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ASSOCIATION BETWEEN SEVERITY OF DYSPHAGIA AND SURVIVAL IN PATIENTS WITH HEAD AND NECK CANCER

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Abstract

Background—This study examined risk factors for dysphagia, a common and serious condition in patients with head and neck cancer, and the association between severity of dysphagia and survival.

Methods—Chart reviews were performed on patients diagnosed with head and neck cancer between January 2001 and April 2003, who had dysphagia diagnoses or swallowing evaluations. Regression analyses determined factors associated with dysphagia and the association between observed survival and severity of dysphagia.

Results—Almost 50% of the 407 patients had dysphagia. Risk factors included advanced stage, older age, female sex, and hypopharyngeal tumors. The most severe dysphagia ([L.] nil per os or “nothing by mouth” status), which was associated with lower survival rates, was the strongest independent predictor of survival.

Conclusions—Swallowing problems should be considered when determining appropriate cancer-directed treatment and posttreatment care. Because of dysphagia’s high incidence rate and association with survival, a speech-language pathologist should be involved to ensure routine diagnostic and therapeutic swallowing interventions.

Keywords

head and neck cancer; dysphagia; swallowing; swallowing therapy; survival

Dysphagia is a common and potentially life-threatening occurrence in patients with head and neck cancer, often associated with anatomic and physiologic changes in the oral and pharyngeal cavities due to surgical, radiation, and/or chemoradiation treatments.^{1–4} The incidence of posttreatment dysphagia in these patients has previously been reported as

falling between approximately 50% and 60%.⁵⁻⁹ It has been suggested, though, that dysphagia and rates of aspiration are often underreported because physicians, the common source of referral for swallowing function assessment services, may underestimate or misidentify severity and refer only overtly symptomatic patients.^{7,9-11} It has also been estimated that 30% to 50% of patients with head and neck cancer demonstrate some degree of malnutrition.¹² The combination of dysphagia with poor nutrition, significant weight loss, and impaired immune function often results in cachexia (full-body wasting and muscle atrophy), fatigue, high susceptibility to infection, poor wound healing, or death.^{12,13}

Regardless of the shift toward organ-sparing, non-surgical treatment to preserve function in patients with head and neck cancer, all current modalities can result in swallowing problems, along with aspiration and aspiration pneumonia.¹⁴ Surgical resection can damage the muscles most critical to swallowing, including the intrinsic and extrinsic muscles of the tongue and larynx, which can lead to dysphagia.^{4,15} Radiation and chemotherapy often cause mucositis, neuromuscular fibrosis, and lymphedema changes in the mucosa and muscle tissues and can alter the coordination and flexibility of the swallowing process.^{1,4,16}

These swallowing difficulties can be further exacerbated by the secondary consequences of prolonged NPO ([L.] nil per os or “nothing by mouth”) status, which is a common sequela among patients with head and neck cancer. Prolonged NPO status is directly correlated with worse swallowing outcomes and increased risk for dysphagia.^{7,17} Atrophy of pharyngeal and tongue-base musculature and increased pharyngeal fibrosis with overall deconditioning can result both from general nonuse of swallowing musculature and from a marked decrease in patient swallows (volitional or spontaneous).^{3,7}

The biopsychosocial ramifications of dysphagia are widespread. Dysphagia can directly result in decreased eating, malnutrition, and weight loss, and the necessity for prolonged enteral feeding, all of which are associated with decreased survival.¹⁸⁻²⁰ Swallowing problems can also result in decreased social participation and increased anxiety, social isolation, and depression, which in turn can lead to decreased quality of life.⁹

One goal of head and neck cancer research is to identify factors predictive of survival, which can lead to more effective treatment decisions and more accurate prognosis. Although tumor stage and site are well-known predictors of survival in patients with head and neck cancer,^{18,21} nutritionally related variables also appear to have potent prognostic implications. Weight loss has been shown to be one of the strongest independent predictors of survival, more powerful than stage or site.¹⁸ Patients with continued oral intake, in the presence of a gastrostomy tube, were more likely to maintain their weight and have higher survival rates compared with patients who had no continued oral intake.¹⁹ Domains specifically related to health-related quality of life, including eating, were also positively associated with survival.²⁰ The extent of the correlation between dysphagia and survival, however, remains unclear.

The purpose of this study was to determine the risk factors for developing dysphagia in patients with head and neck cancer and to examine whether the severity of dysphagia was associated with survival. A retrospective design was used to merge existing cancer registry

and billing data with ratings provided by speech-language pathologists that quantified the severity of swallowing problems in patients with documented dysphagia.

