

The Association of Palliative Care Decision on Secondary Health Care Utilization and Cancer Treatment at the End of Life Among Patients with Head and Neck Cancer: A Single-Center Retrospective Study

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Martti Merikari^{1,2} , Tiina Saarto² , Riikka-Leena Leskelä^{2,3} ,
Antti Mäkitie^{2,4,5,6} , Timo Carpén^{1,2*} , and Outi Akrén^{1,2,7*} 

Abstract

Background: There is a lack of studies concerning the end of life (EOL) of patients with head and neck cancer (HNC). **Objectives:** To investigate whether the timing of palliative care decision (PCD), that is, decision to terminate life-prolonging anticancer treatments, is associated with reduced secondary health care utilization and medical procedures at the EOL among patients with head and neck cancer.

Design and methods: A total of 108 patients with HNC treated at the Helsinki University Hospital Comprehensive Cancer Center were reviewed retrospectively. Three study groups were formed according to the timing of PCD: (1) the early PCD group (PCD >30 days prior to death), (2) the late PCD group (≤30 days prior to death), and (3) the no PCD group.

Results: PCD was made for 78 patients (72%), of which 57 (73%) were considered as early PCD and 21 (27%) as late. The median interval between PCD and death was 71 days (IQR 108). During the last month of life, a significantly smaller proportion of patients with an early PCD was hospitalized (19% vs 67%, OR=0.12, CI [0.04-0.37], $P < .001$ and 19% vs 47%, OR=0.27, CI [0.10-0.72], $P = .007$) and readmitted (5% vs 29%, OR=0.14, CI [0.03-0.62], $P = .004$ and 5% vs 20%, OR=0.22, CI [0.05-0.96], $P = .032$) in secondary health care compared with the patients with late or no PCD. Early PCD also associated with less ED visits (28% vs 52%, OR=0.36, CI [0.126-0.997], $P = .045$) compared with the late PCD in the last month of life. Compared with the late PCD group, early PCD group was more likely to receive palliative radiotherapy (42% vs 14%, OR 4.36, 95% CI [1.15-16.51], $P = .022$).

Conclusion: Early PCD associated with reduced utilization of secondary health care and emergency services at the EOL. The disease trajectories for patients with HNC should warrant more attention to the earlier timing of PCD.

Keywords

head and neck cancer, palliative care, secondary health care, emergency care, palliative care decision

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¹Palliative Care Center, Comprehensive Cancer Center, Helsinki University Hospital, Finland

²Faculty of Medicine, University of Helsinki, Finland

³Nordic Healthcare Group, Helsinki, Finland

⁴Research Program in Systems Oncology, Faculty of Medicine, University of Helsinki, Finland

⁵Department of Otorhinolaryngology – Head and Neck Surgery, University of Helsinki and HUS Helsinki University Hospital, Finland

⁶Division of Ear, Nose and Throat Diseases, Department of Clinical Sciences, Intervention and Technology, Karolinska Institutet and Karolinska Hospital, Stockholm, Sweden

⁷Palliative Center, Turku University Hospital and University of Turku, Finland

*These authors contributed equally to this work and share the last authorship.

Corresponding Author:

Martti Merikari, Palliative Care Center, Comprehensive Cancer Center, Helsinki University Hospital, P.O. Box 180, FI-00029 HUS, Helsinki, Finland.

Email: martti.merikari@fimnet.fi



Introduction

Head and neck cancers (HNCs) comprise an anatomically and functionally challenging group of malignancies in the upper airways. Approximately 940 000 new HNC cases are diagnosed worldwide, and 1088 new cases are diagnosed in Finland annually.^{1,2} HNC accounts for approximately 5% of cancer-related deaths worldwide.² It has previously been estimated that one-third of patients present with an early-stage disease (stage I or II) with a 5-year survival rate of 70% to 90%.³ More than 60% of patients have an advanced stage disease (stage III-IV) at the time of diagnosis with 5-year overall survival of approximately 50%.⁴ Recommended therapy for locally or regionally advanced diseases is combined-modality therapy and single-modality therapy for early-stage disease.⁵ Approximately half of all patients (39%-56%) with locally advanced disease will develop a relapse after primary surgery during a 5-year follow-up and the risk of recurrence is highest during the first 2 years after treatment.⁶ Concomitant chemotherapy has been previously shown to improve overall survival by 6.5%.⁷ Novel immunotherapy has been shown to have a more favorable effect on overall survival compared with standard treatment among patients with recurrent or metastatic HNC.⁸

