

ORIGINAL RESEARCH

Timely delivery of PORT for head and neck squamous cell carcinoma in a county hospital

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Abstract

Objectives: The objective of this study was to compare the rate of post-operative radiation therapy (PORT) initiation within 6 weeks for head and neck squamous cell carcinoma patients treated at a safety net, academic institution between 2019 and 2021 versus those treated in 2022 after implementation of a new clinical pathway.

Methods: A retrospective case-control study was performed at a single tertiary care, safety-net, academic institution. Patient demographics, tumor characteristics, dates of surgery, and other treatment dates were collected from the electronic medical record. The time from surgery to PORT was calculated. Patients who started radiation treatment within 42 days of surgery were regarded as having started PORT on time. The demographics, tumor characteristics, and rate of timely PORT for the two cohorts of patients were compared.

Results: From 2018 to 2021, our rate of PORT initiation within 6 weeks of surgery was 12% ($n = 57$). In 2022, our rate of timely PORT was 88% ($n = 16$), $p < 0.5$. Patient demographics and characteristics were similar with the exception of marital status and use of free-flap reconstruction. The 2022 cohort was more likely to be single ($p < 0.5$), and all patients underwent free-flap reconstruction in 2022 ($p < 0.05$).

Conclusion: Early referrals, frequent communication, and use of a secure registry were the key to the success found by our group despite the socioeconomic challenges of our underserved, safety-net hospital patient population. The changes made at our institution should serve as a template for other institutions seeking to improve the quality of care for their HNSCC patients.

KEYWORDS

head and neck cancer, post-operative radiation, quality improvement, safety-net hospital

1 | INTRODUCTION

With a robust body of literature to support improved oncologic outcomes for head and neck squamous cell carcinoma (HNSCC)

patients who start adjuvant radiotherapy within 6 weeks of surgery,¹⁻³ the Commission on Cancer recently made this guideline a quality metric in 2022. This has led to a number of quality improvement initiatives nationwide.^{4,5} Despite the robust data supporting this guideline for a

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number of years, many institutions, including many leading cancer centers, have struggled to meet this goal for a large percentage of their patients.^{6,7} Additionally, delays in post-operative radiation therapy (PORT) disproportionately affect Black patients, patients with nonprivate insurance or uninsured patients, and patients with lower education.⁷

Our group previously published a clinical pathway initiation that successfully improved the percentage of HNSCC patients receiving PORT within 6 weeks of surgery at a Veterans Affairs (VA) hospital.⁸ Veterans Health Administration (VHA) facilities exist as horizontally and vertically integrated health delivery systems that overcome many institutional barriers to streamlined health care delivery, particularly in the context of timely PORT for head and neck cancer patients. In the cohort of patients subject to a more streamlined, parallel processing clinical pathway 18/24 (75%) initiated PORT within 42 days.

We decided to apply this pathway to a county hospital that serves the predominantly uninsured and minority patients of Harris County. At this county hospital, there exist institutional, patient/social, and disease characteristic barriers to delivering multidisciplinary, multimodality, and temporally integrated care. Despite this, our hypothesis was that we could apply many of the care pathway tenets from our VA hospital experience to our county hospital to improve the delivery of head and neck cancer care by improving the percentage of patients initiating PORT within 6 weeks of surgery.

2 | MATERIALS AND METHODS

2.1 | Patient cohort and calculation of time to PORT initiation

Following approval from the Baylor College of Medicine Institutional Review Board, two cohorts of patients were reviewed for comparison. The historic cohort consisted of head and neck (oral, oropharyngeal, laryngeal, and hypopharyngeal) squamous cell carcinoma patients who underwent curative intent surgery followed by adjuvant radiation between January 1, 2019, and December 31, 2021. After implementation of our cooperative measures to improve timely PORT initiation, a second cohort of patients was reviewed that underwent primary surgery and PORT with a surgery date between January 1, 2022, and December 31, 2022. Demographics, disease characteristics, and treatment details, including date of surgery and date of radiation initiation and completion, were collected. Time to initiation of PORT from date of surgery was calculated. Patients who initiated PORT on or before day 42 after surgery were considered as having started PORT on time, whereas those that started radiation 43 days and beyond their surgery date were regarded as not meeting the quality metric.

