Health outcome priorities in older patients with head and neck cancer

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ABSTRACT

Objectives: Older patients with head and neck cancer often have comorbidity, have reduced life-expectancy and await intensive treatment. For the decision-making process, knowledge of a patient's health outcome prioritization is of paramount importance. We aim to study the health outcome priorities of older patients with head and neck cancer, and to evaluate whether general health, markers of physical, cognitive, and social functioning, and quality of life are associated with health outcome prioritization.

Materials and Methods: Patients aged ≥70 years with head and neck cancer received a Comprehensive Geriatric Assessment and their priorities were assessed using the Outcome Prioritization Tool (OPT). Distribution of first priority, and associations with general health, markers of physical, cognitive, and social functioning, and quality of life were evaluated using ANOVA or chi-square.

Results: Of the 201 included patients, the OPT was available in 170 patients. The majority prioritized maintaining independence ($n = 91$, 53.3%), followed by extending life ($n = 58$, 34.1%), reducing pain ($n = 14$, 8.2%), and reducing other symptoms ($n = 7$, 4.1%). Housing situation, Body Mass Index, presence of musculoskeletal diseases, and quality of life were significantly related to prioritization of health outcomes. Reducing pain or other symptoms was more often prioritized by patients who lived alone, had a history of musculoskeletal problems, or had poor perceived quality of life. Age, sex, comorbidity, and markers of physical and cognitive functioning were not associated with health prioritization.

Conclusion: Maintaining independence is most often prioritized by older patients with head and neck cancer. In addition, we found that health outcome priorities of older patients are only limited based on general and specific health characteristics. We suggest to systematically discuss patients' priorities in order to facilitate complex treatment decisions in older patients with cancer.

1. Introduction

Head and neck cancer (HNC) constitutes about 3–4% of the cancer diagnoses yearly [1]. It encompasses cancer originating from the oral cavity, nasal cavity, paranasal sinuses, pharynx, larynx, and salivary glands [2]. Standard treatment of HNC consists of surgery, chemo- and radiotherapy, often combined or as single therapy, depending on tumor site and stage [3,4]. Tumor growth and cancer treatments have enormous impact on functionality of everyday bodily functions such as eating, tasting, talking, and breathing. On top of that, the five-year survival of HNC is about 65%, entailing varied numbers for the disease-specific survival [1,5]. In attempting to individualize the treatment, a multidisciplinary team is consulted to not only disease location and

stage, but also, for example, expected functional outcome [3,6]. Clinical follow-up is intensive, including a flexible endoscopy every two to three months during the first two years after treatment and every six months for years three to five, along with regular head and neck imaging [3,7].

HNC is prevalent in older ages, particularly over the age of 60, and more frequently seen in men [8]. The risk for HNC is also strongly related to modifiable factors such as the use of tobacco and alcohol [9]. Older age in combination with these risk factors results in a population that has relatively high rates of comorbidity. The biological age is often higher than the chronological age, meaning that patients are more likely to be frail.

Because of frailty, the often extensive disease burden, the large impact of treatment and follow-up, and the reduced life expectancy in older patients with HNC, individualized treatment is necessary, making the weighing of harms and benefits of different treatment options important but challenging. To inform these decisions, knowledge on patients' priorities regarding different possible health outcomes is essential [10]. However, research has shown that providers' perceptions

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about patients' health outcome priorities are often incorrect [11,12]. This indicates that there is limited predictability by physicians of the prioritization their patients hold. The Outcome Prioritization Tool (OPT) can be used to guide the conversation exploring these priorities. Literature on pre-treatment priorities of patients with HNC is scarce [13–15]. Therefore, in this study we aim to assess the health outcome priorities of older patients with HNC using the OPT. We then wish to investigate the relationship between general health status, markers of physical, cognitive, and social functioning, and quality of life with the first prioritized health outcome.

2. Material and Methods

2.1. Study, Setting and Participants

The study is a prospective cohort study conducted in the Erasmus MC University Medical Center in Rotterdam, The Netherlands. All patients with pathologically confirmed HNC of the Departments of Otorhinolaryngology and Oral and maxillofacial surgery are discussed weekly by a multidisciplinary team of various physicians including otolaryngeal, oral and maxillofacial and plastic surgeons, an oncologist, a radiation therapist, a radiologist and a geriatrician. Furthermore, specialized HNC nurses, dieticians, physical therapists and speech and swallowing therapists are involved in the multidisciplinary treatment of HNC patients in the Erasmus Medical Center [6]. All patients who were aged ≥70 years, were referred to the Geriatric Department for a Comprehensive Geriatric Assessment (CGA). Inclusion period was between December of 2019 and October of 2020. All patients were asked for informed consent to participate in this observational study. The ethical committee of the Erasmus MC granted a waiver for ethical approval (MEC-2019-0711).