MATERIALS AND METHODS

Study Sample

With the approval of the University of Iowa Investigational Review Board, records of patients diagnosed with a primary carcinoma of the upper aerodigestive tract between January of 2001 and April of 2003 were extracted from this institution's cancer registry database. Appropriate cases were identified based on anatomic site (ICD-O-2 codes C00.0–14.8, 30.0, 31.0–31.9, and 32.0–32.9 representing the lip, oral cavity, pharynx, larynx, and salivary glands) and histologic type (ICD-O-2 codes M801–867, 894 representing carcinomas). Information about these patients' demographic, disease, and treatment characteristics as well as their survival was included in the data downloaded from the cancer registry.

Billing data were then used to identify which of these patients had a diagnostic code representing dysphagia (ICD-9 codes 787.2x) or a procedural code representing a swallowing evaluation (CPT codes 92610, 92611, and 92612).^{22,23} Severity of dysphagia was quantified using the Swallowing Performance Scale (SPS)²⁴ ratings, ranging from 1 to 7 in accord with criteria shown in Table 1. For patients who had multiple evaluations resulting in more than 1 SPS rating, the rating representing the most severe dysphagia was used.

Charts were audited to ensure that patients' dysphagia was associated with their malignancy. As illustrated later in Appendix A, the original 427 cases of head and neck cancer were reduced to 407 based on the elimination of duplicate records and records with questionable coding data.

SPS ratings were then assigned, when possible, to the 192 patients with documented dysphagia. For 132 patients who received an instrumental swallowing evaluation at this institution, SPS ratings were extracted from the reports describing their oropharyngeal motility study (OPMS) or fiber-optic endoscopic evaluation of swallowing (FEES) procedures. SPS rating could be retrospectively assigned to 22 of the remaining 60 patients who had dysphagia but no record of an instrumental swallowing evaluation. Seventeen of these 22 patients had bedside or clinical swallow evaluations, and the findings from these evaluations as well as subsequent clinical follow-ups about dietary changes and gastrostomy tube placement were used to assign an SPS rating. Of the 43 patients who had an ICD-9 code of dysphagia but no swallowing evaluation, 5 patients could be assigned ratings based on clinical follow-up notes, which denoted a functionally normal swallow (SPS = 2, $n = 1$) or PEG tube dependence resulting from swallowing difficulties (SPS = 7, $n = 4$). The remaining 38 patients with verified diagnosis of dysphagia based on ICD-9 codes but insufficient information to retrospectively assign an SPS rating were excluded from any analysis involving severity of swallowing.

Data Analysis

Severity of dysphagia was categorized into 4 groups for the majority of the analyses. The “no known dysphagia” group represented patients who had neither a dysphagia ICD-9 code nor a swallowing evaluation and were therefore assumed to have normal swallowing function (equivalent to SPS = 1; $n = 215$) or whose swallowing function was considered within functional limits (SPS = 2; $n = 5$). The remaining 3 groups of patients with an SPS rating representing abnormal swallowing function were grouped to differentiate those with dysphagia, but no evidence of aspiration (SPS = 3–4; $n = 47$), those with dysphagia including evidence of mild or inconsistent aspiration (SPS = 5–6; $n = 37$), and those with dysphagia including severe, consistent aspiration, and/or inadequate oropharyngeal transit to the esophagus warranting NPO status (SPS = 7; $n = 65$). The “unknown severity” group represents patients with a dysphagia ICD-9 code but no swallowing evaluation or other information to assign an SPS rating retrospectively ($n = 38$). For the analyses of associations of patient, disease, and treatment characteristics with dysphagia, these groups were further collapsed into absence/presence of aspiration (SPS 1–4 vs 5–7) and absence/presence of dysphagia (SPS 1–2 vs 3–7).

American Joint Committee on Cancer (AJCC) stage represented pathologic stage, if available, or clinical stage when pathologic stage was not applicable or was not known. Stage was combined into early (0–II) and advanced (III–IV) groups for certain analyses.

Statistical analyses (using SPSS version 17.0; SPSS, Chicago, IL) included linear regression analyses to determine which patient, disease, and treatment characteristics were independently associated with dysphagia. Actuarial survival analyses were performed on all 407 patients to determine differences in observed rates (death from all causes) for selected demographic and disease characteristics. Observed survival was chosen because the intent of this study was to determine the relationship between severity of dysphagia and death from all causes. Death, whether attributable to the cancer, sequelae from its management, or other comorbid conditions, is an outcome that it is hoped could be avoided with appropriate clinical intervention for swallowing-related problems. In these univariate analyses, the Wilcoxon statistic was used to determine statistically significant associations that age, sex, stage, site, histologic type, treatment modality, and severity of dysphagia had with survival. Variables with a value of $p < .1$ were included in a Cox regression analysis to determine the independent effect that severity of dysphagia had on survival when other predictors were taken into consideration.

