



An Interdisciplinary Fast-Track Diagnostic Program for Head and Neck Cancer: Reducing Time to Treatment Initiation

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Abstract

Background: A timely initiation of therapy crucially impacts the prognosis of head and neck tumor patients. Previous research has shown that shortening the Time-to-Treatment Initiation (TTI) significantly improves survival and functional outcomes. In February 2020, a novel Interdisciplinary Fast-Track Diagnostic Program (IFTDP) for head and neck cancer was implemented at our institution. The aim was to optimize the diagnostic work up and staging process within three subsequent days. In this study, we aimed to assess the impact of the IFTDP on the TTI.

Methods: We included patients with primary head and neck tumors undergoing the IFTDP from January 2019 to September 2020. A historical patient cohort originating from the time prior to the introduction of the IFTDP served as control group.

Results: A total of 289 patients treated in curative intent either surgically or radio therapeutically were included in the study. Compared to the historical controls, overall TTI was reduced by 25% from 28 to 21 days (p=0.002).

Conclusion: An IFTDP can significantly reduce TTI, which presumably affects survival and functional outcomes. Moreover, increasing the efficiency of the diagnostic workup may avoid redundancies and could contribute to an early detection of potential risk factors.

Introduction

In Switzerland, around 1,500 people develop a malignant head and neck tumor (mouth, throat and larynx) every year. The most important risk factors are excessive alcohol and tobacco consumption and infection with a high-risk type of human papillomavirus. The incidence of Head and Neck Squamous Cell Carcinomas (HNSCC) increases with age. Most patients are between 50 and 70 years of age; however, an increasing incidence in younger patients is evident, which can be attributed to an increasing number of HPV-associated tumors in recent years [1].

Early diagnosis and initiation of the therapy is a crucial factor for prognosis and post-therapeutic quality of life in HNSCC. However, with the exception of glottic carcinoma, which is associated with hoarseness, these tumors rarely show early symptoms and are often detected only by the presence of lymph node metastases and thus at an advanced stage [2]. Depending on the location and size of the tumor, preexisting functional limitations, previous illnesses of the patient and pre-treatments, the recommended therapy for advanced tumors consists of surgery with or without reconstruction, usually followed by adjuvant chemo- and/or radiotherapy or primary radiotherapy with or without concomitant chemotherapy [3].

In HNSCC patients, the Time-to-Treatment Initiation (TTI) is a crucial factor due to relatively fast-growing tumors in anatomically and functionally complex areas. In the past, decision on therapy has been made on an interdisciplinary basis in a tumor board (Multidisciplinary Tumor [MDT] board) after the necessary diagnostic steps have been taken. The necessary diagnostics for head and neck tumors include imaging and panendoscopy under anesthesia for biopsy. In our personal experience, the various diagnostic steps up to the effective start of therapy took an

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average of around 40 days, which does not include the time between the first symptoms and referral by the specialist. Furthermore, at the time of the treatment decision, the specialists in radiation oncology who were responsible for the treatment decision had not yet met the patients personally and could only form an impression of them on the base of descriptions, diagnosis list and imaging. These procedures, established over many years, resulted in a potential professional bias in treatment decisions. Lastly, previously less considered factors in the treatment decision were interprofessional aspects, such as psychosocial factors, nursing aspects, nutritional status of the patient, functional conditions, anesthesiological factors, and dental status. In clinical practice, however, these factors proved to be essential both for the decision on therapy (potential preparation of the patient for the planned therapy) and for the subjective and objective success of the therapy. Furthermore, relevant findings detected only at a later stage, led to a delay in the start of therapy. Studies have shown that by shortening the TTI, survival and functional outcome can be significantly improved [4,5].

Dealing with their disease and its therapy is a major challenge for HNSCC patients and their relatives, both in somatic and psychosocial terms. Already for the determination of the therapy they need patient-oriented information. In the decision-making process, in the development of survival strategies and in order to increase the quality of life, continuous, individually adapted knowledge transfer and practical guidance, coordination and control of the various services of the interprofessional care team as well as sympathy and support are required [6,7].

