Utilizing an Order Set in a Computerized Provider Entry System to Increase Speech Pathology Referrals in Adult Head and Neck Cancer Patients

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Abstract

Introduction

Treatment of head and neck cancers may include radiation therapy and side effects will result in swallowing difficulties that can lead to feeding tube use, malnutrition, and reductions in quality of life. Rehabilitation therapies are available and should be started before radiation treatment. Computerized ordering supports standardization of evidence-based order sets.

Objectives

The purpose of this study is to increase speech pathology referrals in adult patients undergoing radiation treatment for head and neck cancer.

Methods

A quality improvement project aimed at increasing speech pathology referrals was implemented using the PDSA (Plan Do Study Act) format. Chart review was completed to assess the baseline rate of speech pathology consults. An educational program was presented to providers after which an order set linking radiation and speech referrals was implemented. Post intervention data was collected, and chi square analysis was used to compare the difference.

Results

Preliminary data analysis noted an increase in speech pathology referrals from 18% pre-intervention to 82% post-intervention, which is a 450% increase. The sample was mostly Caucasian, married, and had a diagnosis of larynx cancer. Almost all of the patients received chemotherapy with their radiation.
Conclusion

Using order sets will encourage referrals to underutilized services. Nurses should be aware of the benefits of speech therapy in radiation patients and should be encouraged to advocate for services and collaboration to provide improved outcomes for oncology patients.

Key Words: Dysphagia, Head and Neck Cancer, Radiation, Computerized Order Entry
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**Background and Significance**

Cancers involving the head and neck can significantly impact a patient’s swallowing function and quality of life prior to, during, and after treatment; but can be improved with the use of swallowing therapy and the assistance of a speech language pathologist. An estimated 51,540 new cases will be diagnosed in 2018 and five-year survival rates are as high as 84% depending on stage at diagnosis (American Cancer Society 2018). Radiation, chemotherapy, and surgery are standard treatments for cancers involving the oral cavity, tongue base, and larynx (Hutcheson, Bhayani, Beadle, Gold, Shinn, Lai, & Lewin, 2013). Use of radiation will spare these organs from a surgery that may result in speech and swallowing impairment but has side effects including short and long-term dysphagia.

Dysphagia is the most common side effect of radiation in head and neck cancer patients (Hutcheson et al., 2013). Clinicians are concern about dysphagia because it can lead to aspiration, pneumonia, hospitalizations, weight loss, malnutrition, and feeding tube placement (Wells et al 2016). Patients are concern because of reduced quality of life, alterations in speech patterns and physical appearance, pain, and loss of social interaction (Ehrsson, Sundberg, Laurell, & Langius-Eklof, 2015). As survival rates improve there are more patients with long term complications that require rehabilitation services.

Many rehabilitation techniques are available to reduce dysphagia. Some methods are easy to teach the patient and can be reinforced by nurses in a interprofessional care setting (Shaker, Belafsky, Postma, Easterling, 2013), while others require speech language pathologists
with specialized training. Importantly, both short and long-term outcomes in speech and swallowing function are improved with rehabilitation therapy. Timing the implementation of therapy at the beginning of treatment, or earlier is recommended for improved quality of life and earlier feeding tube removal (Carroll, Locher, Canon, Bohannon, McCulloch, & Magnuson, 2008; Hutcheson et al., 2013; Wells et al., 2016). Despite the known benefits of dysphagia therapy, it is still not implemented regularly in clinical practice. Barriers and facilitators to implementation have been evaluated in prior studies. Provider perceived barriers include a lack of services within their community or practice setting, and unknown quality of those services that do exist (McEwen, Rodriguez, Martino, Poon, Dunphy, Rios, & Ringash, 2016). Patient perceived barriers include a lack of knowledge of the existence of rehabilitation methods, lack of time, and transportation concerns (McEwen et al., 2016). Provider reported facilitators include access to resources within the cancer center, confidence in the therapy services and speech pathologist, and automatically generated computer-based referrals. Patient reported facilitators include the ability to be assessed and screened by the speech language pathologist at the same time as other visits, and education about the negative consequences of not having therapy (McEwen et al., 2016). Dysphagia therapies exist and improve outcomes if initiated early. Facilitators to therapy have been identified including the use of automatically generated computer-based referrals.