2.2. Comprehensive Geriatric Assessment

A CGA was conducted assessing physical, psychological, functional, and social domains to map the main geriatric impairments, capacities, and needs for care. This included: *1) a thorough interview* containing the patients' medical and psychiatric history, use of medication, sociodemographic status, and general complaints; *2) a physical examination (general, psychiatric and neurologic)* including measurement of blood pressure (also during orthostatic challenge), length and weight, gait speed, Timed Up & Go Test (TUGT), and hand grip strength; *3) additional measurements* such as laboratory measurements, electrocardiogram, and the Mini Mental State Examination (MMSE) [16]; and *4) completion of various forms* such as Katz' index Activities of Daily Living (ADL) [17], Lawton's Instrumental Activities of Daily Living (IADL) [18], the Outcome Prioritization Tool (OPT) [19], the Mini Nutritional Assessment Short Form (MNA-SF) for evaluating nutritional status [20], and the Exton Smith Scale for the risk of pressure sores (ESS) [21]. Generally, the CGA took place before treatment advice was given by the multidisciplinary team of head and neck cancer, in which a geriatrician participated.

Level of education was classified conforming to the International Standard Classification of Education (ISCED 11). Education was categorized into five levels: early childhood and primary education (level 1, ISCED 0–1), lower secondary education (level 2, ISCED 2), upper secondary education (level 3, ISCED 3), post-secondary non-tertiary and short-cycle tertiary education (level 4, ISCED 4–5), and Bachelor's, Master's or Doctoral level (level 5, ISCED 6–8) [22].

Body mass index (BMI) was calculated as weight (kg) divided by height-squared (m^2). Myocardial infarction (MI) was defined as a history of a MI or coronary artery bypass graft surgery. Heart failure was defined according to medical history. Cerebrovascular accident (CVA) was defined as a history of ischemic or hemorrhagic cerebral infarction or a transient ischemic attack. Vascular disease included peripheral artery disease, aneurysms, and a history of vascular interventions.

Pulmonary disease was defined as a history of obstructive sleep apnea syndrome (OSAS), chronic obstructive pulmonary disease (COPD) or asthma. The Cumulative Illness Rating Scale Comorbidity Index (CIRS-CI) was calculated by counting how many (of a total of thirteen) systems contained moderate to severe levels of disease [23,24]. The psychiatric domain was excluded; hypertension was included as a separate domain.

Grip strength and gait speed were classified into percentile categories following normative reference values based on the patient's sex and age [25,26]. Orthostatic hypotension was defined by a decrease in systolic blood pressure of ≥20 mmHg and/or a decrease in diastolic blood pressure of ≥10 mmHg throughout three blood pressure measurements within three minutes. For ADL and IADL dependence, lower scores indicate independence. The Multidimensional Prognostic Index (MPI) was calculated based on the CGA resulting in an MPI-score between 0 and 1, classifying patients as having a low, moderate, to high one-year mortality risk. [27]. Supplemental Table S1 shows the details of the calculation method of the MPI.

2.3. Health Outcome Prioritization

The OPT was used to assess the health outcome priorities of the patients. This is a non-disease specific tool, first developed by Fried et al., designed to prioritize different health outcome objectives [19]. It consists of visual analogue scales representing four universal health outcomes: 'staying alive', 'maintaining independence', 'reducing or eliminating pain', and 'reducing or eliminating other symptoms' (e.g. dizziness, nausea). 'Staying alive' was changed to 'life extension' since this is in better agreement with the Dutch version of the OPT. Patients were asked to prioritize the four health outcomes by positioning sliders on a chart, giving the four outcomes a score between 0 and 100 (see Supplementary Fig. S1). Patients were instructed om the principle of trade-offs, to obtain a ranking of the four health outcomes. When a patient was not able to score all four items, but only until the first, second or third, only the scored items were registered and entered into thee database. If the OPT was not performed at all, the reason given was noted. The scores were ranked from highest (first choice) to lowest (fourth choice) priority.

2.4. Health-Related Quality of Life and Reported Overall Health

At first consultation of a head and neck surgeon, patients filled out the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30 (EORTC QLQ-C30) version 3.0 [28]. We assessed the health-related quality of life and perceived overall health by evaluating the response to the following questions (translated in Dutch): "How would you consider your quality of life during the last week?" and "How would you consider your overall health during the last week?", the answer ranging from 1 "very poor" to 7 "excellent". We merged these seven scores into three categories: poor [1–3], fair [4,5], and good [6,7].