2.2 | Transitioning to a new phase of head and neck cancer care delivery

Using the VA Head and Neck Cancer Clinical Pathway⁸ as a model (Figure 1), we embarked on a new era of head and neck cancer care delivery at Ben Taub Hospital, a Harris Health System county hospital.

Our tumor board registry exists on a secure server, is used to update head and neck cancer patient information, such as pathology, staging, and treatment dates, and is further purposed as a tool updated on at least a bi-weekly basis to track patients undergoing or pending treatment (surgery and radiation). A patient's deadline (date) for starting radiation was automatically calculated (42 days after their surgery date) and made visible on the secure registry. This visibility led to frequent and secure communication with radiation oncology and medical oncology physicians and other providers to ensure appropriate scheduling of appointments, simulation dates, and radiation start dates to achieve initiation of PORT within the required timeline.

To solidify the plans laid out by our new pathway, explicitly define our goal of timely PORT for all head and neck cancer patients, and review our prior inadequacies at compliance to this guideline/metric, a formal meeting to discuss optimization of head and neck cancer delivery was held at the beginning of 2022. Attendees of this meeting included leaders and heads within the department of Otolaryngology – Head and Neck Surgery and Radiation Oncology. This conference served to mark the initiation of our quality metric improvement objective, familiarize the relevant team members with the secure tumor board registry, and outline plans for rapid secure communication regarding patients pending treatment initiation and completion.

The following improvement goals were made to the usual work up and treatment of head and neck cancer patients (Figure 1):

1. All patients were added to a secure head and neck cancer registry database shared by all relevant providers.
2. Radiation oncology referrals were placed for all new head and neck cancer patients as soon as patients were identified, including those that were to undergo primary surgical treatment with or without the need for adjuvant radiation.
3. Radiation start deadline dates (42 days from surgery date) were auto-populated in the secure registry as soon as a surgery date was input.
4. Frequent secure communication occurred between the surgical and radiation oncology teams for patients being actively worked up and treated or when post-operatively delays were expected.
5. Dental extractions were coordinated with oral maxillofacial surgery team either prior to or during the primary surgical resection.
6. Inpatient and outpatient social workers and case managers were engaged upon acquaintance with the patient to work on optimizing patient eligibility for those that qualified.
7. A low threshold was maintained for the use of high-fidelity free-flap reconstruction for patients to ensure timely healing and readiness for post-operative radiation.
8. For patients not seen prior to surgery, same-day simulation in consultation with radiation oncology was considered if clinically appropriate.

3 | RESULTS

Fifty-seven patients underwent surgery and PORT from 2018 to 2021, whereas 16 patients underwent surgery and PORT in 2022.

