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Survival and prognosis of surgical head and neck cancer patients aged 80 years and older

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Abstract

Introduction: Elderly patients (≥80 years of age) with head and neck cancer (HNC) can prove a management challenge due to concerns regarding their suitability for surgery. This study aims to describe the characteristics and outcomes of elderly patients undergoing HNC surgery.

Methods: A retrospective review of elderly patients undergoing HNC surgery was conducted. Demographics, comorbidities, tumor characteristics, surgical procedure type, postoperative complications, and disposition were reviewed. Overall survival (OS) in the elderly cohort was compared against younger patients (<80 years).

Results: A total of 595 patients were included, of whom 86 were aged >80 years (71% male; mean age 84.8, range 80.0–98.8 years). The overall complication rate was 43%. When compared with younger patients ($n = 509$), elderly patients had reduced OS (risk ratio: 2.0, 95% CI: 1.3–3.2), higher 90-day mortality (8.1% vs. 2.3%, $p = .005$), and lower 5-year survival (43.5% vs. 64.1%, $p < .001$). However, survival was comparable to age-specific life expectancy. There was no difference in OS, 90-day mortality, and 5-year survival when comparing >85 ($n = 33$) and 80–85 ($n = 53$) age groups.

Conclusions: Chronological age alone should not negatively influence decision-making in HNC surgery the elderly. With careful preoperative selection and optimization, surgery can be performed at acceptable risk with good outcomes in elderly patients.

Level of evidence: IV

KEYWORDS
elderly, head and neck cancer, prognosis, surgery, survival

1 | INTRODUCTION

Head and neck cancer (HNC) is a burdensome diagnosis, associated with substantial morbidity, high costs, and premature death.[1] With the continuous rise in life expectancy with a growing older population in Australia, epidemiological data predicts a significant increase in the workload of HNC surgery amongst the aging population.[2] In 2016, there were ~4565 new cases of HNC diagnosed in Australia (3363 males and 1202 females), increasing to 5168 new cases (3721 males and 1448 females) in 2020.[3] There has been an increase in the overall number of deaths due to HNC, despite a reduction in the age-standardized mortality rates because of the growth and aging of Australia's population.[3]

Some studies have shown that overall survival of HNCs in the elderly is inferior compared with that of younger patients.[4,5] The challenge in this cohort arises from the physiological heterogeneity of the older patient population, frequent discrepancies between physiological and chronological age, in addition to the complications of coexisting medical conditions and potential psychological and social care issues.[6] Therefore, many elderly patients are considered poor candidates for multi-modal cancer treatment, and therefore are less likely to receive standard-of-care therapy compared with younger patients.[4,7,8] Recently, the international consensus towards this conjecture has evolved, with the view that appropriately selected elderly patients with HNC should be offered equivalent treatment with curative intent as younger patients.[9]

There is growing literature to suggest that surgical intervention in HNC patients above 70 years of age offers similar complication rates and survival outcomes when compared with younger patients.[10–15] Furthermore, there is evidence to support elderly patients are capable of developing good coping strategies and can expect good quality of life outcomes following HNC treatment.[16] However there is a paucity of literature investigating the surgical outcomes of HNC patients aged above 80 years undergoing surgery. The aim of this study was to describe the demographics, premorbid status, tumor characteristics, postoperative complications, and overall survival of patients aged above 80 years undergoing surgery for HNC, in order to guide decision-making regarding surgical candidacy in elderly HNC patients.[17]

2 | PARTICIPANTS AND METHODS

2.1 | Study design and setting

This cross-sectional study was conducted from March 2015 to July 2021 at Fiona Stanley Hospital, a tertiary teaching hospital in Perth, Western Australia. Data were collected prospectively and analyzed retrospectively.