2.5. Statistical Analyses

Categorical variables are expressed as counts with percentages. Continuous variables are expressed either as means and standard deviations (in case of a normal distribution) or as medians and interquartile ranges (in case of a non-normal distribution). The groups of participants who chose reducing pain and reducing other symptoms as first choice were merged due to the small numbers. The comparative analyses between the three groups of patients who partly or completely filled out the OPT consisted of one-way ANOVA or Kruskall-Wallis tests for continuous variables and chi-square or Fisher's exact tests for categorical variables. Chi-square and Fisher's exact tests were used to test whether there was an association between quality of life or perceived overall health and the first health outcome priority. A *p*-value of <0.05 was

considered significant. For ANOVA-tests, we also reported the post hoc Bonferroni significance value and for chi-square tests we also reported the standardized residuals (st. res.) > 1.96. SPSS version 25 (SPSS Inc. IBM company, Armonk, U.S.A.) was used for the analyses.

3. Results

3.1. Enrolment and Patient Characteristics

Of the 214 patients who were referred to the Geriatric Department, thirteen did not give informed consent. Of the remaining 201 participants, 170 patients were able to fill out the OPT. The OPT was not available for 31 patients (Fig. 1).

The general patient characteristics, and the markers of physical, cognitive, and social functioning are shown in Tables 1 and 2. The cohort consisted mainly of men (71.8%) with a mean age of 77.8 ± 5.5 years, with often relatively low levels of education (28.4% finished primary education), smokers (76.4% current or ex-smoker), and alcohol use (44.5% ≥7 units of alcohol per week). Most patients (69.4%) were living with family, 28.2% was living alone, and only 2.4% of the patients was institutionalized. The three most common tumor locations were larynx (22.9%), oral cavity (20.6%), and skin of the ear and nose (14.7%). Fifty-three patients (31.2%) had regionally localized disease. For 28 patients (16.5%) a palliative treatment approach was advised. Half of the patients had a history of cancer (other than the current diagnosis), 51.8% had hypertension, 23.5% had diabetes mellitus and 20.6% had a history of vascular disease. One hundred forty-six patients (85.9%) had a CIRS-CI ≥ 3, indicating they had three or more systems containing moderate to severe levels of disease. Few patients had a grip strength below the 10th percentile (4.2%) and many had a gait speed above p90 (25.5%), 33.7% were at risk for or had malnutrition, 25.9% made use of a walking aid, and 35.3% was IADL dependent. Fifty-six patients (33%) were moderately to severely frail, according to MPI category two and three.

3.2. Health Outcome Priorities

Of the 31 patients for whom no OPT data were available, data was missing in 23 patients due to patient-related reasons (eight misunderstood the task and fifteen reported it to be too difficult to perform), and in eight patients due to the geriatrician constraints (such as shortage of time). When comparing the patients who filled out the OPT completely or partly (n = 170; 88.1%) with the patients of whom the

OPT data was missing due to a patient-related reason (n = 23; 11.9%), we found no significant differences in age (mean 77.8 ± 5.5 versus 81 ± 7.5 years), sex, level of education, alcohol use, smoking, comorbidity index, MMSE or MPI score.

Of the 170 patients in whom the OPT was available, 34 (20%) filled out the OPT partly, ranking one, two or three health outcomes, and 136 (80%) ranked all four health outcomes.

Ninety-one patients (53.3%) chose maintaining independence as their first priority, 58 (34.1%) life extension, 14 (8.2%) reducing pain, and 7 (4.1%) reducing other symptoms. The distribution of second priorities per first prioritized health outcome are visualized in Fig. 2.

As second priority, staying alive and maintaining independence were equally often chosen by 56 patients (34.1%), followed by reducing pain (n = 32, 19.5%) and reducing other symptoms (n = 20, 12.2%) (supplemental Table S2). Reducing pain was most often ranked as third priority (n = 64, 45.7%) and maintaining independence least often (n = 16, 11.4%). Reducing other symptoms was most often ranked as fourth priority (n = 73, 53.7%) and maintaining independence least often (n = 3, 2.2%).

3.3. Associations of Health Outcome Priority with General Health Characteristics, and Measures of Physical, Cognitive, and Social Functioning