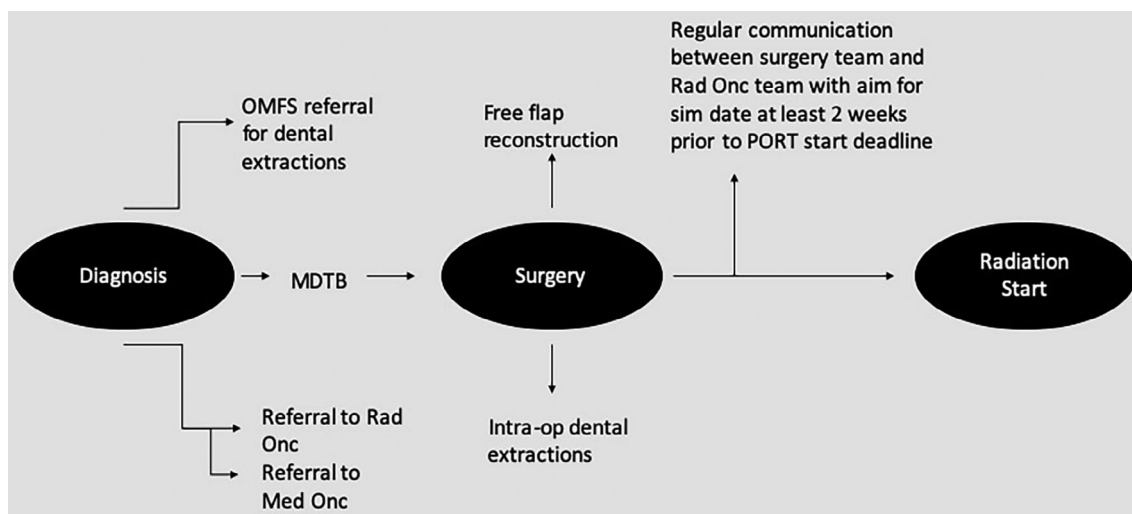


FIGURE 1 Core elements of clinical pathway to improve timely PORT. MDTB, multidisciplinary tumor board; Onc, oncology; OMFS, oral and maxillofacial surgery; PORT, post-operative radiation therapy.

Most patients in both cohorts were minorities. Forty-two percent of the historic cohort were Hispanic, and 26% were Black. In 2022, 38% of patients were Hispanic and 19% were Black. Patients in the 2022 cohort were more likely to be single (63% vs. 30%, $p < 0.05$). With respect to tumor site, T classification, and N classification, there were no significant differences between the two groups. All (100%) the 2022 patients underwent free-flap reconstruction compared to 77% of the historic cohort ($p < 0.05$) (Table 1). Surgical complications were comparable for the two cohorts. However, there were no flap losses in 2022 compared to 4 (8.3%) for the historic cohort (Table 2). With respect to dental extractions prior to radiation, most patients underwent extractions at or before their oncologic surgery (81% vs. 75% for the historic and 2022 cohorts). Five patients in the historic cohort (9%) required dental extractions after their oncologic surgery (prior to radiation), whereas no patients in 2022 required delayed extractions (Table 3).

For the historic cohort, 7/57 patients (12%) initiated PORT within 42 days (6 weeks) of their surgery date. By comparison, in 2022, 16 patients with HNSCC underwent surgery and PORT, and 14/16 (88%) started radiation within 6 weeks ($p < 0.05$). The time interval from simulation to the start of radiation remained consistent at a mean of 17.4 days for the historic cohort and 15.4 for the 2022 cohort. However, the time interval between surgery and radiation simulation was significantly reduced in 2022 (25.2 days vs. 40.9 days, $p < 0.05$). This translated into a mean time from surgery to radiation of 40.6 days in 2022 compared to 58.5 days for the historic cohort ($p < 0.05$) (Figure 2). In addition, referrals to radiation oncology were made prior to surgery for 87.5% of patients in 2022 and only 12.3% of patients in the historic cohort ($p < 0.05$) (Table 4). Table 5 demonstrates the various reasons for radiation delay. Historically, 58% of delays were due to scheduling issues and 14% were due to prolonged hospitalizations, whereas in 2022 there were no delays due to scheduling reasons or prolonged hospitalizations.

4 | DISCUSSION

Now that head and neck oncologic surgery is being challenged to meet a quality metric to ensure the optimal outcomes for patients under our care,⁹ it behooves the head and neck multidisciplinary team to take a hard look at our current and past outcomes and implement changes to affect these outcomes in a way that will improve our ability to meet the 6 week PORT quality metric and continue to advance the care of head and neck cancer patients. Luckily, we do not have to reinvent the wheel. Our affiliated VA head and neck cancer team has previously published their work on implementing a new pathway to improve their timely administration of adjuvant treatment for their head and neck cancer patients.⁸ Similar to the approach taken by our group, this involved rapid, secure electronic communication regarding newly diagnosed patients and simultaneous parallel work up and input from all oncologic services (surgery, medical, and radiation) and ancillary services. In a horizontally and vertically integrated health delivery system such as the VA with all resources available and physically located on a single campus, this makes for a streamlined pathway.