A vast and challenging symptom burden, risk for severe complications, and short life-expectancy, emphasize the burden on health care system and need for palliative care (PC) at the end of life (EOL).^{9,10} When HNC advances despite adequate treatment or the prerequisites for treatment are not met due to, for example, declining overall condition of patient, a palliative care decision (PCD) is usually made. PC aims to reduce suffering and maintain a good quality of life (QOL) despite the fatal disease. Previous studies have shown that hospital-based PC increases health-related QOL and satisfaction, and results in major reduction in symptom burden in the EOL setting.¹¹⁻¹⁵ PCD refers to a decision to terminate life-prolonging anticancer treatments and to shift the focus towards symptom control and QOL. It has been shown that cancer patients with late or no PCD utilize more likely hospital services and receive more aggressive treatments late in their life.¹⁶ Previous studies by Earle et al^{16,17} showed that heavy use of hospital services, including increased emergency department (ED) visits, systemic therapies administered late in life, late PC contact, and death in acute settings are associated with unsatisfactory care at the EOL. Patients with HNC are subjected to major interventions, for example, cardiopulmonary resuscitation, intensive care admissions, invasive treatment, for example, tracheostomy, and chemotherapy close to death and are likely to die in hospital.¹⁸⁻²¹

Early implemented PC has been shown to improve QOL and lead to less aggressive EOL treatment.^{22,23} The established quality indicators for studying the aggressiveness of EOL care emphasize the significance of the final month prior to death as a time frame cutoff point.^{16,17} Recent publications have shown that patients with the initiation of PC before the last month prior to death were significantly less likely to receive potentially aggressive EOL care in the last

month prior to death.²⁴⁻²⁷ There is, however, a lack of studies concerning the impact of PCD among patients with HNC. We have already shown in our previous study that a PC contact, actualized more than 1 month before death, decreases the use of secondary health care and emergency services among patients with HNC.²⁵ In 2017, the American Society of Clinical Oncology (ASCO) recommended the implementation of PC early in the course of advanced cancer and patients with significant symptom burdens.²⁸ However, challenges in implementing PC services include shortage of regional PC services and absence of standardized symptom assessment.²⁹

Previous studies on EOL of cancer patients have shown that PCD is associated with decreased utilization of secondary health care services.^{30,31} Therefore, the aim of this study was to investigate whether the timing of PCD is associated with the utilization of secondary health care services at the EOL among patients with HNC.

Materials and Methods

Study Cohort

The study inclusion criteria were: (1) Adults (≥ 18 years old), (2) diagnosis of HNC (ICD-10 codes C00-14 and C30-32), (3) patient were treated in the Comprehensive Cancer Center (CCC) at the Helsinki University Hospital (HUS), and (4) death between April 1st, 2017, and the end of 2018. Demographic parameters collected were sex, age at death, date of death, and cancer diagnosis according to the ICD-10 classification.

HUS is the largest of the five university hospitals in Finland (population 5.5 million) and has a referral area covering 2.2 million inhabitants. HUS is responsible for treating approximately one-third of Finnish patients with HNC. The CCC at the HUS provides systemic cancer therapy and radiation therapy for adult patients. A specialist palliative care (SPC) clinic operates under the CCC, providing outpatient clinic and consultation services to the catchment area of HUS. The aforementioned SPC unit is responsible for palliative care of cancer patients treated at the HUS CCC and organizes PC in its referral area. In addition, patients with HNC receiving curative intending chemo- or radiotherapy are instructed to be referred to the HUS CCC SPC clinic for transitory symptom management during the treatment.