Of the general health characteristics, housing situation related significantly to the first priority (p = 0.029, Table 3). Patients living alone more often prioritized reducing pain or other symptoms (st. res. 2.1). Fifty-two percent of patients choosing reducing pain or other symptoms lived alone, compared to 20.7% and 27.5% of patients choosing life extension and maintaining independence. Patients living with family tended to prioritize less often reducing pain or other symptoms (st. res. -1.5). Forty-three percent of patients choosing reducing pain or other symptoms lived with family, compared to 75.9% and 71.4% of patients who chose for life extension and maintaining independence. Second, a history of musculoskeletal problems was also associated with first priority (p = 0.005). Patients with musculoskeletal problems prioritized reducing pain or other symptoms more frequently (st. res. 2.3) and tended to prioritize maintaining independence less frequently (st. res. -1.7). Forty-three percent of patients choosing reducing pain or other symptoms had musculoskeletal problems compared to 24.1% and 12.1% of patients who chose for life extension and maintaining independence. Third, BMI was significantly related to the first priority (p = 0.014). Post hoc tests showed a significant difference in BMI between patients who chose life extension versus patients who chose
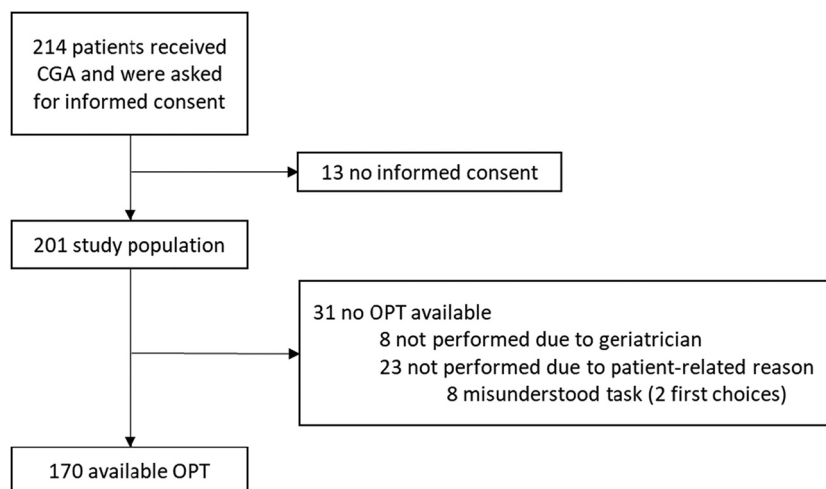

Fig. 1. Enrolment and analysis.
Abbreviations: CGA = Comprehensive Geriatric Assessment, OPT = Outcome Prioritization Tool.

Table 1
Characteristics of the study population.

	N = 170
General characteristics	
Age, mean (SD)	77.8 (5.5)
Men, n (%)	122 (71.8)
Housing situation, n (%)	
Living with family	118 (69.4)
Living alone	48 (28.2)
Institutionalized	4 (2.4)
Level of education, n (%)	
Early childhood and primary education	38 (28.4)
Lower secondary education	57 (42.5)
Upper secondary education	6 (4.5)
Post-secondary non-tertiary and short-cycle tertiary education	0 (0.0)
Bachelor's, Master's or Doctoral level	33 (24.6)
BMI, mean (SD)	25.9 (4.7)
Smoking, n (%)	
No	40 (23.7)
Current or ex-smoker (quit <1 year ago)	89 (52.7)
Ex-smoker (quit >1 year ago)	40 (23.7)
Alcohol, n (%)	
No	61 (37.2)
< 7 units per week	19 (11.6)
≥7 units per week	73 (44.5)
Stopped after abuse	11 (6.7)
Tumor-related characteristics	
Location	
Skin	25 (14.7)
Oral cavity	35 (20.6)
Vestibulum nasi	7 (4.1)
Sino nasal	13 (7.6)
Salivary glands	8 (4.7)
Oropharynx	17 (10.0)
Nasopharynx	1 (0.6)
Hypopharynx	20 (11.8)
Larynx	39 (22.9)
Unknown primary	5 (2.9)
Metastasis, n (%)	
Regional lymph nodes	53 (32.9)
Distant metastasis	5 (3.1)
Palliative treatment intention, n (%)	28 (16.5)
Comorbidities	
Hypertension	88 (51.8)
Cancer	85 (50.0)
Myocardial infarction	29 (17.1)
Heart failure	11 (6.5)
Cerebrovascular accident	20 (11.8)
Vascular disease	35 (20.6)
Diabetes mellitus	40 (23.5)
Pulmonary disease	27 (15.9)
Chronic kidney disease	16 (9.4)
CIRS Comorbidity Index, mean (SD)	4.6 (1.8)

Data incomplete for: level of education (n = 134), BMI (n = 166), smoking (n = 169), alcohol (n = 164), regional lymph nodes (n = 161), distant metastasis (n = 163).
Abbreviations: BMI = Body Mass Index, CIRS = Cumulative Illness Rating Scale.

Table 2
Measures of physical and cognitive functioning.