Our institution is a safety-net hospital for Harris Health System (HHS), which serves Harris County. Uninsured patients who meet eligibility for financial assistance (less than 150% of the national poverty level) are eligible for care at HHS hospitals and clinics. Once the eligibility barrier is crossed, there often exists a myriad of socioeconomic challenges such as language incongruence, transportation,¹⁰ and limited social support. The Harris Health System patient population is comprised of 53% Hispanic, 24% Black, 14% White, and 8.7% Asian or other. In terms of patient payor mix, 46% of patients are uninsured and 21% have Medicaid insurance. In the 2022 fiscal year, HHS provided \$796 million in charity care. Several studies have enumerated and measured the negative impact of certain social determinants of health on head and neck cancer outcomes, many of which apply to patients presenting to a safety-net public hospital.^{7,11-15} Thus, the findings herein that improvements to a head and neck cancer PORT

TABLE 1 Patient demographics and characteristics.

		2019–2021 (n = 57)		2022 (n = 16)		p-value
		n	%	n	%	
Age	≤60	36	63	9	56	0.62
	>60	21	37	7	44	
Sex	Male	44	77	12	75	0.86
	Female	13	23	4	25	
Race/ethnicity	White	13	23	5	31	0.53
	Hispanic	24	42	6	38	0.74
	Black	15	26	3	19	0.54
	Other	5	9	2	12	0.65
Language	English	35	61	12	75	0.32
	Spanish	20	35	3	19	0.21
	Other	2	4	1	6	0.62
Marital status	Married	25	44	1	6	0.005
	Single	17	30	10	63	0.017
	Divorced	12	21	2	12	0.44
	Widowed	3	5	3	19	0.08
Insurance status	Gold card*	41	72	13	81	0.45
	Private	5	9	1	6	0.75
	Medicare	8	14	1	6	0.4
	Medicaid	3	5	0	0	0.35
	Self-pay	0	0	1	6	0.06
Home status	Living alone	10	18	3	19	0.91
	With someone else	42	74	13	81	0.54
	Homeless	5	9	1	6	0.75
Primary site	Oral cavity	39	68.4	12	75	0.61
	Oropharynx	4	7	0	0	0.27
	Hypopharynx/larynx	14	24.6	4	25	0.97
T classification	T1	3	5	0	0	0.35
	T2	9	16	1	6	0.33
	T3	13	23	3	19	0.73
	T4	32	56	12	75	0.17
N classification	N0	21	37	3	19	0.17
	N1	4	7	3	19	0.16
	N2	15	26	7	44	0.18
	N3	17	30	3	19	0.38
Flap	Yes	48	84	16	100	0.09
Type of flap	Free flap	44	77	16	100	0.03
	Pedicled	4	7	0	0	0.28

*Gold card – Harris Health System financial assistance program recipient (uninsured).

TABLE 2 Surgical complications.

	2018–2021 (n = 57)		2022 (n = 16)		p-value
	n	%	n	%	
Flap loss	4/48	8.3	0/16	0	0.23
30 day OR takeback	10	18	1	6	0.26
30-day readmission	6	11	2	13	0.83

TABLE 3 Dental extractions.

	2018–2011 (n = 57)		2022 (n = 16)		p-value
	n	%	n	%	
Dental extractions before or same day as oncologic surgery	46	81	12	75	0.62
Dental extractions after surgery	5	9	0	0	0.22
Edentulous	7	12	1	6	0.5
Refused dental extraction	4	7	3	19	0.16

FIGURE 2 Historic cohort versus 2022 cohort time to PORT initiation. Comparison of historic cohort to 2022 cohort time intervals from surgery to PORT. *p < 0.05.