Computerized provider order entry (CPOE) systems are used to enter orders directly into the patient’s electronic health record and support the standardization of evidence-based order sets. CPOE systems reduce redundancy in ordering, reduce errors, and have been implemented in many settings including oncology (Gellert et al, 2015; Martin, Kaemingk, Frieze, Hendrie, & Payne, 2015). Therefore, the purpose of this study is to examine the effect of implementing a
standardized order set among adult patients undergoing radiation treatment for head and neck cancer on referrals to speech language pathology for dysphagia therapy.

**Review of the Literature**

**Quality of Life**

Patients with cancers of the head and neck will suffer from a reduction in their quality of life (QOL) during radiation treatment (RT). Dysphagia is one of the most prevalent side effects that will also have a significant impact on QOL (Hawkins, Kadam, Jackson, & Eisbruch). Patients have reported impairments in speech and swallowing as their primary concerns post radiation (Ringash, Bernstein, Devins, Dunphy, Giuliani, Martino, & McEwen, 2018), and is one of the leading reasons survivors express decisional regret and stress over their treatment decision (Goepfert et al, 2017). The integration of a speech language pathologist into an oncology care team for prehabilitation, and rehabilitation care has proven to benefit the patient including improving treatment adherence, functional outcomes, patient satisfaction, and long-term QOL (Starmer, Ayoub, Byward, Kizner, Le, Hara, & Holsinger, 2017) (Cnossen et al 2017)

Studies have been completed to determine the timing of therapy including that by Kulbersh et al in 2006. They used a self-reporting scale that was mailed to patients with a history of radiation. The scale assessed the patient’s perception of how dysphagia impacts their daily living. Questions focused on the degree to which the patient feels upset and embarrassed by their inability to eat, ease of food preparation, ability to eat in public, and physical effects such as fatigue and weight loss. Patients who performed swallow therapy prior to radiation had significant improvement in QOL when compared to those who initiated therapy after the completion of RT (Kulbersh, Rosenthal, McGrew, Duncan, McColloch, Carroll, & Magnuson,
Kotz et al (2012) used two quality of life scales in their study. The first scored the type and texture of oral intake the patient could tolerate. The second scale assessed and scored the patient’s ability to eat in public, normalcy of diet, and intelligibility of speech. Significant improvements in scores were noted at three and six month follow up visits in the intervention group which initiated therapy at the beginning of RT, compared to those patients who received therapy only if symptomatic (Kotz, Federman, Kao, Milman, Packer, Lopez-Prieto, Forsythe, & Genden, 2012). Interestingly, that same study did note similar QOL scores in both groups by the nine and 12-month follow up (Kotz et al., 2012). The functional outcome swallowing scale (FOSS) is an objective clinician scored scale of dysphagia that assesses patients weight loss, function, and evidence of aspiration. This was utilized in a study by Peng et al (2015) and those patients who performed therapy prior to RT had little change in their scores indicating better outcomes (Peng, Kuan, Unger, Lorentz, Wang, & Long, 2015). Quality of Life can be improved with the implementation of swallowing therapy prior to starting treatment.

Few studies have assessed long term outcomes of RT on swallowing function due to more recent changes in radiation techniques allowing for improved organ preservation (Szczesniak, Maclean, Zhang, Graham, & Cook, 2014). One long term study was performed to assess the severity of dysphagia in patients who are two -eight years post treatment using a self-reporting questionnaire to evaluate symptom severity. Up to 59% of patients who did not receive therapy suffered from dysphagia in long term follow-up (Szczesniak et al., 2014). Delayed toxicities and complications may appear up to 20 years after treatment (Lavo, Ludlow, Morgan, Caldito, & Nathan, 2017), and although quality of life will be impacted during and after radiation, current evidence supports initiating swallow therapy prior to radiation to limit late toxicity, and provide earlier recovery.
Feeding Tube Usage

