whose clinical findings were presented for review at our institution's head and neck tumor board between December 2009 and February 2010. These patients represent all new diagnoses of head and neck tumors presenting to the departments of Otolaryngology and medical oncology. All cases referred for discussion at our multidisciplinary conference are presented. The sole inclusion criterion was being a patient presented at the head and neck tumor board. Patients were excluded from

consideration if they had been treated at our institution and had previously been presented at the tumor board, but were being re-evaluated as a part of their continuing clinical care (e.g., a review of post-radiotherapy CT or PET/CT imaging studies).

### **Multidisciplinary Tumor Board**

At our institution, multidisciplinary head and neck tumor board conferences occur weekly and last approximately two hours. At a minimum, multiple (3-5) head and neck surgeons, a medical oncologist, and a radiation oncologist are present; however, these meetings are typically enriched by the diverse opinions of multiple experts in each of these fields, as well as others that specialize in issues surrounding head and neck cancer (e.g., neurosurgery, plastic surgery, pathology, radiology, dental, oral and maxillofacial surgery, and social work).

Prior to our multidisciplinary tumor board conference, pathologic slides and diagnostic imaging are reviewed by attending-level specialists. Pathology specimens are reviewed and presented by fellowship-trained head and neck surgical pathologists. These specialists review all available specimens – both internal and external slides. Similarly, all available internal and external diagnostic imaging studies are reviewed and presented by fellowship-trained head and neck radiologists.

### **Data Collection**

After Institutional Review Board approval from the University of North Carolina at Chapel Hill, data was prospectively collected, in real-time, by the study coordinators. To reduce the risk of error and increase validity, multiple coordinators each generated independent records of every conference. Data was then compiled and compared to notes taken by the senior author (A.Z.) – an attending head and neck surgeon. As each patient was presented, a record was made of the “pre-conference” diagnosis, stage, and treatment plan. These “pre-conference” variables reflect the opinion of the referring attending physician, based on examination and studies available at the time of tumor board referral. It should be noted that on rare occasions, the results of radiologic or pathologic studies were not finalized and available to the referring physician prior to multidisciplinary conference. After case discussion, the “post-conference” diagnosis, stage, and treatment plan was recorded.

Based on this information, patients were classified according to a system originally developed for the evaluation of the multidisciplinary management of urologic malignancies by Kurpad et al.: (1) no change in diagnosis/no change in treatment; (2) no change in diagnosis with a change in treatment; (3) change in diagnosis, no change in treatment; (4) change in diagnosis and change in treatment.<sup>10</sup> Changes in diagnosis include changes in tumor type, and significant findings during the review of pathology or radiographic imaging that result in changes to the stage or tumor grade. Changes in treatment include any significant change in treatment modality (e.g. surgery to radiation) or the addition of a treatment modality (e.g. surgery to neoadjuvant chemotherapy + surgery). In addition, patients were classified as “other” if they required further diagnostic workup (e.g. new imaging or biopsies) before a decision could be made.

### **Statistical Methods**

The data have been reported as percentages, using two-tailed Fisher's exact testing and unpaired Student's *t*-testing to determine whether significant differences exist between patient cohorts.  $P < 0.05$  was considered statistically significant.

## RESULTS

The data collected from the proceedings of nine weekly multidisciplinary head and neck tumor board meetings yielded a study population of 120 subjects (Table 1), including the following pathologic diagnoses: 65 with squamous cell carcinoma (54%); 6 with pleomorphic adenoma (5%); 3 with papillary thyroid carcinoma (3%); 2 with B Cell lymphoma (2%); 2 melanoma (2%); 2 with adenocarcinoma (2%); 2 with benign thyroid hyperplasia (2%); 2 with lipoma (2%); 2 with lymphadenopathy (2%); 2 with benign cysts (2%); 2 with benign hyperplasia (2%); 24 single cases of less common head and neck pathologies including condyloma, schwannoma, chondrosarcoma, and picoma (< 1% each); and 8 with tumors which could not be histologically classified at the time of initial presentation at the multidisciplinary conference (7%). As dictated by our study design, these lesions were classified as “unknown” for the purpose of this study; however, final pathology for this cohort revealed 2 cases of benign hyperplasia, 2 follicular thyroid adenomas, and single cases of Warthin's tumor, squamous cell cancer, large B cell lymphoma, and sclerosing Hodgkin's lymphoma.

As shown in Table 2, approximately 27% (32/120) had some change in either tumor diagnosis or treatment plan due to the input from the multidisciplinary tumor board. Of this group, 3 of 32 (9%) had changes in both diagnosis and treatment, while 19 of 32 (59%) had a change in their treatment plan without a change in diagnosis, and 10 of 32 patients (31%) had a change in diagnosis or stage that did not result in a change in treatment. Of the changes in diagnosis without a change in treatment, 7 of 10 patients presented with malignant lesions. Approximately 7% of patients required further diagnostic workup before definitive treatment planning.