Data Collection and Sources

Cancer treatment in Finland is provided by tertiary and secondary health care hospitals. In addition, a very small number of patients are treated in the private sector. SPC services are provided by primary, secondary, and tertiary health care. In this study, both tertiary and secondary care data are considered secondary health care. Data collected from patient records included secondary health care hospitalization and length of hospital stay, secondary health care ED visits, secondary health care SPC outpatient clinic visits and date of PCD, and the date of PC ICD-10 diagnosis code

(Z51.5) registration. In this study, SPC outpatient clinic visits are referred to as SPC unit visits. Data were handled in structured format. Data concerning PC decision date were gathered by searching for the registered ICD-10 diagnosis code of Z51.5 (palliative care) from the patient records. A free text search of words related to PCD, for example, EOL care, PC etc. was used if no Z51.5 code was found. The date of PCD was chosen either as the day the PCD was registered in the patient record or the date of first Z51.5 diagnosis registered. Data on radiotherapy, chemotherapy, and surgical procedures carried out in an operating room were collected separately from patient records. Radiotherapy with palliative intention was defined according to palliative procedure codes used in the patient registry for each given treatment occasion. In addition, the data on the procedures of extensive teeth extraction, bronchoscopy, gastrostomy tube inserted endoscopically (percutaneous) or with open surgery, and the insertion of esophageal stent were manually extracted from the data on procedures carried out in an outpatient clinic.

Palliative Care Decision

The PCD is a clinical decision to terminate life-prolonging anticancer treatments and to shift the focus of treatment towards symptom control and QOL. The PC period, from the PCD until death, focuses solely on palliative, symptom- and comfort-focused supportive care. However, palliative radiotherapy and palliative surgery could still be given during the PC period solely with the purpose of attempting to alleviate symptoms.

In this study, PCD was considered early when the decision was actualized >30 days before death, and late when PCD was actualized ≤30 days prior to death. The study population was divided into three groups: (1) early PCD group (PCD >30 days prior to death), (2) late PCD group (PCD ≤30 days prior to death), and (3) no PCD group.

Ethical Approval

The study is a registry-based and retrospective study based on hospital registry data on patients deceased during 2017 to 2018. No human interventions were included in this retrospective and registry-based study. The Helsinki University Hospital authorities approved the study protocol (HUS/325/2023) and waived the need for informed consent and ethical approval based on the legislation of registry-based retrospective studies (522/2019). The authors confirm that all methods used followed the principals of the Declaration of Helsinki. All data were stored and handled according to the General Data Protection Regulation (GDPR).

Statistical Analysis

Statistics were performed with IBM-SPSS version 29 (IBM Corp, Armonk, NY, USA). Means, ranges, and standard deviations were used for descriptive statistics. The early PCD group was compared bivariately with the

Table 1. Demographic Data.

Total, n (%)	108 (100)
Sex	
Male, n (%)	80 (74.1)
Female, n (%)	28 (25.9)
Mean age at death (SD)	69 (11.2)
Site of cancer, n (%)	
Pharynx	48 (44.4)
Lip or oral cavity	36 (33.3)
Larynx	16 (14.4)
Nasal cavity or paranasal sinuses	6 (5.6)
Major salivary gland	4 (3.7)
PCD, n (%)	78 (72.2)
Early PCD	57 (52.8)
Late PCD	21 (19.4)
No PCD	30 (27.8)

Abbreviations: Early PCD, palliative care decision actualized >30 days before death; Late PCD, palliative care decision actualized ≤30 days prior to death; No PCD, no palliative care decision prior to death; n, number of patients; PCD, palliative care decision; SD, standard deviation.

late PCD group and no PCD group in the analysis. Categorical data were analyzed utilizing Pearson's chi square test. The Mood's median test was used to analyze median ED-visits, median inpatient durations, and median time intervals to death of PCD and first SPC unit visit. Only data with observed values were analyzed. *P*-value < .05 was considered statistically significant. Analysis of medians included only cases with a value and was analyzed utilizing the Mann-Whitney *U* test. Odds Ratios (OR) and 95% confidence intervals [95% CI] were analyzed utilizing Pearson's chi square risk assessment for categorical variables.

Results

Demographic Statistics

The majority of patients, 80 (74%), were male. Mean age at death was 69 years (range, 26-93). Pharynx (48 patients, 44%) and lip or oral cavity (36 patients, 33%) were the most prevalent tumor sites. The demographic data are presented in Table 1.

PCD was made for 72% of all patients. Altogether, 57 patients (53%) had their PCD >30 days before death and thus formed the early PCD group. Twenty-one patients (19%) had the PCD late (≤30 days before death) forming the late PCD group. Thirty patients (28%) did not have a PCD and formed the no PCD group. The timing of PCD is presented in Figure 1.