Patients with an HNC undergoing operative intervention as per the Head and Neck Multidisciplinary Team (H&N MDT), were included in the final analysis, with patients over 80 years of age considered elderly. Baseline demographics, comorbidities, and tumor characteristics of elderly patients undergoing operative intervention were compared with those who underwent nonoperative management of their HNC. The H&N MDT is an interdisciplinary team comprising head and neck surgeons, plastic and reconstructive surgeons, oral and maxillofacial surgeons, radiation and medical oncologists, radiologists, pathologists, speech pathologists, dietitians, and palliative care physicians managing HNCs across both inpatient and outpatient settings. Cancers were staged according to the American Joint Committee on Cancer (AJCC) TNM Staging of HNCs.[18] Standard protocol-based follow-up was employed, and data were entered in a prospective database (REDCap) maintained by Fiona Stanley Hospital.

This study was conducted according to the guidelines of the Declaration of Helsinki and approved by the South Metropolitan Health Service Governance Evidence Knowledge Outcomes (GEKO) Committee (GEKO approval No. 42543). All participants provided informed consent at the time of diagnosis for data collection for this study.

2.2 | Study indicators

Baseline characteristics of elderly patients, which included age, sex, residence, past medical history, mobility, and smoking status were recorded. American Society of Anaesthesiologists (ASA) grade was determined following assessment by a Consultant Anesthetist in the Preanesthetic Clinic if they were selected for operative intervention by the H&N MDT.[19] Preoperative tumor characteristics obtained included tumor site, histology, and overall tumor stage according to the AJCC staging system.[20] Operation records, progress notes, biochemistry, and imaging results were reviewed with type of surgery, surgical reconstruction, neck dissection, inpatient postoperative complications according to the Clavien–Dindo Classification, adjuvant therapy, and postdischarge disposition were recorded.[21]

2.3 | Statistical analysis

Chi-squared tests were used to compare the baseline demographics and tumor characteristics of elderly patients undergoing operative and nonoperative management of their HNCs. Cancer-specific survival analysis was calculated by comparing overall survival in elderly patients (≥80 years) with that of younger patients (<80 years) from the start of treatment. Elderly patients were then further stratified into ≥85 years and 80–85 year groups to explore survival with advancing age. Kaplan–Meier survival estimate curves and log-rank tests using Cox's proportional hazards model were used to compare the survival between age categories, and chi-square tests were used to compare proportions. Hazard ratios were computed using the Mantel Haenszel approach.[22] Binomial tests were used to explore associations between comorbidities, treatment, and postoperative complications with survival data. As association and multivariable cox proportional analyses revealed insignificant findings, multivariate analyses were not performed.

Results were analyzed using R (V4.0.0; R Core Team, Vienna, Austria) and graphs were prepared using GraphPad Prism (V6.05; GraphPad Software Inc, San Diego, California). Two-sided p-values < .05 was considered statistically significant.

3 | RESULTS

3.1 | Characteristics of study cohort

A total of 595 patients underwent HNC surgery at the unit between March 2015 and July 2021, with a median follow-up period of 17.8 months (interquartile range 28.7 months). There were 86 elderly patients (of which 33 were ≥ 85 years) who underwent surgery over the study period with a mean age of 84.8 years (range 80.0–98.8 years, median 83.8 years, and interquartile range 5.2 years). During the study period, 120 elderly patients with a mean age of 85.1 years (range 80.0–101 years, median 84.0 years, interquartile range 4.6 years) had their HNCs managed nonoperatively (i.e., a total of 206 elderly patients were assessed by the H&N MDT during the study period). Of these, 57 (47.5%) underwent curative-intent radiotherapy and/or chemotherapy, 56 (47%) were deemed palliative, and 7 (5.8%) were offered operative management but declined. Patient demographics and premorbid status of the elderly cohorts undergoing operative and nonoperative management of their HNCs are shown in Table 1. Compared with the nonoperative group, elderly patients undergoing HNC surgery were predominantly

TABLE 1 Summary of patient demographics and premorbid status of the elderly patient cohort (age ≥ 80 years) undergoing operative or nonoperative intervention for their head and neck cancers.