	N = 170
Grip strength, n (%)	
< p10	7 (4.2)
P10 - p90	141 (84.9)
> p90	18 (10.8)
Gait speed, n (%)	
< p10	22 (13.5)
P10 - p90	100 (61.3)
> p90	41 (25.2)
Timed Up and Go Test in s, median [IQR]	9.3 [7.8, 12.7]
Orthostatic hypotension, n (%)	19 (12.7)
Nutritional status according to MNA-SF, n (%)	
Sufficient: 12–14	110 (66.3)
At risk for malnutrition: 8–11	47 (28.3)
Malnutrition: 0–7	9 (5.4)
Use of walking aid, n (%)	44 (25.9)
MMSE	
Total score, median [IQR]	28 [26, 29]
< 24, n (%)	9 (5.7)
Exton Smith Scale, median [IQR]	20 [18, 20]
ADL Dependent (Katz ≥1), n (%)	24 (14.1)
IADL Dependent (Lawton ≥4), n (%)	60 (35.3)
Number of medications, mean (SD)	6.1 (3.9)
Multidimensional Prognostic Index, mean (SD)	0.30 (0.14)
WHO performance status	
WHO 0	55 (35.0)
WHO 1	62 (39.5)
WHO 2	28 (17.8)
WHO 3	12 (7.6)
WHO 4	0 (0.0)

Data incomplete for: grip strength (n = 166), gait speed (n = 163), Timed Up and Go Test (n = 163), orthostatic hypotension (n = 150), nutritional status (n = 166), MMSE (n = 159), WHO (n = 157).
Abbreviations: MNA-SF = Mini Nutritional Assessment Short Form, MMSE = Mini Mental State Examination, ADL = Activities of Daily Living, IADL = Instrumental Activities of Daily Living, WHO = World Health Organization.

patient ($p = 0.017$). Namely, patients perceiving quality of life as poor chose more frequently for reducing pain and other symptoms (st. res. 3.3). Thirty-nine percent of patients choosing reducing pain or other symptoms had a poorly perceived quality of life, compared to 6.8% and 6.2% of patients who chose for life extension and maintaining independence. Patients perceiving quality of life as good tended to choose less frequently for reducing pain and other symptoms (st. res. -1.2). Thirty-one percent of patients choosing reducing pain or other symptoms perceived their quality of life as good, compared to 65.9% and 55.4% of patients who chose for life extension and maintaining independence. There was no association between perceived overall health and first health outcome priority.

4. Discussion

Maintaining independence was the most important priority for older patients with head and neck cancer, followed by extending life, reducing pain, and reducing other symptoms. Reducing pain or other symptoms was a higher priority for patients who lived alone, had a history of musculoskeletal problems, or had poor perceived quality of life. On the other hand, reducing pain or other symptoms tended to be a lower priority for patients who lived with family or had good perceived quality of life. We found no significant associations between highest priorities and age, level of education, comorbidity, cognitive and physical functioning, or others measures of frailty.

Prioritization of treatment goals has been studied previously in patients with HNC using different tools. First, List et al. asked patients with HNC with a median age of 59 to rank twelve potential HNC-related disease or treatment effects [14]. They found that older patients (aged ≥65 years) were less likely to place 'living as long as possible' in their top three than younger patients. Additionally, older patients were less likely to place 'being cured of my cancer' in the top three.

maintaining independence (mean 27.4 ± 5.1 versus 25.1 ± 4.5 kg/m^2, $p = 0.011$). Table 3 and Table 4 show the associations of the three health outcome priorities with general health characteristics and markers of physical, cognitive, and social functioning. No other associations between general health characteristics such as age, sex, comorbidity, or measures of physical and/or cognitive functioning were found.