Utilization of Secondary Health Care and Emergency Department Services

The utilization of secondary health care services was high at the EOL as 48% and 36% of all patients were hospitalized during the last 2 months and 1 month prior to death, respectively. The median number of hospital admissions

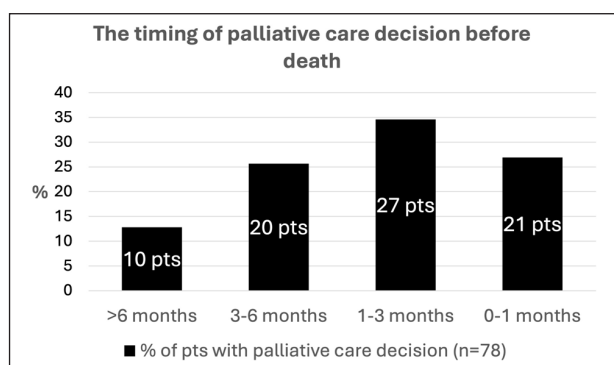


Figure 1. The timing of palliative care decision (PCD) before death.

among all patients was 2 (IQR 2) during the last 60 days prior to death and 2 (IQR 1) during the last month prior to death. The median of inpatient days of all patients during the 60 days prior to death was 8 days (IQR 6) and 6 days (IQR 7) during the last month prior to death.

Of all patients, 40% utilized ED services in the last 60 days prior to death with 33% utilizing ED services during the preceding month before death. The median number of ED visits during the last 60 days and 30 days before death was 1 (IQR 1) and 1 (IQR 1), respectively. The utilization of secondary health care and ED services is presented in Table 2.

The Association of the Timing of Palliative Care Decision on Health Care Utilization

Hospitalization in secondary health care occurred substantially less often among patients in the early PCD group during the last 60 days (35% vs 67%, OR=0.27, 95% CI [0.10-0.78], $P=.013$ and 35% vs 60%, OR=0.36, 95% CI [0.15-0.90], $P=.026$) compared with the patients in the late PCD and no PCD groups. Early PCD group had less hospitalizations also in the last month (19% vs 67%, OR=0.12, 95% CI [0.04-0.37], $P<.001$ and 19% vs 47%, OR=0.27, 95% CI [0.10-0.72], $P=.007$) prior to death compared with the patients in the late PCD group and in the no PCD group, respectively. No difference in hospitalization was found between the late PCD and no PCD groups. Patients in the early PCD group were also significantly less likely (5% vs 29%, OR=0.14, 95% CI [0.03-0.62], $P=.004$ and 5% vs 20%, OR=0.22, 95% CI [0.05-0.96], $P=.032$) readmitted to secondary health care in the last month prior to death than the patients in the late and no PCD groups, respectively.

The median hospitalization duration during the last 60 days prior to death was shorter in the early PCD group compared with the late PCD group (5 days [IQR 6] vs 6 days [IQR 8], $P=.037$). There were no difference found in the median number of hospitalizations between the patients in the early PCD group compared with the patients in the late PCD group and no PCD group. The data concerning secondary health care utilization are presented in Table 2.

The patients in the early PCD group were significantly less likely to visit ED in the last month compared with the patients in the late PCD group (28% vs 52%, OR=0.36, 95% CI [0.126-0.997], $P=.045$). No significant difference was found between the early, late and no PCD groups with regard to the median number of ED visits, as seen in Table 2.

Palliative Care Decision and SPC Unit Visits

The median time period from PCD to death in the entire study population was 71 days (IQR 108). The PCD was made significantly earlier in the early PCD group compared with the late PCD group (94 [IQR=103] vs 6 [IQR=18] days, $P<.001$). Seventy-seven patients (71%) visited the SPC unit and the median interval from the first visit to death was 121 days (IQR 178). Sixty-one of the patients (79%) who visited the SPC unit had a PCD made before death. PCD was made before the first visit in 13 patients (17%) and on the same day as the SPC unit visit in 14 patients (18%). Patients in the early PCD group were significantly more likely to visit the SPC unit compared with the patients in the late PCD group and the patients in the no PCD group (86% vs 57%, OR=4.59, 95% CI [1.47-14.40], $P=.006$ and 86% vs 53%, OR=5.36, 95% CI [1.90-15.10], $P<.001$).