Numerous scientific studies have demonstrated positive effects on patient outcomes (quality of care, outcomes of medical interventions, patient safety, patient satisfaction) and teamwork of different professional groups of practice development projects based on interprofessional collaboration [8-12]. In 2014, the Swiss Academy of Medical Sciences published the Charter "Collaboration of Healthcare Professionals", which provides a basis for interprofessional collaboration for healthcare professionals and institutions [13]. It states that the patient is at the center of health care, which means that the educational, advisory, preventive, diagnostic, therapeutic, nursing, rehabilitative and palliative services of all necessary professionals must be coordinated. In addition, mutual information should be always guaranteed, and work should be based on mutual respect and jointly defined, recognized standards [7]. Experience at our institution has shown that the various players in the interprofessional treatment team each competently informed patients in their respective areas of responsibility, but that the information process was uncoordinated and there was no mutual exchange.

This study therefore aimed to assess the impact of a recently implemented Interdisciplinary Fast-Track Diagnostic Program (IFTDP) on the TTI for HNSCC patients.

Material and Methods

Data collection

Data stems from patients with HNSCC treated at the University Hospital Zurich, Zurich Switzerland (USZ), from January 2019 to September 2020. All data was retrieved electronically from the electronic health records of oncological patients *via* the clinical management software (KISIM, Cistec AG, Zurich, Switzerland).

Study population

With Ethics Review Board approval (Ref. -No. BASEC-NR.

2018-02126), we retrospectively included HNSCC patients treated from January 2019 to September 2020 at the Department of Otorhinolaryngology - Head and Neck Surgery and Department of Cranio-Maxillo-Facial and Oral Surgery of the University Hospital Zurich, Zurich, Switzerland.

Primary squamous cell carcinoma of the oral cavity, oropharynx, hypopharynx, larynx, nasopharynx and metastases in the neck from an unknown primary tumor were included. Patients with previous treatment for their tumor elsewhere, previous HNSCC, or previous radio (chemo) therapy in the head and neck area were excluded. The patient cohort from January 2019 to February 2020, before introduction of the IFTDP, was compared with the cohort after the implementation in February 2020.

Statistical analyses

For descriptive data analysis, we used R software environment for statistical computing and graphics. The level of significance was set at $p < 0.05$. For continuous variables, distribution was evaluated for normality according to Gauss' theorem. In addition, the normality of data distribution was assured through log-transformation whenever necessary. For normally distributed variables, mean and standard deviations are given and comparison among study groups was done using the t-test. For non-normally distributed variables median, Interquartile Range (IQR) are given. To compare distribution of variables among groups, we used t-tests and non-parametric Mann-Whitney U tests.

Diagnostic process

All patients with proven cancer or a suspicion of cancer were guaranteed access to a first consultation within 7 days of referral by a consultant. All patients underwent a full oncological workup, including a medical history, a physical examination, and imaging, cytological, and/or histopathological examinations. Imaging (Computed Tomography (CT) and/or Magnetic Resonance Imaging and/or PET scan) of the head and neck, ultrasonography with Fine-Needle Aspiration Cytology (FNAC) of lymph nodes suspected for metastases, and Positron Emission Tomography (PET)- CT for unknown primary tumors. All cases were discussed at the MDT board, which included head and neck surgeons (otorhinolaryngology and maxillofacial surgeons), radiation oncologists, medical oncologists, pathologists, radiologists, nuclear medicine physicians and the oncology nurse. Tumors were classified according to the TNM classification of malignant tumors (8th edition) and a treatment recommendation was formulated.

Results

Study population

We included 289 patients, details and treatment characteristics are outlined in Table 1. A total of 204 patients (70.6%) were included before February 2020 and therefore underwent a conventional work up. After February 2020 and introduction of the IFTDP, 85 patients (29.4%) were included.