RESULTS

The mean age of the 407 patients in this study was 58.9 years, 67.3% were male, and 60.7% presented with advanced-stage disease (Table 2). Of these 407, 220 were classified as having no known dysphagia, including 215 who had no dysphagia code or swallowing evaluation and 5 who had an SPS rating of 2 (“functionally normal”) based on medical information. The incidence rate of dysphagia was therefore 45.9%, with 187 of the 407 patients identified as having a speech-language pathology evaluation that demonstrated impaired swallowing function or a dysphagia ICD-9 code that was confirmed in the chart review process. The majority of the swallowing evaluations (85.1%) were performed within

the first year following diagnosis of the cancer, whereas 8.1% were within the second year after diagnosis and 8.5% within 3 to 5 years after diagnosis.

The results shown in Table 2 indicated that a higher percentage of patients who were female, had hypopharyngeal tumors, had squamous cell carcinomas (SCCs), presented with advanced-stage disease, or were treated with radiation therapy tended to have worse swallowing function, as reflected in an SPS rating of 5 or greater. Table 3 shows the results of linear regression analyses performed to determine which of these patient, disease, and treatment characteristics were significant independent predictors of the presence of dysphagia, the presence of aspiration, and the severity of dysphagia. Female sex, advanced stage, and radiation therapy were independently associated with all 3 swallowing-related problems, whereas SCCs were independently associated with the presence and severity of dysphagia but not with aspiration. Although site was associated in the univariate analyses, it was not an independent predictor of these swallowing-related problems once other disease factors were taken into consideration.

Observed survival rates for the 369 patients with known severity of dysphagia indicated significant differences based on dysphagia severity ($p = .001$) (see Figure 1). Pairwise comparisons demonstrated that patients with an SPS rating of 7, the most severe dysphagia requiring NPO status, were responsible for this significant difference. The 35.4% 5-year rate for these patients was significantly lower than that for the other 3 groups composed of patients with no known dysphagia (62.3%; $p = .001$), patients with a mild–moderate dysphagia rating of 3–4 (61.7%; $p = .005$), and patients with a moderate–severe dysphagia rating of 5–6 representing aspiration (67.6%; $p = .001$). None of the latter 3 groups was significantly different from each other.

Additional survival analyses were performed to examine observed survival rates as a function of age, sex, stage, anatomic site, histologic type, and treatment modality, variables known to be associated with survival and the development of dysphagia (Table 4). The analyses were performed on the 369 patients with known severity of dysphagia, reflecting the group to be used in the multivariate analysis. The results indicated that worse survival rates were significantly associated with older age, advanced-stage disease, tumors originating in the hypopharynx and oral cavity, histologic types other than adenocarcinoma, and the receipt of radiation therapy. Sex and the receipt of surgery were not significantly associated with survival.

Variables that were significantly associated with survival in the univariate analyses (Table 4) were included in the Cox regression analyses (Table 5) to determine whether severity of dysphagia remained an independent predictor of survival when other confounders were taken into account. The values for each variable in the model that were significantly associated with survival ($p < .05$) have a coefficient representing their increased risk of dying relative to the value of that variable (labeled “baseline”) that had the highest survival rate.

The multivariate analysis performed on patients with known severity of dysphagia, which included those with no known dysphagia, indicated that dysphagia severity was an

independent predictor in addition to age, site, and the receipt of radiation therapy (Table 5, second and third columns). Patients with an SPS rating of 7, representing severe dysphagia requiring NPO status, were 3.4 times more likely to die than patients with no known dysphagia. For site, the increased risk of death for hypopharyngeal and oral cavity tumors, relative to oropharyngeal tumors, was 3.1 and 1.9, respectively. For age, the 70+ age group was 2.9 times more likely and the 55 to 69 age group was 1.7 times more likely to die compared with the <55 age group. Finally, the receipt of radiation therapy had a 2.4 increased risk compared with treatments not involving radiation therapy. Although receipt of surgery was not associated with survival in the univariate analyses, a post hoc multivariate analysis was performed that included surgery in the model to verify that radiation therapy and not surgery was the significant predictor. Also, a post hoc multivariate analysis that omitted radiation therapy indicated that stage was a predictor of survival when treatment was not included in the model.

The result of the multivariate analysis performed on patients with abnormal swallowing (SPS ratings 3–7) indicated that NPO status (with a 2.9 increased risk of death) and hypopharyngeal and oral cavity tumors (with 2.7 and 2.2 increased risks, respectively) were the only independent predictors of survival (Table 5, fourth and fifth columns). Age and radiation therapy were no longer associated with survival.