	Operative		Nonoperative		
Demographic profile	***N*** **= 86**	**%**	***N*** **= 120**	**%**	***p*-Value**
Age (years)					
Mean	84.8		85.1		.208
Range	80.0–98.8		80.0–101		
Median	83.8		84.0		
Interquartile range	5.2		7		
Standard deviation	4.0		4.6		
Sex	(/86)		(/120)		
Male	61	70.9	68	56.7	**.037**
Female	25	29.1	52	43.3	**.037**
Residence	(/86)		(/120)		
Home	76	88.4	92	76.7	**.033**
Retirement village	5	5.8	7	5.8	.235
Nursing home	5	5.8	21	17.5	**.013**
Past medical history	(/86)		(/120)		
Ischemic heart disease	29	34.1	52	43.3	.164
Hypercholesterolaemia	39	43.4	51	42.5	.684
Peripheral vascular disease	11	12.8	19	15.8	.542
Atrial fibrillation	14	16.3	33	27.5	.058
Hypertension	61	70.9	66	55	**.020**
COPD/Asthma	14	16.3	23	19.2	.594
Diabetes mellitus	18	20.9	30	25	.496
Gastroesophageal reflux disease	18	20.9	26	21.7	.899
Chronic kidney disease	9	10.7	18	15	.342
Previous cerebrovascular accident	8	9.3	20	16.7	.128
Chronic confusion	5	5.8	17	14.2	**.049**
Mobility	(/86)		(/120)		
Independent	62	72.1	58	48.3	**<.001**
Aid (4WW/WS/Frame)	24	27.9	62	51.7	**<.001**
Smoker	(/86)		(/120)		
Current	3	3.5	10	8.3	.786
Previous	41	47.7	51	42.5	.193
Nonsmoker	42	48.8	59	49.2	.907
ASA grade	(/86)		(/120)		
I	1	1.2	–	–	
II	21	24.4	–	–	
III	55	64.0	–	–	
IV	9	10.5	–	–	

Note: Bold values indicates a statistically significant result.
Abbreviations: 4WW, four-wheeled walker; ASA, American Society of Anesthetists; WS, walking stick.

male (70.9% vs. 56.7%, $p = .037$) and resided at home (88.4% vs. 76.7%, $p = .033$). Cardiovascular comorbidities were common in the operative cohort, with a high proportion of patients having hypertension (70.9%), ischemic heart disease (34.1%), hypercholesterolaemia (43.4%), and atrial fibrillation (16.3%). Around 15% of patients had chronic lung disease and 21% had either type I or II diabetes. Of note, the elderly cohort undergoing HNC surgery had a higher proportion of independent mobility (i.e., no use of mobility of aids) compared with the group undergoing nonoperative management (72.1 vs. 48.3%, $p < .001$). The median ASA grade for elderly cohort undergoing HNC surgery was III (a patient with a severe systemic disease that is not life-threatening), with a range of I–IV.

Compared with the elderly patients who had their HNCs management nonoperatively, elderly patients who underwent operative management had a higher proportion of complex skin (41.9% vs. 28.3%, $p = .043$) and oral cavity (31.4% vs. 17.5%, $p = .020$) cavity tumors, and a lower proportion of nasopharynx (0% vs. 2.5%, $p < .001$) and oropharynx (1.2% vs. 15%, $p < .001$) tumors (Table 2). Most of these malignancies were squamous cell carcinomas (88.3% and 87.5%, respectively, $p = .850$). Approximately 50% of elderly patients undergoing HNC surgery had Stage IVa or IVb disease. There was no difference in tumor histology or stage between operative and nonoperative elderly groups (all $p > .05$).