Patients undergoing radiation therapy are at risk for requiring feeding tubes (percutaneous endoscopic gastrostomy [PEG] tube) for nutrition support whether they receive swallowing therapy or not due to acute toxicities associated with RT. The incidence of requiring a PEG tube after completion of treatment can be as high as 45%, and up to 65% of patients will still show evidence of aspiration three months after treatment (Lavo et al., 2017). One study that assessed long term complications found that 21% of survivors required permanent PEG tube usage at 10 years post treatment, and some patients developed delayed complications requiring PEG placement anywhere from five-nine years after the completion of treatment (Dong, Ridge, Li, Lango, Churilla, Bauman, & Galloway, 2017).

Studies support early intervention to reduce reliance on feeding tubes. An early study from 2008 demonstrated that patients who started therapy two weeks prior to RT had a reduction in long term PEG usage. At 12- months post treatment only 33% of early intervention patients were still reliant on their PEG, compared to 44% of patients who started therapy once symptoms arose (Carroll et al., 2008). In 2013 Hutcheson et al compared outcomes based on compliance with recommended therapy. Prophylactic PEG tubes were not used, and placed in cases of weight loss, or malnutrition. Patients were encouraged to continue oral intake through treatment. Almost 40% of patients who both ate and performed regular therapy did not require prophylactic feeding tube placement; and those patients that did require PEG’s reduced duration of use by an average of 100 days (Hutcheson et al., 2013). This was supported by a second study in 2015 that demonstrated early feeding tube removal in patients who received therapy (Virani, Kunduk, Fink, & McWhorter, 2015). Kotz et al (2012) noted no difference in the number of patients who required PEG insertion, however they did not assess duration or extent.
of usage. Although patients may still require a feeding tube the extent and duration of usage can be significantly minimized by initiating dysphagia therapy prior to starting radiation treatment.

**Use of CPOE**

Changing a providers current practice, and ordering habits are a major hurdle. Passive dissemination methods have proven ineffective; however, the use of education, reminders, and computerized systems have been effective (Sim, Tan, & Abdullah, 2017). CPOE is used by clinicians to digitally enter orders into the patient’s electronic health record; evidence supports its use to provide standardized, evidence-based orders (Gellert et al., 2015). Oncology has lagged in the use of CPOE due to safety concerns, and the complexity of orders (Martin et al., 2015). One study set in a large oncology center implemented chemotherapy order sets in both an inpatient and outpatient setting. They developed 189 order sets and safety events were monitored for two years post implementation. These were compared to those events reported for the year prior to implementation. In the first year post implementation safety events rose slightly, but ultimately by the completion of the study they dropped by over 20% (Martin et al., 2015). The results of the study supported the use of standardized order sets in an oncology setting and found a significant reduction in redundancy and errors.

**Summary**

Although a patient’s quality of life will be impacted during their cancer treatment evidence reports a positive impact in those patients who receive swallowing therapy early in their treatment. Early intervention can improve QOL, reduce reliance on feeding tubes, promote earlier oral intake, and a reduce the length of time feeding tubes are needed. Few studies have evaluated the long-term impact of radiation on swallowing function, but there is evidence that dysphagia symptoms may persist in nearly 60% of patients two years or more after
treatment. CPOE has not been studied extensively in the oncology population, but has proven effective in increasing compliance, and reducing errors. With an estimated 436,000 head and neck cancer survivors currently in the US (Dong et al., 2017) it is imperative we aim to reduce both acute and chronic complications of RT. The goal of this study is to determine if referrals to the speech language pathology department increase with the use of a standardized order set in the CPOE system.