DISCUSSION

Despite current treatment protocols that are designed to spare normal tissue and preserve structure and function without sacrificing tumor control, dysphagia remains a prevalent and debilitating problem for many patients with head and neck cancer. In the present study, approximately 46% of patients had dysphagia before, during, or after their cancer treatments. Although this value is on the low end of the estimated range of 50% to 60% noted previously, 46% likely represents an underestimation of the incidence rate of patients with head and neck cancer who experience dysphagia. Although patients who did not have a formal diagnosis of dysphagia or a swallowing evaluation were assumed to have normal swallow function, it is likely that a small subset of these patients experienced swallowing difficulties. It is possible that a portion of these patients had some degree of dysphagia or aspiration, but were asymptomatic. Additionally, since the University of Iowa Hospitals and Clinics is a tertiary care center, some patients in the no-known-dysphagia group may have received dysphagia management services within their communities. The 46% therefore represents a conservative estimate reflecting health care providers' recognizing, perhaps evaluating, and definitely documenting these problems in the patients' medical notes.

The results of this study indicated that patients with early-stage disease and adenocarcinomas were significantly less likely to have swallowing problems, whereas females and patients receiving radiation therapy were significantly more likely to have swallowing problems. Because patients with advanced-stage SCCs represent the vast majority of this patient population, these disease-related variables are not very useful in identifying individuals who are likely to have swallowing problems; however, patients who are receiving radiation therapy to manage their stage III and stage IV SCCs, especially females, should be targeted as individuals who are likely to benefit from swallowing-related

preventative clinical interventions. It may be beneficial to obtain baseline measures of swallowing function and to integrate swallowing therapy into the standard protocol for radiation therapy by referring these patients to a speech-language pathologist before the initiation of cancer treatment. This proactive step for early intervention of high-risk individuals could enhance these patients' outcomes by promoting more aggressive treatment of swallowing difficulties. Also, that these swallowing evaluations were performed in a small percentage of patients up to 5 years after diagnosis illustrates how dysphagia can be a long-term problem for this patient population. This finding emphasizes the importance of monitoring for swallowing-related problems during follow-up visits, and making appropriate referrals when needed.

The significant difference shown in observed survival as a function of dysphagia severity was attributed to patients with an SPS rating of 7 (NPO status), having substantially lower rates than those of all other patients. There was no apparent correlation between increasing severity of dysphagia and decreasing length of survival. Instead, the significant predictor of survival was the most severe level of dysphagia with frank aspiration and/or inadequate oropharyngeal transit to the esophagus that resulted in a recommendation of NPO status.

The similar survival rates among the patients who were not NPO (62% to 68% at 5 years) suggests that individuals with moderate to moderate-severe dysphagia (SPS 5–6), which includes mild or inconsistent aspiration requiring both dietary modifications and swallowing precautions, did remarkably well. Their survival did not appear to be negatively affected by their dysphagia. Although this study did not address the efficacy of swallowing therapy, dietary modification, or swallowing precautions in these patients, their impressive survival may have been attributed to more intensive swallowing therapy that they may have received to ensure safety during continuing oral intake despite the presence of aspiration.

The multivariate analyses performed in this study indicated that severe dysphagia remained a significant, independent predictor of survival, even when other factors shown to influence survival (age, stage, site, histologic type, and receipt of radiation therapy) were included in the model. Although age, site, and the receipt of radiation therapy were all significant, independent predictors of survival in a group of patients representing all swallowing function ratings (normal to severe), NPO status was the independent predictor with the largest increased risk of dying (3.4 times more likely). NPO status also had a high risk of dying (2.9 times more likely) as an independent predictor of survival in the group of patients with documented mild to severe dysphagia. Anatomic site, the only other significant predictor of survival in this patient group, had 2.7 and 2.2 increased risks of death for hypopharyngeal and oral cavity tumors, respectively.

The present study's findings about the association between NPO status and worse survival reflect those of Ames et al,¹⁹ in which continued oral intake during gastrostomy tube placement in patients with head and neck cancer was associated with better survival. The study reported by Ames and colleagues, which was limited to patients with gastrostomy tubes during radiation therapy, found that continued oral intake was the only significant, independent predictor of survival, even when age and stage were taken into consideration. The present study, which included a broader spectrum of patients relative to swallow

function and treatment modality, still demonstrated that severe dysphagia with no oral intake has significant implications for expected survival.

It is intuitive that patients with the worst disease and most aggressive treatment would also be the patients most likely to experience severe dysphagia as well as decreased survival rates. However, these findings suggest that nutritionally related variables represent a merging of various demographic, clinical, and treatment-related factors that definitely predict and likely influence patient outcomes. This fusing of influential factors into single variables provides potent prognostic information.