The data on the first SPC unit visit in relation to the timing of PCD are presented in Table 3.

Medical Interventions in Relation to the Timing of Palliative Care Decision

In total, only five patients (5%) received chemotherapy within the last month prior to death. Therefore, the number is too low to conduct further subgroup analyses.

Radiotherapy with a palliative intention was given to 36 patients (33%). Patients in the early PCD group were significantly more likely to receive radiotherapy with palliative intention (42% vs 14%, OR 4.36, 95% CI [1.15-16.51], $P=.022$) at any time point before death when compared with the patients in the late PCD group. One in ten patients were given radiotherapy in the last month prior to death but no significant difference was found between study groups. Thirteen percent of all the patients had surgery during the last month before death, but no significant association was found with the timing of PCD.

Discussion

This retrospective cohort study on patients treated in tertiary care demonstrates the benefits of early PCD, that is, a clinical decision to cease anticancer treatments and to focus on palliative care among patients with HNC. Compared with late or no PCD, an early PC decision (>30 days prior to death) was associated with significantly fewer hospitalizations and lower probability for readmissions in the last month prior to death. The early PCD was also strongly associated with a lower probability of an ED visit in the last

Table 2. Utilization of Health Care Services in the Last 60 Days and 30 Days Prior to Death.

	All patients, n (%)	Early PCD (%)	Late PCD (%)	No PCD (%)	OR [95% CI]	P-value
Total (%)	108 (100)	57 (100)	21 (100)	30 (100)		
<i>Patients hospitalized in secondary health care</i>						
≤60 days prior to death, n (%)	52 (48.1)	20 (35.1)	14 (66.7)	18 (60.0)	Early PCD vs Late PCD: 0.27 [0.10-0.78] Early PCD vs No PCD: 0.36 [0.15-0.90] Late PCD vs No PCD: 1.33 [0.42-4.27]	Early PCD vs Late PCD: .013 Early PCD vs No PCD: .026 Late PCD vs No PCD: .628
≤30 days prior to death, n (%)	39 (36.1)	11 (19.3)	14 (66.7)	14 (46.7)	Early PCD vs Late PCD: 0.12 [0.04-0.37] Early PCD vs No PCD: 0.27 [0.10-0.72] Late PCD vs No PCD: 2.29 [0.72-7.27]	Early PCD vs Late PCD: <.001 Early PCD vs No PCD: .007 Late PCD vs No PCD: .158
Readmission to secondary health care ≤30 days prior to death, n (%)	15 (13.9)	3 (5.3)	6 (28.6)	6 (20.0)	Early PCD vs Late PCD: 0.14 [0.03-0.62] Early PCD vs No PCD: 0.22 [0.05-0.96] Late PCD vs No PCD: 1.60 [0.44-5.89]	Early PCD vs Late PCD: .004 Early PCD vs No PCD: .032 Late PCD vs No PCD: .478
<i>Median (IQR) number of hospitalizations in secondary health care</i>						
≤60 days prior to death	2.0 (2)	1.0 (2)	2.0 (2)	2.0 (4)		Early PCD vs Late PCD: .069 Early PCD vs No PCD: .334 Late PCD vs No PCD: .574
≤30 days prior to death	1.7 (1)	1.0 (1)	1.0 (1)	2.0 (4)		Early PCD vs Late PCD: .497 Early PCD vs No PCD: .250 Late PCD vs No PCD: .489
<i>Median (IQR) number of inpatient days in secondary health care</i>						
≤60 days prior to death	7.5 (6)	5.0 (6)	6.0 (8)	6.0 (12)		Early PCD vs Late PCD: .037 Early PCD vs No PCD: .532 Late PCD vs No PCD: .079
≤30 days prior to death	5.5 (7)	5.0 (7)	4.0 (7)	6.0 (8)		Early PCD vs Late PCD: .737 Early PCD vs No PCD: .915 Late PCD vs No PCD: .784
<i>Patients visiting emergency department</i>						
≤60 days prior to death, n (%)	43 (39.8)	22 (38.6)	12 (57.1)	9 (30.0)	Early PCD vs Late PCD: 0.47 [0.17-1.30] Early PCD vs No PCD: 1.47 [0.57-3.78] Late PCD vs No PCD: 3.11 [0.97-9.97]	Early PCD vs Late PCD: .143 Early PCD vs No PCD: .426 Late PCD vs No PCD: .053
≤30 days prior to death, n (%)	36 (33.3)	16 (28.1)	11 (52.4)	9 (30.0)	Early PCD vs Late PCD: 0.36 [0.126-0.997] Early PCD vs No PCD: 0.91 [0.35-2.41] Late PCD vs No PCD: 2.57 [0.81-8.18]	Early PCD vs Late PCD: .045 Early PCD vs No PCD: .850 Late PCD vs No PCD: .107
<i>Median number of emergency department visits (IQR)</i>						
≤60 days prior to death	1.0 (1)	1.0 (1)	1.0 (1)	1.0 (1)		Early PCD vs Late PCD: .952 Early PCD vs No PCD: .573 Late PCD vs No PCD: .683
≤30 days prior to death	1.0 (1)	1.0 (1)	1.0 (0)	1.0 (1)		Early PCD vs Late PCD: .426 Early PCD vs No PCD: .894 Late PCD vs No PCD: .516