Methods

Design

A Retrospective -Prospective quasi-experimental quality improvement project was completed using a time series design, and the Plan Do Study Act (PDSA) framework. A retrospective chart review using the hospitals electronic health records, data repository, and tumor registry data was completed to determine the rate which speech pathology consults were ordered by the provider at the same time as the radiation consult. Patients were selected by cancer diagnosis, and the orders were reviewed to assess if a speech consult was placed. Once the referral rate was determined a brief educational program targeting ordering providers, clinical support staff, and nurses was presented at the departmental multidisciplinary tumor board. This discussed the known benefits of a swallow preservation protocol, and early swallow therapy. A demonstration of the order set, and ordering process was completed at the same presentation. At completion of the education program the standardized order set (Figure 1) created with the hospital IT specialist was pushed to all providers. Now Every time a radiation oncology referral is ordered the speech pathology referral will be automatically linked. The provider will need to edit the set and deselect the speech pathology order if it is determined to be an inappropriate
referral. Once the order set was implemented, prospective data collection monitored the rate at which speech pathology consults were ordered.

**Setting**

Patients from the Head and Neck Surgical Oncology outpatient clinic within a large urban teaching hospital were included. Patients are referred to the oncology service through internal consultations, emergency department referrals, and referrals from outside providers including other otolaryngologists, dentists, and primary care physicians.

**Inclusion Criteria**

Adult patients who were and will be treated for cancers involving primary sites associated with swallowing were included. Radiation to these sites will result in anatomic changes such as edema, and fibrosis which will affect range of motion of the muscles involved in swallowing, and lead to dysphagia (Hutcheson et al., 2013). The treatment plan must include radiation with or without chemotherapy. Cancer diagnoses included are: base of tongue (ICD-10 code C01), oral tongue (ICD-10 codes C02.0 C02.1 C02.2 C02.3 C02.4 C02.8 C02.9), tonsil (ICD-10 codes C09.0 C09.1 C09.8 C09.9), oropharynx (ICD-10 codes C10 C10.1 C10.2 C10.3 C10.8 C10.9), pyriform sinus (ICD-10 C12), hypopharynx (ICD-10 codes C13.0 C13.1 C13.2 C13.8 C13.9), and larynx (ICD-10 codes C32.0 C32.1 C32.2 C32.3 C32.8 C32.9).

**Exclusion Criteria**

Patients diagnosed with cancers that are treated with radiation for any primary site other than the prior mentioned diagnosis will be excluded. Many other cancers are treated with radiation that may not affect the patients swallowing function after treatment due to their targeted radiation fields such as nasopharynx, and skin cancers. Patients with unknown primary sites will be excluded since there would be no way to determine the radiation field, or its potential impact.
on swallowing function. Prisoners and patients referred from the veteran’s administration hospitals will also be excluded because we are unable to control the referral process and cannot guarantee the patient would be seen by our departments speech pathologists.

Data Collection

Data was extracted from the patient’s electronic health record including the data repository, tumor registry and Allscripts using a clinical data extraction tool developed by the researcher to collect the variables of interest. Demographics were collected including the patients date of birth, age in years, ethnicity, marital status, and educational level. Research variables include cancer diagnosis, use of concurrent chemotherapy, and if the order for speech pathology was completed.

Protocol

The methodology was reviewed with the hospital IT department, and the quality assurance officer. IRB approval was deemed unnecessary due to the fact the project is a quality improvement project. The data set did not include any identifying information, and each subject was de-identified by a study ID number. The protocol was written in the hospital PDSA format and included the plan, and intervention. Once completed it was submitted to the quality assurance office for approval. At the completion of the study the data will be submitted, with analysis and plans for future research.

Statistical Analysis

Demographic data was analyzed using descriptive statistics. A statistical analysis was conducted at the completion of data collection to determine the change in rate of ordering using a chi square analysis. A power analysis indicated that a sample size of at least 87 patients is sufficient (power = .80) with an alpha of .05 to determine statistical significance.
Preliminary Data Analysis

The charts were reviewed and key data points to be obtained included demographics such as age, gender, ethnicity, and marital status, the patients’ cancer diagnosis, whether they received chemotherapy with radiation, and finally the variable of interest; if the speech pathology consult was ordered. Fifty-six patients were enrolled in the study, 45 pre-intervention and 11 post-intervention. Descriptive statistics was used to describe the sample. And a chi square analysis was completed to assess the efficacy of the intervention. The total sample was mostly Caucasian (82%, n= 42) males (84%, n= 47) with an average age of 63 (range 38-83). Marital status was almost equally distributed 43% (n=24) were married, 38% (n=21) single, and 20% (n=11) were either divorced or widowed. Nearly all the patients received chemotherapy with their radiation treatment (98%, n= 55), and larynx cancer (36%, n=20) was the predominant diagnosis. Descriptive data is presented in Table 1. A statistical comparison of both groups noted similar demographics.