The most common procedure performed on the primary tumors was wide local excision (66.2%), followed by parotidectomy (37.2%; Table 3). Half of the elderly cohort undergoing HNC surgery required soft tissue reconstruction, either via free flap (29%), pedicled flap (14%), or split skin graft (7%). The majority (86%) of elderly patients underwent a neck dissection. Postoperatively, just under half of the cohort (42%) required intensive care unit admission. The overall postoperative complication rate was 43%. Delirium was the most common postoperative complication, affecting around 20% patients, followed by gastrointestinal (17.4%), urogenital (16.3%) and cardiac and pulmonary (15.1%) problems. Sixteen patients were required to return to theater again either due to wound/flap problems, airway issues, or inadequate tumor resections. Most patients returned to their previous residence on discharge, with 11.6% being discharged to a rehabilitation facility. In total, three elderly patients (3.5%) died postoperatively as an inpatient, due to aspiration pneumonia, hypoxic brain injury, and dysphagia resulting in malnutrition, with the patient electing for comfort care.

3.2 | Survival analysis

There was a significant difference in overall survival observed between the elderly patients who underwent surgery for HNC

TABLE 2 Tumor characteristics of elderly patients undergoing operative and nonoperative management of their head and neck cancers

	Operative		Nonoperative		
Indicator	$N = 86$	%	$N = 120$	%	*p*-Value
Tumor site					
Skin	36	41.9	34	28.3	**.043**
Oral cavity	27	31.4	21	17.5	**.020**
Unknown	9	10.5	17	14.2	.430
Salivary gland	6	7.0	6	5	.550
Larynx	4	4.7	14	11.7	.079
Thyroid	2	2.3	—	—	
Nasopharynx	—	—	3	2.5	**.001**
Oropharynx	1	1.2	19	15	**<.001**
Hypopharynx	1	1.2	6	5	.134
Histology					
Squamous cell carcinoma	76	88.3	105	87.5	.850
Other	5	5.8	10	8.3	.493
Basal cell carcinoma	2	2.33	3	2.5	.936
Sarcoma	2	2.33	2	1.7	.735
Papillary thyroid carcinoma	1	1.2	—	—	.238
Tumor staging					
I	9	10.5	10	8.3	.602
II	17	19.8	22	18.3	.796
III	17	19.8	26	21.7	.741
IVa	33	38.4	40	33.3	.456
IVb	10	11.6	22	18.3	.190

Note: Bold values indicates a statistically significant result.

TABLE 3 Surgical procedures performed, postoperative complications, and adjuvant therapies for elderly patients undergoing head and neck surgery.

Indicator	*N* = 86	%
Surgery of primary tumor		
Wide local excision (skin or mucosa)	58	67.5
Parotidectomy	32	37.2
Laryngectomy	4	4.7
Thyroidectomy	1	1.2
Surgical reconstruction		
Free flap	25	29.0
Pedicled flap	12	14.0
Split skin graft	6	7.0
Neck dissection		
Selective	39	45.9
Modified radical	25	29.4
Bilateral	7	8.2
Radical	3	3.5
Operating time (minutes)		
Median/mean	396/428.3	
Range	87–941	
Standard deviation	197.4	
Intensive care unit admission postoperatively		
Yes	36	42.0
Postoperative complications		
Any complication	37	43.0
Wound/Flap Issues	11	12.8
Delirium	17	19.8
Urogenital	14	16.3
Cardiac	13	15.1
Pulmonary	13	15.1
Airway	2	2.3
Gastrointestinal	15	17.4
Neurological	1	1.2
Sepsis	2	2.3
Inpatient death	3	3.5
Unexpected return to theater		
Yes	16	18.6
Hospital length of stay (days)		
Median/mean	8.0/11.9	
Range	1–47	
Standard deviation	10.6	
Adjuvant therapy		
Radiotherapy	42	48.8
Immunotherapy	1	1.2
Chemotherapy	0	0
Disposition after admission		
Previous residence	73	84.8
Rehabilitation facility	10	11.6