Abbreviations: 95% CI, 95% confidence interval; OR, odds ratio; PCD, palliative care decision; SD, standard deviation.

Table 3. The Timing of First Specialist Palliative Care Unit Visit in Relation to Palliative Care Decision and Death.

	All patients, n (%)	Early PCD (%)	Late PCD (%)	No PCD	OR [95% CI]	P-value
Total (%)	108 (100)	57 (100)	21 (100)	30 (100)		
Specialist palliative care unit visit	77 (71)	49 (86.0)	12 (57.1)	16 (53.3)	Early PCD vs Late PCD 4.59 [1.47-14.40] Early PCD vs No PCD 5.36 [1.90-15.10] Late PCD vs No PCD .788	Early PCD vs Late PCD .006 Early PCD vs No PCD <.001 Late PCD vs No PCD .788
Median interval in days from the first specialist palliative care unit visit to death (IQR)	121 (178)	140.0 (184)	102.5 (137)	91.0 (300)	Early PCD vs Late PCD .052 Early PCD vs No PCD .315 Late PCD vs No PCD .531	Early PCD vs Late PCD .052 Early PCD vs No PCD .315 Late PCD vs No PCD .531
Median interval in days from PCD to death (IQR)	71.0 (108)	94.0 (103)	6.0 (18)	—	Early PCD vs Late PCD <.001 Early PCD vs No PCD — Late PCD vs No PCD —	Early PCD vs Late PCD <.001 Early PCD vs No PCD — Late PCD vs No PCD —

Abbreviations: PCD, palliative care decision; SD, standard deviation. P-value < .05 are indicated with an asterisk.

month. Early PCD was also associated with over fourfold increase in the use of palliative radiotherapy at any time point before death compared with late and no PCD groups. Early PCD was also strongly associated with an increased probability of a SPC unit visit compared with late PCD or patients with no PCD at all. These findings emphasize the importance of timely PC interventions among patients with HNC who are approaching their EOL.

PCD was made for the majority of patients (72%). The present results among HNC patients align with an earlier Finnish study of 992 deceased cancer patients treated in the same cancer center, which noted that 82% of patients had a PCD made before death.³⁰ In our study, 73% of the patients with a PCD had the decision made early, that is, over 1 month before death. The PCD was made, on median, over 3 months (94 days) prior to death among patients with early PCD, enabling a sufficient time interval to organize EOL care. The corresponding percentages for a previous cohort of HNC patients were 72% for all PCD and 36% for early PCD, indicating some improvement in clinical practice.³² Nevertheless, for a fifth of the patients the PCD was made late, on median 6 days prior to death, which is substantially late in the disease trajectory, and approximately a third of all patients did not have a PCD made at any time point before death.