3.4. Associations of Health Outcome Priority with Quality of Life and Perceived Overall Health

In 122 of the 170 patients, data on quality of life and overall health were available (Table 5). Patients of whom no data was available did not differ significantly from the other patients, regarding age, sex, housing situation, smoking, alcohol use, ADL and IADL dependence, use of walking aid, nutritional status, BMI, TUGT, gait speed, grip strength, level of education, MMSE score, comorbidities, and MPI-score. Quality of life related significantly to the first health outcome priority of a
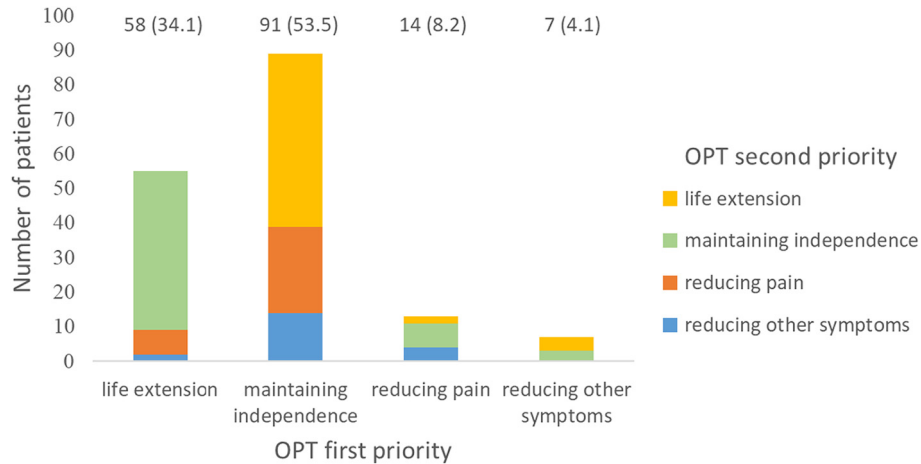
Fig. 2. Health outcome priorities. Distribution of patients' second priority health outcome when chosen for a certain first priority health outcome. Numbers are expressed as n (%). Of the patients choosing life extension as first priority; 46 (79.3%) chose maintaining independence, 7 (12.1%) reducing pain and 2 (3.4%) reducing other symptoms as second priority. 3 (5.2%) did not choose a second priority. Of the patients choosing maintaining independence as first priority; 50 (54.9%) chose life extension, 25 (27.5%) reducing pain and 14 (15.4%) reducing other symptoms as second priority. 2 (2.2%) did not choose a second priority. Of the patients choosing reducing pain as first priority; 7 (50.0%) chose maintaining independence, 4 (28.6%) reducing other symptoms and 2 (14.3%) life extension as second priority. One (7.1%) did not choose a second priority. Of the patients choosing to reduce other symptoms as first priority; 57.1% chose life extension and 42.9% chose maintaining independence as second priority.

Table 3
Characteristics of the population per patients' first choice health outcome priority.

	First priority Outcome Prioritization Tool			P^a
	Life extension n = 58	Maintaining independence n = 91	Reducing pain or other symptoms n = 21	
General characteristics				
Age, mean (SD)	77.0 (5.7)	78.1 (5.3)	79.1 (5.8)	0.3
Men, n (%)	44 (75.9)	64 (70.3)	14 (66.7)	0.7
Housing situation, n (%)				0.029
Living with family	44 (75.9)	65 (71.4)	9 (42.9)	
Living alone	12 (20.7)	25 (27.5)	11 (52.4)[b]	
Institutionalized	2 (3.4)	1 (1.1)	1 (4.8)	
Educational level, n (%)				0.9
Early childhood and primary education	15 (33.3)	17 (23.6)	6 (35.3)	
Lower secondary education	17 (37.8)	33 (45.8)	7 (41.2)	
Upper secondary education	2 (4.4)	3 (4.2)	1 (5.9)	
Post-secondary non-tertiary and short-cycle tertiary education	0 (0.0)	0 (0.0)	0 (0.0)	
Bachelor's, Master's or Doctoral level	11 (24.4)	19 (26.4)	3 (17.6)	
BMI, mean (SD)	27.4 (5.1)[c]	25.1 (4.5)[c]	25.7 (3.9)	0.014
Smoking, n (%)				0.9
No	13 (22.8)	23 (25.3)	4 (19.0)	
Ex-smoker (quit >1 year ago)	28 (49.1)	49 (53.8)	12 (57.1)	
Current smoker or quit <1 year ago	16 (28.1)	19 (20.9)	5 (23.8)	
Alcohol, n (%)				0.5
No (or stopped after abuse)	22 (38.6)	42 (47.7)	11 (14.7)	
< 7 units per week	9 (15.8)	7 (8.0)	3 (14.3)	
≥7 units per week	26 (45.6)	39 (44.3)	7 (33.3)	
Tumor-related characteristics				
Metastasis, n (%)				
Regional lymph nodes	22 (38.6)	24 (28.6)	7 (35.0)	0.5
Distant metastasis	3 (5.3)	1 (1.2)	1 (4.8)	0.3
Palliative treatment intention, n (%)	12 (20.7)	11 (12.1)	5 (23.8)	0.3
Comorbidities				
Hypertension	30 (51.7)	47 (51.6)	11 (52.4)	1.0
Cancer	28 (48.3)	51 (56.0)	6 (28.6)	0.08
Myocardial infarction	12 (20.7)	14 (15.4)	3 (14.3)	0.7
Heart failure	5 (8.6)	6 (6.6)	0 (0.0)	0.6
Cerebrovascular accident	5 (8.6)	13 (14.3)	2 (9.5)	0.7
Vascular disease	15 (25.9)	15 (16.5)	5 (23.8)	0.4
Diabetes mellitus	20 (34.5)	16 (17.6)	4 (19.0)	0.054
Pulmonary disease	7 (12.1)	17 (18.7)	3 (14.3)	0.5
Chronic kidney disease	5 (8.6)	10 (11.0)	1 (4.8)	0.7
Musculoskeletal problems	14 (24.1)	11 (12.1)	9 (42.9)[d]	0.005
CIRS Comorbidity Index, mean (SD)	4.6 (1.6)	4.5 (1.9)	4.6 (2.2)	1.0