A chi square test of independence was calculated using IBM SPSS statistical analysis software (see table 2) comparing the frequency of speech pathology referral rates prior to the implementation of a standardized order set to the frequency of referrals post intervention. The relation between these variables was found to be statistically significant, \( x^2 (1, n=56) =17.147, p <0.01 \). The percentage of referrals post intervention (82%), was significantly higher than pre-intervention (18%) which is consistent with the hypothesis that a standardized order set would increase referral rates. The data is preliminary, and the sample size post intervention currently is small (n=11) in comparison to the pre-intervention group (n=45).
Discussion

The study supports the use of a computerized order set to increase the rate of speech pathology referrals. There was a clinical and statistical significance between both groups when compared. The success of the order set has led to an expansion of the project now including referral to dental oncology within the radiation set, and the creation of additional order sets such as a thyroid function panel (pairing T3, T4 and TSH), and imaging panel (pairing CT imaging with BUN and creatinine labs). Order sets can also be used to encourage referrals to other underutilized ancillary services that may be beneficial to the patient such as psycho oncology, dental, and palliative care.

Knowledge of the hospitals administration, IT department, and systems management all proved to be valuable assets in implementing the process improvement project. This project was implemented through the hospitals regulatory office and did not need to be submitted to the IRB; but this may not be the case in other hospital systems.

Limitations of the study include the small post intervention sample size. The goal was to evaluate 45 charts pre and post intervention, however due to a drop in the number of oncology patients referred to the department mid study there were fewer charts reviewed resulting in only a preliminary data analysis. The utilization of neoadjuvant induction chemotherapy resulted in delay of radiation referrals by multiple weeks-months after initial consultation resulting in a limited number of charts that could be reviewed between implementation of the intervention and the writing of this abstract. Staffing changes may have contributed to the increase in speech pathology referral rates. At the beginning of the study there was only one advanced practice provider working in the department which may have led to a reduction in speech referrals due to
time limitations. Over the last nine months three additional advanced practice providers were hired, one of which was hired post order set implementation.

**Implications for Nursing**

Nurses should be aware of the existence of supportive services that can be provided to patients during their treatment such as speech pathology, psycho oncology, dental, palliative/supportive care, and others. If such services are available within the hospital there should be an attempt made to create relationships with those providers, and work together in a interprofessional setting to educate and reinforce rehabilitation and techniques in the absence of the speech pathologist. If the nurse works in a non-tertiary setting they should work with the providers to establish relationships with specialists in their geographic region to facilitate patient referrals. Nurses should also ensure when assessing patients beginning or undergoing radiation treatment they have been referred to the appropriate ancillary services and encourage the provider to order appropriate referrals to improve long term outcomes. Awareness and implementation of order sets will encourage and improve evidence-based practice, and nurses should make recommendations to implement such changes in their practice setting when appropriate.

**Conclusion**

Patients who have been diagnosed with a cancer of the head and neck will suffer from treatment related side effects, most commonly dysphagia. Dysphagia can be treated with early intervention therapy with the assistance of a speech language pathologist. Use of a computerized order entry set has proven an effective method to increase referral rates to the speech language
pathologist and should be considered to promote evidenced based ordering. Providers should be encouraged to create relationships with professionals in other disciplines such as a speech language pathologist that they can refer their patients to for beneficial services during their cancer treatment.

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References


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### Tables

#### Table 1

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<tr>
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Table 2

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a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.34.
b. Computed only for a 2x2 table
Figure 1. Example of the current order set