Interdisciplinary fast-track diagnostic structure

Table 2 illustrates the differences in coordination and sequence of examinations for patients suspected to have a HNSCC. Visualized in Figure 1, we can follow the concept of the IFTDP in more detail:

On day 1, the patient is greeted by the nurse of the outpatient clinic in the outpatient clinic and informed about the daily schedule. This is followed by a medical examination by an ENT specialist with

Table 1: Patient demographics and clinical characteristics.

Characteristic	All Patients (N=289)	
Cancer diagnosis and workup		
before 02/2020	No. (%)	204 (70.6%)
after 02/2020 (interdisciplinary fast-track diagnostic program)	No. (%)	85 (29.4%)
Age at diagnosis (years)	Mean (SD)	67 (25-95)
Gender		
Male	No. (%)	189 (65.4%)
Female	No. (%)	100 (34.6%)
Therapy		
Operative treatment	No. (%)	186 (64.4%)
Primary radiotherapy	No. (%)	28 (9.7%)
Primary radiochemotherapy	No. (%)	64 (22.1%)
other treatment	No. (%)	11 (3.8%)

No.: Number; SD: Standard Deviation

T-Test for normally distributed variables (age). 2-sided Pearson chi-squared test for categorical variables

Table 2: Conventional workup vs. "fast track" interdisciplinary tumor care program.

Conventional Workup (until 02/2020)	New workup concept introduced 02/2020: interdisciplinary fast-track diagnostic program
1. Separate evaluation by ENT surgeon, maxillofacial surgeon and sometimes a radiation oncologist 2. Imaging days later by the colleagues of neuroradiology and/or nuclear medicine 3. Clinical evaluation of tumor staging including rigid panendoscopy and biopsy under general anesthesia 4. Case discussion in the following interdisciplinary tumor board meeting 5. Further diagnostic steps including dental evaluation	Day 1 (first consultation)
	1. Consultation and screening by a nurse
	2. Joint consultation by ENT surgeon, maxillofacial surgeon and radiation oncologist
	3. Clinical evaluation and transnasal video endoscopy
	4. Imaging
	5. Fine needle aspiration cytology if indicated
	6. Consultation anesthetist and blood patient management
	Day 2
	1. Stationary entry for endoscopic tumor evaluation (panendoscopy) and biopsy under general anesthesia
	Day 3
	1. Discussion and establishing a treatment plan at the interdisciplinary tumor board meeting
	2. Consultation and screening by a dietician, a speech and swallow therapist and if radiation therapy is recommended a dentist

video documentation of the findings and ultrasound of the cervical lymph nodes. Then, together with the patient, the clinical findings are discussed with radiation oncologist and maxillofacial surgeon. This personal contact by the senior physicians of all disciplines makes it possible to gain a picture of the individual patient and his tumor disease without professional bias, which is eminently important for determining the therapy recommendation. It also provides an opportunity to ask specialist questions. In the subsequent discussion with the anesthesiologist, the patient is informed about the panendoscopy planned for the following day under anesthesia. It also serves to assess the patient's ability to undergo anesthesia for a major tumor operation that may follow later. Following this consultation, the patient will get the imaging indicated in his individual case.

On the second day, the patient is admitted to the hospital and panendoscopy is performed under general anesthesia. Panendoscopy serves to evaluate the tumor, its extend and to histologically confirm the diagnosis. In addition, synchronous secondary carcinomas in the upper aerodigestive tract can be excluded.

Day three: At the tumor board meeting, the interprofessional team discusses the tumor stage, the current patient situation and the therapy recommendation to be derived from this after demonstration

of the findings by pathology and radiology/nuclear medicine. After interdisciplinary case discussion the patient receives his personalized therapy recommendation and a schedule for the necessary further steps. He is given the opportunity to ask questions to the individual members of the interprofessional treatment team. The documentation of the interprofessional clarification takes place in the electronic patient dossier, which can be viewed by all the professional groups involved. On the same day, the patient has an appointment with the speech therapist: Aim is to examine the swallowing and speech function and to determine any functional changes caused by the tumor disease and to discuss the expected impairments caused by the therapy as well as the content of the speech therapy. The dietitian focuses on recording the nutritional status and gives the patient information about nutritional supplements before and during treatment.