Our cohort was comprised of 84 patients with confirmed malignancies and 36 patients with tumors classified as either benign or unknown tumors. Power calculations using a proportional subgroup analysis reveal 80.5% power to resolve statistically significant differences between our malignant and benign study cohorts, based on our sample and effect sizes ( $\alpha = 0.05$ ). As shown in Table 3, changes in diagnosis occurred in three cases – one malignant and two benign tumors. Within our study population, all stages of cancer are represented, with 82% diagnosed as either stage 3 or 4 tumors. Changes in stage occurred in 12% of cancer cases ( $n=10$ ). These changes in stage were well-distributed, with changes in primary site and nodal involvement each accounting for 40% of changes and alterations in metastatic spread occurring in 20% of cases. Change in treatment occurred in 24% of cancer cases (compared with 6% of benign tumor cases). The difference in the rates of treatment changes between the two groups was noted to be statistically significant ( $p = 0.0199$ ).

It is also interesting to note the distribution of changes in treatment. For the purposes of this study, escalation is defined as the addition of a treatment modality (e.g., surgery to surgery + postoperative radiotherapy). De-escalation is the subtraction of a treatment modality (e.g., chemotherapy + radiotherapy to radiotherapy alone). Modality shift is simply a lateral change in treatment modality (e.g., surgery to radiotherapy). The malignancy cohort, which is comprised of twenty patients with changes in treatment, does include patients with de-escalated and modality-shifted treatment plans; however, the majority (65%) of malignancy patients with changes in treatment experience an escalation in their treatment plan as a result of tumor board discussion ( $p = 0.0212$ ). Similarly, both benign tumor patients with treatment changes receive treatment escalations after case presentation. When all patients with changes in treatment are compared, there is also a statistically significant difference in rates of treatment escalation and de-escalation, favoring treatment escalation ( $p = 0.0084$ ).

## DISCUSSION

As the management of head and neck tumors has expanded to include many complex treatment modalities, the multidisciplinary team approach has become critical in optimizing treatment planning and patient outcomes. In fact, many argue that multidisciplinary tumor boards represent a new standard of care. Our study shows that multidisciplinary tumor boards have a significant impact on approximately one out of every four patients presented and in complex cancer care. As data is accumulated that proves the impact of the multidisciplinary tumor board, such conferences may serve as an important Pay for Performance or Center of Excellence indicator.

Our data is the first to look at the efficacy of the multidisciplinary tumor board in changing the management of head and neck tumors. Overall, this data suggests that our multidisciplinary head and neck tumor board alters the diagnosis, work-up, stage, or treatment in approximately one out of every four patients reviewed (27%). Of these patients, over two-thirds (68%) have their treatment plan altered as a result of the tumor board discussion – approximately 18.3% of the total study population. These results are similar to those of Kurpad et al, who found that multidisciplinary meetings change diagnosis or treatment in 38% of patients with urologic malignancies, with the majority of changes being alterations in treatment plan.<sup>10</sup>

Furthermore, it appears that our multidisciplinary tumor board has a greater impact on the management of malignant tumors than benign tumors. The statistically significant difference in the rate of treatment changes between the two groups (24% in malignancies versus 6% in benign tumors,  $p = 0.0199$ ) is due to the expanding role of multi-modality treatment. As cases of malignancy are more likely to benefit from multi-modality approaches, when these cases are presented for review, treatment plans are more often augmented. In these discussions, experts from radiation oncology, medical oncology, radiology, and pathology work with the otolaryngologist to design an optimal treatment plan, in accordance with “best practice” standards. This augmentation phenomenon likely also explains the trend toward escalation of treatment planning in patients presented at multidisciplinary tumor board.

It is important to note that our strategy for measuring changes in treatment was very conservative. Not infrequently during the course of data collection, specific discussions of the surgical procedure occurred. Benefiting from the knowledge of subspecialists in the fields of head & neck surgery, skull base surgery, facial plastics, and transoral laser surgeons, the group is able to efficiently discuss the advantages and disadvantages of multiple surgical approaches, in order to develop the optimal operative plan. Our results do not consider intra-modality changes (e.g. traditional open excision to transoral laser surgery), thereby, underestimating the total number of patients whose treatment plan was changed as a result of case discussion. Similarly, changes in radiotherapy (e.g. from unilateral to bilateral neck irradiation) would be considered an intra-modality change in treatment.