The prognostic information provided by dysphagia suggests that swallowing status should be incorporated into the decision-making process regarding the treatment and follow-up care of patients with head and neck cancer. Although site and stage of disease are primary factors when choosing the appropriate management of these patients, dysphagia at the time of diagnosis might be an important consideration when determining the aggressiveness of cancer-directed treatment. After treatment, severe dysphagia should be a strong indication that patients are faring poorly and that clinical intervention might improve their prognosis.

The association between dysphagia and survival and the frequent underestimation of the presence of dysphagia demonstrate the important role that a speech-language pathologist performs as a member of the multidisciplinary management team overseeing the care of this patient population. A speech-language pathologist can ensure routine diagnostic and therapeutic swallowing interventions while encouraging oral intake as long as possible.

Although these studies have shown that continued oral intake in certain conditions is associated with better survival and that NPO status is associated with worse survival, there is a paucity of information about the positive and negative consequences associated with encouraging or discouraging continued oral intake in patients with varying degrees of dysphagia. Aspiration pneumonia is a primary concern with continued oral intake in patients with swallowing problems, although the patients in this study who were able to maintain at least a partial oral diet, even in the presence of aspiration, did remarkably well. Also, making a patient NPO does not necessarily prevent aspiration pneumonia. Studies conducted in the aging population indicated that the presence of a feeding tube was a strong predictor for developing aspiration pneumonia, presumably arising from the aspiration of secretions.^{25,26} Additional risk factors for developing aspiration pneumonia that were noted in these studies included multiple comorbidities, number of medications, and smoking.^{25,26} Poor overall oral hygiene, decayed teeth, and xerostomia, especially in the presence of compromised host resistance, were associated with an increased concentration of bacteria in the mouth and increased risk of aspiration pneumonia.^{27,28} These data suggest that patients who are NPO would also benefit from clinical interventions that focus on good oral hygiene and the ability to manage their secretions more efficiently and effectively.

Retrospective methodologies, such as the present study's design, play an important role in providing initial evidence about various topics, especially in relatively small patient populations such as those with head and neck cancer. Retrospective designs are limited, however, by the accuracy and availability of previously recorded information. For example,

the present study included 38 patients with dysphagia who had to be omitted from most analyses because the level of severity of their swallowing problems was unknown. Also, in a retrospective study, it is often difficult if not impossible to control for all possible biases that can influence the results' design.

The results of this retrospective study indicate that prospective studies are needed to determine if proactive swallowing therapy and strict oral hygiene regimens before, during, and after cancer treatment can counteract the negative impact of dysphagia, enhancing both quality and quantity of life potentially by encouraging patients to safely maintain and tolerate an oral diet as much as possible. Characteristics relating to disease status and demographics may allow for earlier identification and swallowing-related intervention of those patients at highest risk for poor survival, potentially improving long-term survival.

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Appendix A: Application of inclusion/exclusion criteria through each stage to determine eligibility