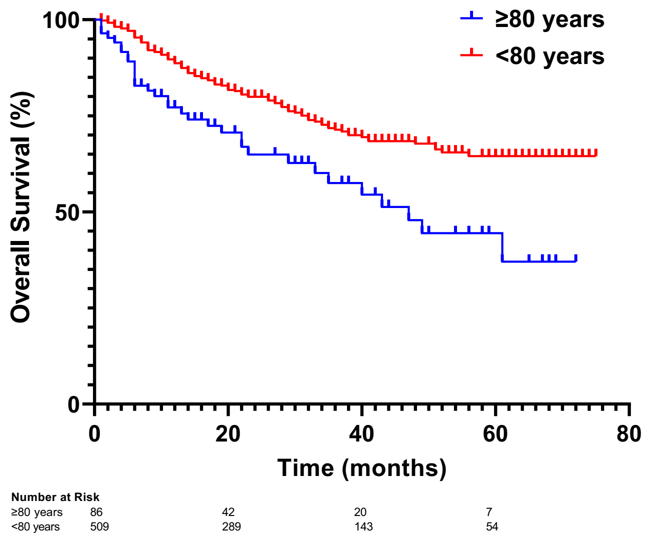

FIGURE 1 Kaplan–Meier curve comparing overall postoperative survival in patients >80 years in blue ($n = 86$) versus <80 years in red ($n = 509$) undergoing head and neck surgery. There was a significant difference in overall survival between patients ≥80 and < 80 years ($\chi^2 = 13.9$, hazard ratio: 2.0, 95% CI: 1.25–3.23, $p = .0002$).

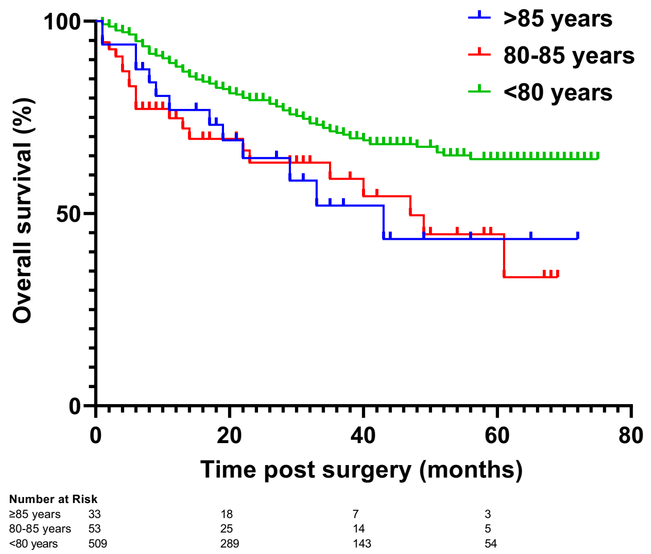

FIGURE 2 Kaplan–Meier curve comparing overall postoperative survival in age-stratified elderly patients (≥85 years in blue, 80–85 years in red) and younger patients (<80 years of age in green) undergoing head and neck surgery. The <80-year-old group ($n = 509$) had better overall survival compared with the ≥85 ($\chi^2 = 5.2$, hazard ratio 2.4, 95% CI: 1.1–5.2, $p = .03$) and 80–85 age groups ($\chi^2 = 10.4$, hazard ratio 2.7, 95% CI: 1.5–5.0, $p = .0013$). There was no difference in overall survival when comparing ≥85 ($n = 33$) and 80–85 ($n = 53$) age groups ($\chi^2 = 0.016$, hazard ratio 0.96, 95% CI: 0.48–1.9, $p = .73$).

compared with those below 80 years of age ($\chi^2 = 13.9$, $p = .0002$; Figure 1). Elderly patients were at twice the risk of death at any point of time compared with patients <80 years of age (hazard ratio: 2.0, 95% CI: 1.3–3.2). At 90 days postoperation, 7 out of 86 patients in the elderly group had died, whereas 12 out 509 died in the younger group. Therefore, elderly patients were 3.7 times (95% CI: 1.4–9.6) more likely to die within 90 days postoperatively compared with patients under 80 years of age (8.1% vs. 2.3%, $p = .005$). The 5-year overall survival rate of elderly patients was significantly lower compared with patients below 80 years of age (43.5% vs. 64.1%, risk difference 95% CI: 9.8%–32.2%, $p < .001$).