It must be acknowledged that this study has potential limitations. One relevant shortcoming of this study is that it only evaluates diagnostic and treatment decisions, and not actual patient outcomes. Since all of our patients are presented at the tumor board, we do not have a non-tumor board comparison group and a randomized trial will never be performed to measure these outcomes. Although we expect that the multidisciplinary approach leads to improved decisions, better treatments, and, therefore, superior outcomes, the present analysis cannot conclude that the multidisciplinary tumor board improves cancer survival. Furthermore, our institution's status as a comprehensive cancer center with a large head and neck tumor population may limit this study's generalizability. Our multidisciplinary tumor

board meetings benefit from the expertise of diverse fields (e.g., otolaryngology, neurosurgery, plastic surgery, medical oncology, radiation oncology, pathology, radiology, dental, oral and maxillofacial surgery, and social work) that specialize in issues surrounding head and neck cancer. It is unclear how closely the results of this study will translate to the multidisciplinary conferences at smaller academic or community programs. Interestingly, our tumor board is beginning to utilize teleconferencing to communicate with community and regional programs – allowing these smaller centers the opportunity to partner with a larger group; however, none of the patients included in the current study were teleconference patients.

An additional limitation of this type of study design is that the pre-conference diagnosis and stage may be preliminary due to incomplete information provided by an outside facility. We have experienced this in our own tumor boards, where many patients are referred with outside slides and films. It is not unusual for the pathologic and/or radiologic interpretation to change after review by the university faculty. At our institution, the tumor board conference facilitates this dissemination of information and allows for multidisciplinary discussion about why interpretations have changed. The stratification of patients with changes in treatment resulted in 19 of 22 patients experiencing changes of treatment without changes of diagnosis or stage, lending support to our contention that treatment changes are the result of active tumor board discussion rather than shifting treatment plans secondary to new diagnoses or staging information from pathologic and radiologic interpretation.

Our results show promise for demonstrating the utility of a multidisciplinary head and neck tumor board on patient care. Future testing will allow for conclusions to be made regarding the impact of such multidisciplinary care on the management of tumors with various histologies, stages, planned treatment modalities, and subsites. This knowledge will allow us to determine which patients are maximally impacted by multidisciplinary care. These patients may be better served with subspecialty tumor boards, such as skull base tumor boards or advanced thyroid cancer tumor boards.

## CONCLUSIONS

A tumor board conference affects the diagnostic and treatment decisions in a significant number (27%) of patients with newly diagnosed head and neck tumors, changing the treatment plan in one out of every five patients (18.3%). Multidisciplinary tumor boards should be a standard of care for complex head and neck tumor patients. The multidisciplinary approach to patient care is particularly effective in managing malignant tumors; treatment plans were altered in 24% of these cases (versus 6% for benign tumors). Further studies evaluating the impact of multidisciplinary care on the management of specific tumor histologies, stages, sites, and treatment modalities will allow a more efficient use of limited tumor board resources.

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**Table 1**

## Patient Demographic Information

	Number (N = 120)
<b>Population Information</b>	
Male : Female	65% : 35%
Age (mean)	54.2 (range, 2 - 85)
<b>Malignant Tumors</b>	
Squamous cell carcinoma	65
Papillary thyroid carcinoma	3
B Cell Lymphoma	2
Melanoma	2
Adenocarcinoma	2
Other	10
<b>Stage</b>	
1	10
2	5
3	9
4	60
<b>Benign Tumors</b>	
Pleomorphic adenoma	6
Benign hyperplasia	4
Lipoma	2
Lymphadenopathy	2
Benign cyst	2
Other	20



**Table 2**

## Head and Neck Tumor Board Outcomes

Type of change resulting from the Tumor Board Presentation	All Patients (N=120)
No change in either diagnosis or treatment	79/120 (66%)
Change in either diagnosis or treatment	32/120 (27%)
Change in treatment plan without a change in diagnosis	19/120 (16%)
Change in diagnosis without a change in treatment plan	10/120 (8%)
Change in both diagnosis and treatment	3/120 (3%)
Other *	9/120 (7%)

\* Patients were categorized as other if they required further diagnostic workup (e.g. new imaging or biopsies) before a decision could be made.

**Table 3**

## Tumor Board Outcomes by Malignant Potential

	Malignancy (N=84)	Benign (N=36)
Change in Tumor Type	1 (1%)	2 (6%)
Change in Stage	10 (12%)	N/A
Change in Treatment	20 (24%)	2 (6%) <sup>†</sup>
Escalation **	13	2
De-escalation **	4	0
Modality Shift	3	0

<sup>†</sup> Difference in the rates of treatment change between benign and malignant cohorts was statistically significant ( $p = 0.0199$ ).

\*\* Difference in the rates of escalation and de-escalation among all patients with changes in treatment was statistically significant ( $p = 0.0084$ ). Difference in rate of escalation and de-escalation among the malignant tumor cohort was also statistically significant ( $p = 0.0212$ ).