In our cohort, 5% of all patients received chemotherapy in the last month of life, but the absolute number is very small (five patients). The administration of chemotherapy late in the EOL has been shown to be associated with higher health care service use, shorter hospice care periods prior to death, and more likely death in a hospital.^{16,33} It has been proposed that patients receive overly aggressive care at the EOL when over 10% of patients are given chemotherapy in the last 14 days prior to death.¹⁶ Our study results show that late administration of chemotherapy is not overly aggressive in the present study population. Rochigneux et al³⁴ reported that approximately 27% of the 7058 patients with metastatic cancer who had deceased in a hospital received chemotherapy in the last month before death. A previous study on epithelial cancer patients shows that the patients receiving chemotherapy during the last month prior to death had a shorter survival time and were admitted more often to hospital compared with patients who did not receive chemotherapy at the EOL.³⁵

Studies on the aggressiveness of treatment near EOL among patients with HNC remain scarce. Chang et al¹⁸ noted in their nationwide Taiwanese study that approximately 70% of patients with oral cancer were administered chemotherapy in the last month prior to death. Established quality indicators for evaluating potentially aggressive care among patients with cancer in the last month prior to death include, for example, chemotherapy administration, revisit to emergency department, readmission to hospital ward, hospital death, and intensive care unit admission.^{16,17,24} Our results show that late PCD is associated with increased likelihood of hospitalization and readmission to a secondary health care inpatient unit but in the present cohort the use of anticancer treatments during the last month of life was relatively low. However, although the use of cancer

treatments was low at the end of life, the decision and discussion about the termination of anticancer treatments seemed to be postponed, which prevents timely initiation of end-of-life care. There was also an association found between early PCD and lower probability of ED visits in the last month of life when compared with the late PCD. Almost third of the patients in the early PCD group and over half of the patients in the late PCD group visited ED in the last month. There was no meaningful association found in surgical procedures during the last month prior to death. The number of patients receiving radiotherapy or chemotherapy in the last month was too low to be presented in the results. However, early PCD was associated with a fourfold increase in the probability of receiving radiotherapy with palliative intent at any time point prior to death compared with the late PCD. A third of all patients received palliative radiotherapy before death. A previous study on patients with HNC treated at HUS Palliative Care Center showed that 55% had received radiotherapy with palliative intent during the EOL.³⁶ According to a previous Norwegian nationwide study, approximately 29% of patients with HNC received radiotherapy with palliative intent during the last 2 years prior to death.³⁷ Our present study results show similar rates of palliative radiotherapy among all patients with HNC.

Hui et al³⁸ have previously shown that early implemented PC leads to better established EOL care. In addition, early implementation of PC and EOL discussion have shown to decrease the probability of invasive procedures and chemotherapy administration at the EOL among cancer patients,^{39,40} though this has not been studied solely among patients with HNC.

PCD, that is, the decision to terminate life-prolonging anticancer treatments, generally triggers a referral to PC services. In the present study, access to a PC clinic was rather high, as over 70% of the study population visited the clinic, and access to the clinic was higher among the patients who had an early PCD. According to a review article by Mayland et al,¹⁰ approximately 18% to 21% of patients with HNC receive palliative care after the diagnosis. In our previous nationwide retrospective register study, 33% of the patients who deceased of HNC had a contact with an SPC unit prior to death. In another study on patients with cancer treated in every Finnish academic cancer center, 44% of patients with HNC had visited a PC unit prior to death.⁴¹ In a national retrospective study conducted in the USA by Civantos et al,⁴² only 19% of patients with stage IVc HNC received PC. The definition of PC could also include palliative chemotherapy, in contrast to our study. In our study, the referral to the SPC unit was performed reasonably early as, for all patients, the first visit to the SPC unit actualized approximately 4 months (121 days) before death on median. In our previous nationwide study, the median time from the first contact to an SPC unit to death was 62 days, but in addition to being a national study, it also included patients not treated in the departments of oncology.²⁵ The high access to a PC clinic with well-established timing is at least partly due to the fact that a referral to the SPC unit has been systematically implemented on the

disease trajectory for patients with HNC at the HUS CCC. Heinonen et al³⁶ have previously shown that approximately 56% of patients with HNC treated at HUS CCC were referred to the Palliative Care Center by a multidisciplinary Head and Neck tumor board.

The most efficient means of decreasing health care burden has been previously shown to be when the patient has a PCD made early and an SPC unit visit organized.³⁰ In the present study, approximately every second (45%) patient had the PCD made early (>30 days prior to death) and visited the SPC unit, enabling good end-of-life planning.