Time-to-treatment initiation

In the historical cohort of primary neck-head tumor cases before the introduction of the IFTDP in February 2020, 204 patients were treated with curative intent. The IFTDP comprised 85 patients treated with curative intent. The median duration from first consultation to start of treatment TTI for all included 289 patients was 26 days. The

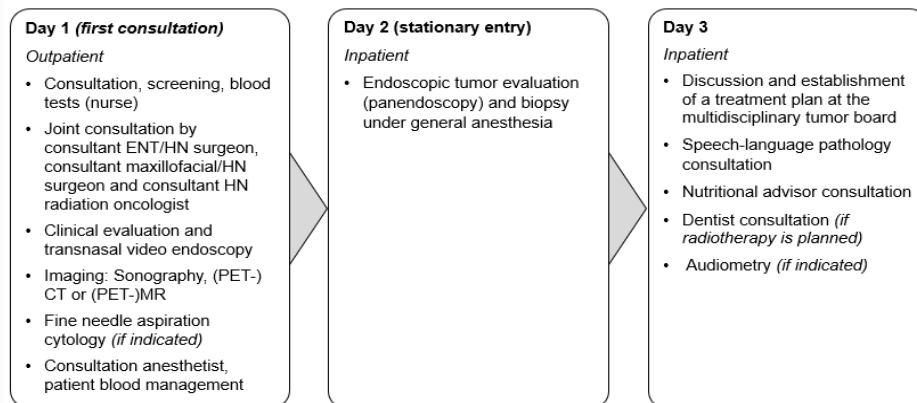


Figure 1: The interdisciplinary fast-track diagnostic program for patients with head and neck squamous cell carcinomas implemented in February 2020.

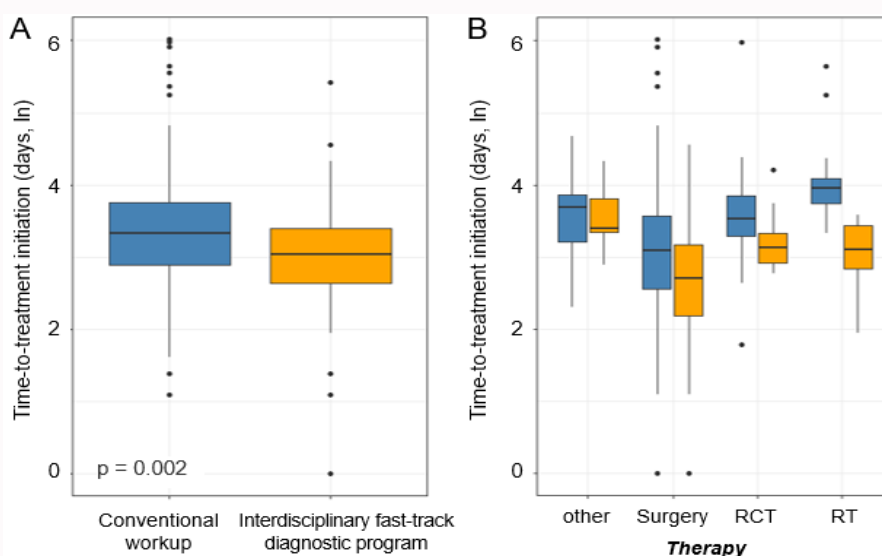


Figure 2: A) Box plot showing of the two works up groups, i.e., conventional workup versus interdisciplinary fast-track diagnostic program. B) Patient groups subdivided into the final treatment modalities. The box ranges from the first quartile to the third quartile of the distribution and the range represents the interquartile range. The median is indicated by a line across the box. Y-axis represents a normal logarithmic scale.

median TTI in the historical controls was 28 days. In contrast, the TTI after the introduction of the IFTDP was 21 days, which amounts for a reduction of 7 days (-25%, $p=0.002$, Figure 2). Furthermore, when divided into the different treatment modalities, the TTI was also significantly shorter in every group of treatment for the patients undergoing the IFTDP.