Data incomplete for: level of education (n = 134), BMI (n = 166), smoking (n = 169), alcohol (n = 164), regional lymph nodes (n = 161), distant metastasis (n = 163).
Abbreviation: BMI = Body Mass Index, CIRS = Cumulative Illness Rating Scale.
  [a] P-values of ANOVA (between categories), Kruskall-Wallis, chi-square and Fisher's exact tests.
  [b] Standardized residual = 2.1.
  [c] Bonferroni significance p = 0.011.
  [d] Standardized residual = 2.3.

Table 4
Measures of physical and cognitive functioning per patients' first choice health outcome priority.

	First choice Outcome Prioritization Tool			P [a]
	Life extension n = 58	Maintaining independence n = 91	Reducing pain or other symptoms n = 21	
Grip strength, n (%)				0.6
< p10	1 (1.8)	5 (5.6)	1 (4.8)	
P10 - p90	47 (83.9)	75 (84.3)	19 (90.5)	
> p90	8 (14.3)	9 (10.1)	1 (4.8)	
Gait speed, n (%)				0.2
< p10	11 (19.6)	8 (8.8)	3 (18.8)	
P10 - p90	35 (62.5)	55 (60.4)	10 (62.5)	
> p90	10 (17.9)	28 (30.8)	3 (18.8)	
Timed Up and Go Test in s, median [IQR]	10.2 [7.8, 14.1]	9.0 [7.8, 12.0]	10.5 [7.8, 13.8]	0.6
Orthostatic hypotension, n (%)	5 (11.1)	12 (13.8)	2 (11.1)	0.6
Nutritional status according to MNA-SF, n (%)				0.1
Sufficient: 12–14	42 (73.7)	57 (63.3)	11 (57.9)	
At risk for malnutrition: 8–11	12 (21.1)	30 (33.3)	5 (26.3)	
Malnutrition: 0–7	3 (5.3)	3 (3.3)	3 (15.8)	
Use of walking aid, n (%)	18 (31.0)	18 (19.8)	8 (38.1)	0.1
MMSE				
Total, median [IQR]	28.0 [26.0, 29.0]	29.0 [27.0, 29.0]	28.0 [26.0, 29.0]	0.6
< 24, n (%)	2 (3.9)	6 (6.8)	1 (5.3)	0.9
ESS, median [IQR]	20.0 [18.0, 20.0]	20.0 [19.0, 20.0]	19.0 [17.5, 20.0]	0.06
ADL Dependent (Katz ≥1), n (%)	8 (13.8)	11 (12.1)	5 (23.8)	0.4
IADL Dependent (Lawton ≥4), n (%)	22 (37.9)	32 (35.2)	6 (28.6)	0.8
Number of medications, mean (SD)	6.4 (3.6)	6.0 (4.1)	5.8 (3.8)	0.7
Multidimensional Prognostic Index, mean (SD)	0.29 (0.14)	0.29 (0.14)	0.35 (0.17)	0.2
WHO performance status				0.3
WHO 0	19 (34.5)	32 (39.0)	4 (20.0)	
WHO 1	18 (32.7)	34 (41.5)	10 (50.0)	
WHO 2	13 (23.6)	12 (14.6)	3 (15.0)	
WHO 3	5 (9.1)	4 (4.9)	3 (15.0)	
WHO 4	0 (0.0)	0 (0.0)	0 (0.0)	

Data incomplete for: grip strength (n = 166), gait speed (n = 163), Timed Up and Go Test (n = 163), orthostatic hypotension (n = 150), nutritional status (n = 166), MMSE (n = 159), WHO (n = 157).
Abbreviations: MNA-SF = Mini Nutritional Assessment Short Form, MMSE = Mini Mental State Examination, ADL = Activities of Daily Living, IADL = Instrumental Activities of Daily Living, WHO = World Health Organization.
[a] P-values of ANOVA (between categories), Kruskall-Wallis, chi-square and Fisher's exact tests.

Second, Windon et al. confirmed this finding by also showing decreasing importance of survival per increasing decade of age in patients with head and neck squamous cell cancer with a median age of 60 years [15]. These findings suggest that with increasing age 'living as long as possible' and 'being cured of my cancer' might become less important. However, since these studies used a different tool with other competing priorities, and the age of participants in both studies was much lower than in our study, we are not able to directly compare findings. Still, the findings suggest that older patients less often prioritize health outcomes related to extending life, in line with the results of our study in which maintaining independence is more often prioritized than life extension.