In line with the previous studies, patients with HNC use secondary health care services profusely at the EOL.^{10,25} In the present study, approximately half of the patients were hospitalized in secondary health care during the last 2 months and over one-third in the last month before death. The abundant use of health care services presents a significant challenge in managing patients with HNC at the late stage of their disease trajectory.

Our results show that early PCD was associated with lower hospitalization rate and duration of treatment period in secondary health care during the last 2 months prior to death. Similar findings have been reported in earlier studies, where early PCD had a major reducing impact on secondary health care usage among cancer patients in general.^{30,43} While we could not specifically study the reasons leading to hospitalization, one of the reasons for the difference in secondary health care utilization might be due to a better established PC pathway among the patients in the early PCD group. Early implemented PC contact has been shown to lead to less aggressive cancer treatments and reduced secondary health care use at the EOL.^{23,41,43,44} PC contact has also been shown to lead to longer hospice care period.^{23,44,45} We have recently shown in a nationwide cohort study of patients with HNC that SPC contact actualizing before the last month prior to death leads to lower utilization of secondary health care and ED and higher overall access to SPC services, including SPC wards at the EOL,²⁵ highlighting the benefits of an early PC contact.

The need for ED services reported in the current study population was considerably high, as over one-third of the patients with HNC utilized ED services during the last 30 days before death. The results align with those of previous studies.^{10,25,46} In a previous study by Henson et al,⁴⁶ patients with HNC were more subject to multiple ED visits during the last month prior to death. In our study, there was a significant difference in ED service utilization during the last month between the early PCD and the late PCD groups. The unique acute problems among patients with HNC because of the anatomical region, for example, airway compromise, could present a challenge, especially in care settings without special procedural competence available acutely. Another plausible explanation could be the insufficient SPC services in Finland and especially the lack of nighttime consultation services from palliative care physicians by the time of the study.

The limitation of this study is its retrospective, register-based design and small sample size. The lack of data on the patients' exact cause of death is also a limitation. As a


strength of the study, the data on hospitalizations in secondary and ED were reliably available in hospital registers visits for all patients. In addition, the PCD was systematically screened for each patient, with no missing data.


Conclusion

This study consolidates the understanding that early PCD, that is, clinical decision to the termination of anticancer treatments is associated with reduced utilization of secondary health care and emergency services at the EOL. In addition, early PCD is also associated with a highly increased probability of an SPC unit visit before death, hence contributing to end-of-life care. Randomized prospective studies on the EOL of patients with HNC are warranted in the future to better understand the role of timely decision making and integration of palliative care in the treatment of patients with HNC. The timing of PCD should be considered earlier in the course of disease to allow for better established EOL care among patients with HNC.

ORCID iDs

Martti Merikari  <https://orcid.org/0009-0006-4702-6840>

Tiina Saarto  <https://orcid.org/0000-0002-3310-3490>

Riikka-Leena Leskelä  <https://orcid.org/0000-0002-9255-2958>

Antti Mäkitie  <https://orcid.org/0000-0002-0451-2404>

Timo Carpén  <https://orcid.org/0000-0003-0117-8559>

Outi Akrén  <https://orcid.org/0009-0003-9037-0557>

Ethical Considerations

The study is a registry-based and retrospective study based on hospital registry data on patients deceased during 2017 to 2018. No human interventions were included in this retrospective and registry-based study. The Helsinki University Hospital authorities approved the study protocol (HUS/325/2023) and waived the need for informed consent and ethical approval because of the register-based retrospective study design. The authors confirm that all methods used followed the principles of the Declaration of Helsinki. All data are stored and handled according to General Data Protection Regulation (GDPR).

Author Contributions

Martti Merikari is the corresponding author, wrote the first draft of the manuscript, and is responsible for the data analysis in this study. Martti Merikari and Riikka-Leena Leskelä performed the data collection and the material preparation. Martti Merikari, Outi Akrén, Riikka-Leena Leskelä, Antti Mäkitie, Tiina Saarto, and Timo Carpén contributed to the study conception and design. All authors have commented on previous versions of the manuscript and have read and approved the final manuscript.

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Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Data Availability Statement

The data generated during the current study are not publicly available as the data are a part of the larger dataset owned by Helsinki University Hospital. Data are however available from the principal author MM upon reasonable request and with permission of Helsinki University Hospital.

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