REFERENCES

1. Mittal B, Pauloski B, Haraf D, et al. Swallowing dysfunction: preventative and rehabilitation strategies in patients with head-and-neck cancers treated with surgery, radiotherapy, and chemotherapy: a critical review. *Int J Radiat Oncol Biol Phys.* 2003; 57:1219–1230. [PubMed: 14630255]
2. Pauloski B, Rademaker A, Logemann J, et al. Relationship between swallow motility disorders on videofluorography and oral intake in patients treated for head and neck cancer with radiotherapy with or without chemotherapy. *Head Neck.* 2006; 28:1069–1076. [PubMed: 16823874]
3. Carroll W, Locher J, Canon C, Bohannon I, McColloch N, Magnuson JS. Pretreatment swallowing exercises improve swallow function after chemoradiation. *Laryngoscope.* 2008; 118:39–43. [PubMed: 17989581]
4. Murphy BA, Gilbert J. Dysphagia in head and neck cancer patients treated with radiation: assessment, sequelae, and rehabilitation. *Semin Radiat Oncol.* 2009; 19:35–42. [PubMed: 19028344]
5. Epstein JB, Emerton S, Kolbinson DA, et al. Quality of life and oral function following radiotherapy for head and neck cancer. *Head Neck.* 1999; 21:1–11. [PubMed: 9890345]
6. Nguyen N, Sallah S, Karlsson U, Antoine J. Combined chemotherapy and radiation therapy for head and neck malignancies: quality of life issues. *Cancer.* 2002; 94:1131–1141. [PubMed: 11920484]
7. Gillespie MB, Brodsky M, Day T, Lee F, Martin-Harris B. Swallowing-related quality of life after head and neck cancer treatment. *Laryngoscope.* 2004; 114:1362–1367. [PubMed: 15280708]
8. Nguyen NP, Moltz CC, Frank C, et al. Dysphagia following chemoradiation for locally advanced head and neck cancer. *Ann Oncol.* 2004; 15:383–388. [PubMed: 14998839]
9. Nguyen N, Frank C, Moltz C, et al. Impact of dysphagia on quality of life after treatment of head-and-neck cancer. *Int J Radiat Oncol Biol Phys.* 2005; 61:772–778. [PubMed: 15708256]
10. Eisbruch A, Lyden T, Bradford C, et al. Objective assessment of swallowing dysfunction and aspiration after radiation concurrent with chemotherapy for head-and-neck cancer. *Int J Radiat Oncol Biol Phys.* 2002; 53:23–28. [PubMed: 12007937]
11. Nguyen N, Moltz C, Frank C, et al. Severity and duration of chronic dysphagia following treatment for head and neck cancer. *Anticancer Res.* 2005; 25:2929–2934. [PubMed: 16080546]
12. van Bokhorst-de van der Schuer PA, van Leeuwen DJ, Kuik WM, et al. The impact of nutritional status on the prognoses of patients with advanced head and neck cancer. *Cancer.* 1999; 86:519–527. [PubMed: 10430262]
13. Norton JA, Peacock JL, Morrison SD. Cancer cachexia. *Crit Rev Oncol.* 1987; 7:289–327.
14. Nguyen N, Moltz C, Frank C, et al. Impact of swallowing therapy on aspiration rate following treatment for locally advanced head and neck cancer. *Oral Oncol.* 2007; 43:352–357. [PubMed: 16931114]
15. Kronenberger MB, Meyers AD. Dysphagia following head and neck cancer surgery. *Dysphagia.* 1994; 9:236–244. [PubMed: 7805423]
16. Smith RV, Kotz T, Beitler JJ, Wadler S. Long-term swallowing problems after organ preservation therapy with concomitant radiation therapy and intravenous hydroxyurea: initial results. *Arch Otolaryngol Head Neck Surg.* 2000; 126:384–389. [PubMed: 10722013]
17. Morton R, Crowder V, Mawdsley R, Ong E, Izzard M. Elective gastrostomy, nutritional status and quality of life in advanced head and neck cancer patients receiving chemoradiotherapy. *ANZ J Surg.* 2009; 79:713–718. [PubMed: 19878166]
18. Mick R, Vokes EE, Weichselbaum RR, Panje WR. Prognostic factors in advanced head and neck cancer patients undergoing multimodality therapy. *Otolaryngol Head Neck Surg.* 1991; 105:62–73. [PubMed: 1909010]
19. Ames JA, Karnell LH, Gupta AK, et al. Outcomes following the use of gastrostomy tubes in patients whose head and neck cancer was managed with radiation therapy. *Head and Neck.* 2011; 33:638–644. [PubMed: 21077186]
20. Karvonen-Gutierrez CA, Ronis DL, Fowler KE, Terrell JE, Gruber SB, Duffy SA. Quality of life scores predict survival among patients with head and neck cancer. *J Clin Oncol.* 2008; 26:2754–2760. [PubMed: 18509185]

21. Dreyfuss AI, Clark JR. Analysis of prognostic factors in squamous cell carcinomas of the head and neck. *Hematol Oncol Clin North Am.* 1991; 5:701–712. [PubMed: 1890061]
22. IDC-9-CM 2010 Office edition. Practice Management Information Corporation; Los Angeles, CA: 2009.
23. CPT 2010 Professional edition. American Medical Association Press; 2009.
24. Karnell MP, MacCracken E. A database information storage and reporting system for videofluorographic oropharyngeal motility (OPM) swallowing evaluations. *Am J Speech Language Pathol.* 1994; 3:54–60.
25. Langmore SE, Terpenning MS, Schork A, et al. Predictors of aspiration pneumonia: how important is dysphagia? *Dysphagia.* 1998; 13:69–81. [PubMed: 9513300]
26. Langmore S, Skarupski K, Park P, Fries B. Predictors of aspiration pneumonia in nursing home residents. *Dysphagia.* 2002; 17:298–307. [PubMed: 12355145]
27. Campbell-Taylor I. Oropharyngeal dysphagia in long-term care: misperceptions of treatment efficacy. *J Am Med Directors Assoc.* 2008; 9:523–531.
28. Eisenstadt E. Dysphagia and aspiration pneumonia in older adults. *J Am Acad Nurse Pract.* 2010; 22:17–22. [PubMed: 20074192]

Severity of dysphagia	SPS rating by year					No. of patients	p-value
	1	2	3	4	5		
No known dysphagia	85.0	78.6	70.9	65.0	62.3	220	0.001*
SPS 3-4 (Mild/Mild-moderate)	93.6	80.9	70.2	66.0	61.7	47	
SPS 5-6 (Moderate/Mod-severe)	97.3	86.5	81.1	75.7	67.6	37	
SPS7 (Severe)	78.2	64.6	52.3	43.1	35.4	65	

FIGURE 1.