At 90 days postoperation, 2 out of 33 patients in the ≥85-year group died, compared with 5 out of 53 in the 80-year to 85-year group. At 5 years postoperation, 19 out of 33 patients survived in the ≥85-year group, and 30 out of 53 in the 80-year to 85-year group. Therefore, when comparing patients ≥85 years with those aged 80–85 years, there was no difference in overall survival (relative risk: 0.96, 95% CI: 0.47–1.9, $\chi^2 = 0.016$, $p = .90$), 90-day mortality (6.1% vs. 9.2%, $p = .91$), and 5-year overall survival (43.4% vs. 44.6%, $p = .994$; Figure 2).

There was no statistical association between patient demographics and premorbid status, preoperative tumor characteristics, surgical procedures performed, postoperative complications, and adjuvant therapies in predicting mortality (all $p > .05$; data not shown). Therefore, binomial logistic regression was not performed.

4 | DISCUSSION

To date, this is one of few studies in the literature to describe the characteristics and survival of HNC patients undergoing surgery aged above 80 years of age. Our results demonstrate that this cohort had a high level of preoperative function, although the large majority presented with locally advanced disease. This cohort of patients was at increased risk of death at any given point in time, with higher 90-day mortality and lower 5-year survival when compared with patients under 80 years of age undergoing HNC surgery; however, there was no difference in risk of death and survival when comparing patients aged 80–85 and above 85 years of age.

Given the definition of elderly is broad, there are few studies with which to directly compare our survival findings.[17] Previous studies have used an age cutoff anywhere between 65 and 80 years of age to describe their elderly patients. Clayman et al.'s[15] study focused on HNC surgery in elderly patients matched for sex, ethnicity, site, and stage of the primary tumor. In this study, they compared 43 elderly patients compared with 79 similar patients aged 65 or younger. Their survival analysis revealed a 5-year survival rate of 33% for the elderly patients and 63% for the matched controls, which was statistically significant. In comparison to our study, we demonstrated a higher 5-year survival rate of approximately 44%, which is similar to the younger-matched control group of this study.

Fancy et al.'s[23] retrospective, multicenter cohort study of 376 elderly patients undergoing pedicle or free-flap reconstruction following ablative HNC surgery and L'Esperance et al.'s[24] single-center retrospective review of 219 elderly patients undergoing HNC surgery had 90-day mortality rates of 8% and 11%, respectively, which are comparable to our finding of 8%. Our results add to the building literature that pedicle flap and free-flap reconstruction is not associated with an increased risk of mortality or complications in elderly compared with younger patients, given we did not obtain a statistically significant correlation.[23,25]

Furthermore, compared with Yang et al.'s[26] retrospective cohort of 53 elderly patients undergoing HNC surgery, our cohort demonstrated a lower discharge rate to a rehabilitation facility (35% vs. 12%) thus showing that patients can return to their previous level of functioning postoperatively. A potential explanation for this difference may be attributed to their preoperative evaluation, where their patients were assessed by either a primary care physician or consultant medical specialist, whereas our center used a comprehensive MDT.

Although we demonstrate that elderly patients undergoing HNC surgery are at increased risk of death and have greater 90-day and 5-year mortality when compared with those under 80 years of age, these results should be considered in context of life expectancy. According to the Australian Bureau of Statistics in 2020, the life expectancy of an Australian at 80 years of age for both sexes combined was around 9.9 years. The mean age of surgery for our cohort was ~85 years and demonstrated a 5-year survival rate of 45%, showing that this cohort of HNC patients undergoing surgery has a largely unaffected survival trajectory compared with the general population. Furthermore, Clayman et al.'s[15] study also yielded similar findings with the overall survival of their patients above the age of 80 also comparable to the expected survival based on cohort life statistics derived from US Census data. Therefore, although our results demonstrate statistically significant survival between patients aged above and below 80 years of age, there is strong evidence to suggest this is not clinically significant.