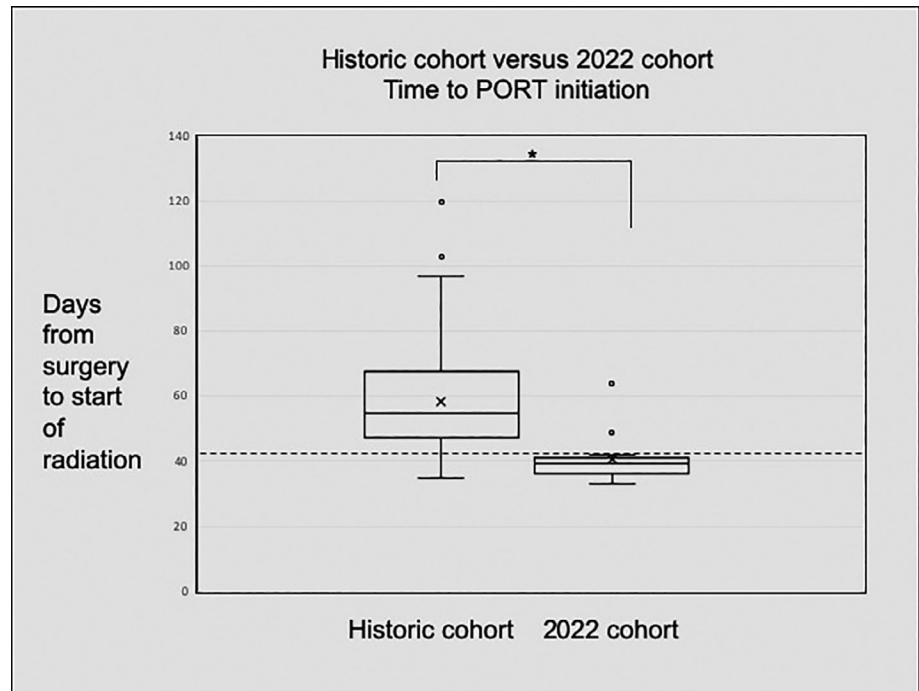


TABLE 4 PORT data.

	2018–2021 (n = 57)		2022 (n = 16)		p-value
	n	%	n	%	
PORT started within 42 days of surgery	7	12.3	14	87.5	<0.05
Referral to radiotherapy prior to surgery	19	33.3	14	87.5	<0.05
	Mean	Std dev	Mean	Std dev	p-value
Surgery to RT sim (days)	40.9	17.5	25.2	15.4	<0.05
Sim to RT start (days)	17.4	8.3	15.4	4.5	0.16
Surgery to RT start (days)	58.5	17	40.6	7.1	<0.05

pathway can be applied to this challenging patient population with meaningful and objectively measured success is extremely encouraging for all institutions hoping to improve their metrics.

Patients presenting with HNSCC at tertiary care, public/county hospitals often present with advanced stage disease.^{16,17} Thus, multimodality treatment coordination is paramount to treating these patients appropriately. The improvements made in the timely delivery of PORT across the two cohorts in this study demonstrate the targetable improvements the multidisciplinary team can focus to shorten the time to PORT initiation. These include the timing of the radiation referral prior to surgery and the time from surgery to radiation

simulation. These improvements, specifically the latter, are facilitated by improved communication between the surgical teams and the radiation oncologists. Table 5 highlights the scheduling issues addressed at the start of 2022 as 58% of prior delays were due to scheduling issues and there were no such scheduling issues resulting in delays in the 2022 cohort.

Key improvements in our head and neck post-operative pathway can be replicated at other institutions with the appropriate time and energy and a secure head and neck cancer registry to allow real-time tracking of patients (variables captured by this registry listed in Table 6). At our institution, the head and neck surgery team took on

	2018–2011 (n = 57)		2022 (n = 16)		p-value
	n	%	n	%	
Scheduling	33	58	0	0	<0.05
Prolonged hospitalization	8	14	0	0	0.11
Readmission	4	7	0	0	0.28
Patient compliance	2	4	1	6	0.62
Social issues	3	5	1	6	0.88
Pending dental work	5	9	0	0	0.22
COVID	1	2	0	0	0.6
Anxiety attack	1	2	0	0	0.6

TABLE 5 Reasons for delayed PORT.

TABLE 6 Head and neck tumor registry variables.