Previous studies have investigated the role of the OPT in other populations of older patients with multimorbidity, polypharmacy, chronic kidney disease or non-curable cancer. Almost all showed a similar ranking of priorities in which "maintaining independence" was most frequently prioritized [11,19,29–32].

We expected that older age, multimorbidity, and frailty reflected by markers of physical and cognitive functioning would influence the prioritization of health outcomes. Our results do not support this

Table 5
Perceived quality of life and overall health per top health outcome priority.

	Patient choice			Total	P [a]
	Life extension 44 (36.1)	Maintaining independence 65 (53.3)	Reducing pain or other symptoms 13 (10.7)		
Perceived quality of life					0.017
Poor	3 (6.8)	4 (6.2)	5 (38.5)[b]	12 (9.8)	
Fair	12 (27.3)	25 (38.5)	4 (30.8)	41 (33.6)	
Good	29 (65.9)	36 (55.4)	4 (30.8)	69 (56.6)	
Perceived overall health					0.4
Poor	3 (6.8)	6 (9.2)	3 (23.1)	12 (9.8)	
Fair	17 (38.6)	29 (44.6)	6 (46.2)	52 (42.6)	
Good	24 (54.4)	30 (46.2)	4 (30.8)	58 (47.5)	

Perceived quality of life and overall health of 122 patients per top health outcome priority. Numbers are expressed as n (%), percentages are from column totals. Perceived QoL and overall health were defined as poor, fair or very good when patients responded respectively 1–3, 4–5 or 6–7 on the questions on how they perceived their overall quality of life and overall health. The questionnaire was administered before conduction of the Comprehensive Geriatric Assessment.
[a] P-values of Fisher's exact tests.
[b] Standardized residual = 3.3.

hypothesis, with few exceptions. The association between musculoskeletal disorders and prioritization of reducing pain or other symptoms could be explained by the disability and discomfort that those diseases often cause. The association between housing situation and prioritization is also interesting. This suggests that patients living alone might set other priorities than patients with another housing situation. Regarding age, frailty, and other determinants of physical and cognitive functioning, the absence of any association with health prioritization is striking. Probably the overall perceived quality of life is in the end most important, and not the actual frailty status or functional limitations. This is underscored by our finding that perceived quality of life was associated with health prioritization. Patients can become accustomed to their limitations, causing their quality of life not to decline to the same extent as the level of independence. Another explanation might be that the study cohort was relatively frail, and had a large comorbidity burden, as 85.9% had three or more moderate to severe levels of disease. The comparison to other cancer populations, and healthier community-based older adults regarding their health outcome prioritization, would therefore be worthy of further investigation.

This study has limitations. First, our population included a limited number of patients receiving palliative treatment, since patients already receiving palliative treatment at diagnosis were sometimes not referred for a CGA. This could have influenced our results since those are patients with more extensive disease and will therefore have often more bodily complaints, and potentially also value health outcomes differently. Second, we encountered patients who expressed difficulties to rank 'reducing pain' or 'reducing other symptoms', because they were not experiencing these symptoms at that moment. Possibly, older patients with a different type of cancer with a larger symptom burden would rank those health priorities differently. Finally, a small number of patients were not able to fill out the OPT ($n = 23$); however, since this was randomly determined we do not think that this can affect our findings. A strength of our study is the relatively large sample size as compared to previous studies using the OPT. Second, detailed information on physical, cognitive, and social functioning was available in this cohort, as well as various measures of frailty. This enabled us to research many variables in relation to prioritization. Third, we included all patients aged ≥70 years thereby increasing the generalizability of our findings for other populations with HNC.

Our study also suggests that the predictability of patients' prioritization on the basis of general health determinants, and specific geriatric determinants, is relatively poor. Additionally, previous research showed that prioritization cannot be predicted by the health-care provider involved with the patient as well, since patient-provider agreement is often poor [11,12]. This points out the need for exploring patient priorities before treatment decisions are made. Several studies have shown positive experiences while using the OPT [30,33]. In addition, 88.1% of the patients in our population was able to fill out the OPT. Thus, the OPT is a suitable tool to explore the priorities of patients. Moreover, as treatment goals may change over time [34], we suggest to conduct the OPT repeatedly when new treatment decisions have to be made.

In conclusion, maintaining independence is most often prioritized by older patients with head and neck cancer. In addition, health outcome priorities of patients are only limited based on general and specific health characteristics. We suggest to systematically discuss patients' priorities in order to facilitate complex treatment decisions in older patients with cancer.

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Author Contributions

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Writing - review & editing: GAE, AB, AS, FUSMR, RJBJ, HAPB.

Declaration of Competing Interest

The authors declare no conflicts of interest.

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Appendix A. Supplementary Data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jgo.2022.02.001.

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