Discussion

Our IFTDP for patients with HNSCC aimed to develop, implement and evaluate a patient-oriented and efficient process for pre-therapeutic clarification of patients with head and neck tumors. We were able to show that after systematic reorganization and introduction of the IFTDP in February 2020 the TTI could be shortened from median 28 to 21 days.

The problem of prolonged waiting time is widely acknowledged and discussed in the literature over the last two decades. Increasing the TTI is an insidious phenomenon, caused in large part by the pursuit of improved care. Advances in pretreatment evaluations and therapy improve outcome but also increase the time to the start of treatment. Colin et al. evaluated the impact of increasing time to

treatment initiation for patients with HNSCC in the US. They could show that a time to treatment greater than 46 to 52 days is associated with increased risk of death. Prolonged time to treatment therefore affects survival [4]. Chen et al. [14] showed in their meta-analysis, that the relative increased risk of death per month of waiting is 16%. For comparison, implementation of both chemotherapy or targeted therapy concomitant to irradiation only leads to an overall survival improvement of 6% to 10% [15,16]. According to these findings, several head and neck oncology centers abroad already managed to optimize their work up trial [8,9,12,17-19]. In our center we were able to reduce the time to treatment for our HNSCC patients by one week.

As we all know, the COVID-19 pandemic has deeply influenced the activity of interventional oncology in most hospitals and cancer centers. Therefore, it should not be forgotten, that the start of the IFTDP took place during the COVID pandemic. It is therefore likely, that the initial surgical treatment in particular would have been even faster at “regular” times.

Given the fast-growing nature of HNSCC, early-stage as well as advanced stage HNSCC patients could potentially profit of better functional outcome and quality of life after rapid therapy initiation:

While current practice patterns potentially give priority to patients with advanced-stage disease to commence therapy before their tumors become formally unresectable or before they develop distant metastases, surgical wait times are generally longest for patients with early-stage disease [20,21]. This may lead to stage progression and worse functional therapy outcome. With the newly implemented IFTDP, early staged carcinomas also benefit from the shorter time to treatment. Standardized implementation of speech and swallow therapists in the pretherapeutic assessment additionally help to strive for swallowing recovery after therapy quicker and potentially prevent long-term dysphagia [22,23].

In addition, we experienced that:

1. A complex interprofessional cooperation within the framework of a pre-therapeutic assessment with different professional groups is feasible.

2. The patient is assessed in a more comprehensive way. Thus, factors that have rarely been considered so far in the recommendation of a therapy are included, which can have a significant influence on the complication rate, the functional outcome, the patient satisfaction and finally the long-term success of the therapy.

The IFTDP increases the quality of treatment in that risk factors for a complication-ridden course or a lack of response to therapy, such as malnutrition, addictive behavior with a higher risk of delirium or a lack of social integration, can be identified at an early stage through an intensive, interprofessional examination of the patient in all his facets and taken into account when determining the therapy recommendation.

Our study is limited by the relatively short runtime of the program. Thus, no well-founded statements can yet be made about a change in survival or improvement in quality of life. Furthermore, during the program development, the opinion of affected patients was not explicitly heard and considered. Patient needs were not systematically recorded or evaluated. In verbal feedback nevertheless, some patients found the first outpatient day too long and tiring. The group of patients described were mainly older, polymorbid patients. Language barriers with foreign-speaking patients were an additional burden. Therefore, the newly established clarification process needs to be evaluated regarding the psychological burden on our patients [6,7,24]. The aim is to identify patient subgroups that require more time and possibly psychological support during this process. This could facilitate individualized patient management based on subgroup characterization in the future.

Conclusion

Our IFTDP for diagnosis and rapid treatment initiation of HNSCC is feasible and can significantly reduce the TTI. Furthermore, increasing the efficiency of the diagnostic workup may avoid redundancies and helps to detect potential risk factors early on, such as delirium, malnutrition, social situation.

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