Date of birth	TB recommendation
Age [at diagnosis]	Patient decision
Sex	Curative intent
Race/ethnicity	Dental extractions (date)
Insurance	Surgery type
Language	Surgery date
Marital status	Surgery pathology number
Home status/homeless	T (pathologic)
Pack years (tobacco)	N (pathologic)
Alcohol use	Target XRT date
Pathology (histology)	XRT appt (date)
Date of diagnosis	XRT sim (date)
Pathology number	XRT start (date)
Site	XRT stop (date)
Subsite	Completed treatment
Previous treatment	Chemo
T (clinical)	Chemo, induction
N (clinical)	Chemo, other
M	1st post-treatment imaging date
TB date	1st post-treatment imaging modality

the responsibility of regularly updating the registry and sending frequent communications to radiation oncology and other relevant team members, as necessary, to ensure appropriate timing of appointments, simulation dates, and radiation start dates. In multiple instances, early communication allowed our radiation oncologists to be aware that a patient may not make their appointment due to surgical recovery or other extenuating factors; these patients were often rescheduled promptly with a same-day simulation or seen and simulated as inpatients. A physician extender or clinical navigator with the appropriate training may serve in the role of patient navigation and primary clinical team communicator for the multidisciplinary head and neck cancer team.¹⁸

The availability of oral maxillofacial surgery (OMFS) with the flexibility to assess patients pre-operatively in a timely manner and

accommodate dental extractions at the time of surgery is another cornerstone of a successful head and neck cancer program. This requires a strong partnership with the OMFS surgeons, who are knowledgeable of the risk of osteoradionecrosis of the jaw based on radiation doses and the quality of patient dentition. Pre-operative assessment includes clinical examination and panoramic x-ray of the jaws. The practice of early dental extractions has been shown to facilitate timely PORT¹⁹ and should be a part of any multidisciplinary treatment plan.

Another essential component of a successful multidisciplinary team is the availability of reliable, high-quality microvascular free-flap reconstruction. High-fidelity free-flap reconstruction is a vital tool for any head and neck oncologic program to ensure patients heal in a timely manner prior to initiation of adjuvant radiotherapy.²⁰ Although the complexity of surgeries increase with the use of microvascular-free tissue transfer (MVFTT) reconstruction, low complication rates justify and support the use of this reconstructive modality. In our 2022 cohort, all 16 HNSCC patients received MVFTT reconstruction, and no flap failures were observed. Our groups' experience and the recent literature supports the decision to perform MVFTT as a reliable and safe first-line reconstruction for our patients.^{21,22}

The next objective our group will look to measure is the sustainability of this clinical pathway in years to come. Ultimately, we care about meeting the timely post-operative radiation therapy metric because of its impact on oncologic outcomes.^{1–3} Thus, we aim to demonstrate the impact on improved oncologic outcomes for our patients with better adherence to the 6 week PORT timeline. Health care systems that serve as a safety net for uninsured patients have an incentive to provide resources for head and neck multidisciplinary teams (transportation, case managers, social workers, clinical navigators, surgical equipment, radiation equipment, more efficient radiation treatment planning software, etc.) to improve time to PORT, improve oncologic outcomes, and, therefore, avoid the costly endeavor of treating recurrent squamous cell carcinoma. Jurica et al. estimated that for institutions responsible for the delivery and payment of health care (VA and other public institutions), there are immense cost-saving incentives for delivering timely PORT for HNSCC due to the measurable cost of FDA-approved immunotherapy for recurrent and metastatic HNSCC.²³

5 | CONCLUSION

Delivery of timely post-operative radiation therapy in a safety-net health care setting is attainable with buy-in from all clinical services and implementation of several protocols as part of a clinical pathway, the most important of which is a secure registry tracking patients and regular secure communication between surgeons and radiation oncology physicians. Institutional resources, such as transportation assistance and clinical navigators, should be appropriately allocated to support such a pathway. Our success within a safety-net hospital that primarily serves minority patients of low socioeconomic status allows for optimism for other institutions seeking to improve the timely delivery of PORT to HNSCC patients.

CONFLICT OF INTEREST STATEMENT

The authors report no conflicts of interest for the existing work.

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