Observed survival by severity of dysphagia (SPS rating) for patients with head and neck cancer whose level of severity was known ($N = 369$). This analysis excludes the 38 patients who were known to have dysphagia but whose severity of dysphagia was unknown. Pairwise comparisons indicated that the SPS 7 (“severe”) group had a significantly lower rate than that of the no-known-dysphagia ($p = .001$), SPS 3–4 ($p = .005$), and SPS 5–6 ($p = .001$) groups. None of the other pairs was significantly different from each other.

Table 1Swallowing Performance Scale guidelines/criteria.²⁴

Rating	Degree of impairment	Description	No. of patients
1	Normal		*
2	Within functional limits	Abnormal oral or pharyngeal stage but able to eat regular diet without modifications or swallowing precautions	5
3	Mild impairment	Mild dysfunction in oral or pharyngeal stage; requires modified diet or therapeutic swallowing precautions	19
4	Mild-moderate impairment	Mild dysfunction in oral or pharyngeal stage; requires modified diet and therapeutic precautions to minimize aspiration risk	28
5	Moderate impairment	Moderate dysfunction in oral or pharyngeal stage; aspiration noted on exam requires modified diet and swallowing precautions to minimize risk of aspiration	22
6	Moderate-severe impairment	Moderate dysfunction in oral or pharyngeal stage; aspiration noted on exam requires modified diet and swallowing precautions to minimize risk of aspiration; needs supplemental enteral feeding support	15
7	Severe impairment	Severe dysfunction with significant aspiration or inadequate oropharyngeal transit to esophagus; nothing by mouth; requires primary enteral feeding support	65

Abbreviation: SPS, Swallowing Performance Scale.

* No patient was categorized as SPS 1 (normal) based on clinical or instrumental swallow evaluations. Instead, the 215 patients in this study who were considered as having no known dysphagia included those who had neither a dysphagia ICD-9 code nor a swallowing evaluation.

Table 2

Patient, disease, and treatment characteristics of patients with head and neck cancer by severity of dysphagia (SPS ratings) ($n = 407$).

	Row percentages of patients within the swallowing-function groups					
Characteristic	No known dysphagia (<i>n</i> = 220)	SPS 3–4: Mild to mild/moderate (<i>n</i> = 47)	SPS 5–6: Aspiration (<i>n</i> = 37)	SPS 7: NPO (<i>n</i> = 65)	Dysphagia, unknown severity (<i>n</i> = 38)	Total no. of patients (<i>n</i> = 407)
Age at diagnosis, y						
<55	51.8	16.5	7.9	13.4	10.4	164
55–69	46.6	1.1	14.2	18.2	10.8	148
70+	69.5	5.3	3.2	16.8	5.3	95
(Mean age)	(59.7)	(55.4)	(56.9)	(60.4)	(58.0)	(58.9)
Sex						
Male	55.5	12.8	7.7	13.5	10.6	274
Female	51.1	9.0	12.0	21.1	6.8	133
Site						
Oral cavity	57.5	14.2	6.7	18.7	3.0	134
Oropharynx	45.7	10.9	12.0	13.0	18.5	92
Hypopharynx	35.7	3.6	21.4	17.9	21.4	28
Larynx	48.6	13.3	10.5	20.0	7.6	105
Other [*]	83.3	6.3	—	4.2	6.3	48
Histology						
Adenocarcinoma	84.2	2.6	—	7.9	5.3	38
SCC	50.6	12.7	10.2	16.9	9.7	362
Other carcinoma	71.4	—	—	14.3	14.3	7
Stage						
Early (0–II)	71.5	9.3	4.6	8.6	6.0	151
Advanced (III–IV)	42.1	13.0	12.1	21.1	11.7	247
Unknown	88.9	11.1	—	—	—	9
Surgery						
Performed	56.4	12.9	8.2	17.1	5.4	280
Not performed	48.4	8.7	11.1	13.5	18.3	126
Unknown	100.0	—	—	—	—	1
Radiation						
Performed	44.4	13.1	13.1	18.3	11.2	268
Not performed	72.2	8.7	1.6	11.9	5.6	126
Unknown	75.0	—	—	25.0	—	4

Abbreviations: SPS, Swallowing Performance Scale; NPO, nil per os (“nothing by mouth”); SCC, squamous cell carcinoma.

* The 48 cases in the “Other” site group included 14 lip, 25 parotid gland, 1 submandibular gland, 6 nasopharynx, and 2 pharynx, not otherwise specified cases.

Table 3

Significant risk factors for swallowing-related outcomes in patients with head and neck cancer.