Our results support the conjecture that clinicians and MDTs use physiological, rather than chronological age when considering HNC surgery in the elderly. This is evidenced by our results, whereby the mean age of elderly patients undergoing operative and nonoperative intervention for their HNCs was not different (84.8 vs. 85.1 years, $p = .208$). Rather, the decision to offer surgical management depended largely on the elderly patient's premorbid functional status (i.e., if they were living at home and were able to mobilize independently) and the location of the primary tumor. Although the physiological heterogeneity of the older patient cohort makes the decision for HNC surgery difficult, with frequent incongruities between physiological and chronological age, coupled with the high prevalence of comorbidities, potential psychological and social care issues, our carefully selected elderly cohort tolerated HNC surgeries well.[27,28] The complication rate of 43% in this cohort, is comparable to similar cohorts documented in the previous literature.[19,20] Furthermore our postoperative complication rate is comparable to previously reported complication rates of younger cohorts (below 70 years of age) undergoing HNC surgery, such as Tzelnick et al.'s[29] study (42.3%) and Shaari et al.'s[30] study (57%). We demonstrated that delirium (19.8%), followed by gastrointestinal (17.4%) and urogenital (16.3%) complications were most prevalent in our elderly cohort. In comparison to younger cohorts undergoing HNC surgery, the most common complications observed in the literature include surgical site infections, bleeding, and pulmonary complications.[15,29–31]

Many recent studies have shown that careful preoperative selection, surgical treatment could be performed at acceptable risk and with good outcomes in elderly patients with various types of cancer.[28,32,33] Goldstein et al.'s[34] prospective study of 274 patients aged 50 years or older undergoing HNC surgery demonstrated that preoperative utilization of frailty indices such as Fried's Frailty Index, Barthel Index, Lawton-Brody questionnaire and Vulnerable Elders Survey-13 can be used to predict morbidity. They demonstrated that both frailty and measures of independence in activities of daily living were independent predictors of length of stay and type and severity of complications.[34] This is consistent with our findings, were the majority of elderly patients who were offered surgery were living at home and were mobilizing independently compared with those managed nonoperatively. At our site, all patients regardless of age undergo a frailty assessment, nutritional assessment, and prehabilitation prior to surgery for preoperative optimization. The heterogeneity associated with operative outcomes in our elderly cohort suggests that age is not the only predictor of postoperative mortality but also rather affected by a combination of comorbidities and functional status.[35,36] A high proportion of our elderly patients were able to mobilize without aid and lived at home preoperatively and the majority returned to their previous residence postoperatively, suggesting a high functional status of our cohort. Our results highlight the importance of appropriate patient selection, preoperative risk stratification, and refinement of postoperative care for all elderly patients undergoing HNC surgery.

5 | LIMITATIONS

Our study was a retrospective analysis of a single-center cross-sectional study, which was reliant on the completeness and accuracy of the chart documentation. We did not include characteristics of the younger cohort as the purpose of this paper was to describe and compare survival, thus, this information was excluded from our study.

6 | CONCLUSIONS

Elderly patients (above the age of 80) account for a large proportion of newly diagnosed HNCs and the number of these patients receiving surgical intervention continues to increase. The presence of preoperative medical comorbidities should be carefully considered but is not in itself a reason to exclude these patients from surgical consideration. Although this cohort is at increased risk of death at any given point in time with greater 90-day and 5-year mortality, it is comparable with population life expectancy. Therefore, chronological age should not negatively influence decision-making when offering surgical resection in this cohort of patients.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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