Factor	Swallowing-related outcome		
	Presence of dysphagia (n = 375)	Presence of aspiration (n = 339)	Level of dysphagia severity (n = 339)
Age at diagnosis	.246	.963	.952
Sex	.033	<.001	.002
Stage	<.001	.001	<.001
Site	.270	.598	.415
Histologic type	.016	.075	.047
Radiation performed	.006	.010	.015
Surgery performed	.922	.691	.421

Abbreviation: SPS, Swallowing Performance Scale.

Note: (1) The presence of dysphagia in 375 patients with known stage and treatment includes 181 with and 194 without, (2) the presence of aspiration in 339 patients with known dysphagia severity, stage, and treatment includes 100 with and 239 without, and (3) the level of severity of dysphagia in 339 patients with known dysphagia severity, stage, and treatment includes 194 with no known dysphagia, 45 with SPS 5–6, and 64 with SPS 7 ratings.

Table 4

Observed survival rates by demographic and disease characteristics of patients with head and neck cancer with known severity of dysphagia ($n = 369$).

Characteristic	5-y survival rate	No. of patients	<i>p</i> value
Age, y			<.001
<55	68.0	147	
55–69	56.1	132	
70+	44.4	90	
Sex			.455
Male	56.3	245	
Female	61.3	124	
Stage			<.001*
Early (0–II)	69.7	142	
Advanced (III–IV)	50.5	218	
Unknown	55.6	9	
Site			.039
Oral cavity	55.4	130	
Oropharynx	62.7	75	
Hypopharynx	31.8	22	
Larynx	61.9	97	
Other	62.2	45	
Histologic type			.027
Adenocarcinoma	74.9	36	
SCC	56.6	327	
Other carcinoma	33.3	6	
Radiation therapy			<.001**
Performed	52.7	237	
Not performed	73.6	110	
Unknown	36.4	22	
Surgery			.814
Performed	58.7	259	
Not performed	61.4	88	
Unknown	36.4	22	

Abbreviation: SCC, squamous cell carcinoma.

Note: This analysis excludes the 38 patients who were known to have dysphagia, but whose severity of dysphagia was unknown.

* *p* value excludes cases with unknown stage.

** *p* value excludes cases with unknown treatment.

Table 5

Cox regression analysis of the association between observed survival and selected patient, disease, and treatment variables. * within 2 groups of patients with head and neck cancer (1) who had a known level of dysphagia severity or (2) who had an SPS rating of 3 or higher denoting abnormal swallowing function.

Characteristic	Patients with a known dysphagia level (<i>n</i> = 339 [†])		Patients with abnormal swallow function (<i>n</i> = 145 [‡])	
	<i>p</i> value	Coefficient [§]	<i>p</i> value	Coefficient [§]
Age, y	<.001		.108	
<55	(Baseline)		— ¶	
55–69	.011	1.691	— ¶	
70+	<.001	2.971	— ¶	
Site	<.001		.023	
Oropharynx	(Baseline)		(Baseline)	
Oral cavity	.006	1.971	.028	2.230
Hypopharynx	.001	3.109	.041	2.670
Larynx	.966	— **	.843	— **
Other sites	.449	— **	.792	— **
Histologic type	.084		.103	
Adenocarcinoma	— ¶		— ¶	
SCC	— ¶		— ¶	
Other carcinoma	— ¶		— ¶	
Radiation therapy	<.001		.482	
Not performed	(Baseline)		— ¶	
Performed		2.399	— ¶	
Dysphagia severity	.001		.002	
No known dysphagia	(Baseline)		NA	
SPS 3–4: Mild–Mild/Mod	.018	2.113	.385	— **
SPS 5–6: Aspiration	.055	2.056	Baseline	
SPS 7: Severe	<.001	3.424	.002	2.886

Abbreviations: SCC, squamous cell carcinoma; NA, not applicable; SPS, Swallowing Performance Scale.

* The selected case-mix variables were those that were significantly associated with observed survival in univariate analyses (shown in Table 4).

[†]This group omits 38 patients who were known to have dysphagia but whose severity of dysphagia was unknown and 30 patients for whom stage and/or treatment was unknown.

[‡]This group omits 220 patients with no known dysphagia, 38 patients who were known to have dysphagia but whose severity of dysphagia was unknown, and 4 patients for whom stage and/or treatment was unknown.

[§]exp(B) coefficients are provided only for values with a *p* value <.05.

¶ If the overall variable's *p* value was not <.05, *p* values for a variable's individual values are not included.

** If the overall variable's p value is $<.05$ but the p value for an individual value for an individual value of the Variable is not $<.05$, the coefficient is not included. NA Patients with no known dysphagia were omitted from this analysis, so the "no known dysphagia" level within severity of dysphagia is not applicable.