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Association Between Cognitive Function and Quality of Life in Patients With Head and Neck Cancer

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IMPORTANCE There is a dearth of research examining the associations between cognitive function and quality of life (QoL) in patients with head and neck cancer (HNC), despite much research examining QoL and some research examining cognitive function in this population.

OBJECTIVE To identify the associations between cognitive functioning and QoL in patients prior to treatment for HNC within a multidisciplinary care team.

DESIGN, SETTING, AND PARTICIPANTS Case series with planned data collection of cognitive function, QoL, and psychosocial variables at an urban Midwest academic medical center including 83 patients with a diagnosis of HNC between August 2015 and December 2016 who underwent a pretreatment assessment with a clinical health psychologist and a speech and language pathologist.

MAIN OUTCOMES AND MEASURES At pretreatment assessment, the Montreal Cognitive Assessment and Functional Assessment of Cancer Therapy–Head & Neck, version 4, were administered along with a semistructured interview to gather data on psychiatric symptoms, social support, and substance use. Patient demographic, clinical, and psychosocial variables were extracted via medical record review.

RESULTS Of 83 patients (64 [77%] male; mean age, 59.54 [95% CI, 57.23-61.73] years), cognitive impairment was identified in 55% (n = 46) at pretreatment. Number of depressive symptoms (mean, 2.43 [95% CI, 2.06-2.89] symptoms) was associated with impairments in delayed recall (r = −0.28; 95% CI, −0.47 to −0.07) and all domains of QoL. Cognitive impairment in delayed recall was associated with lower QoL in both overall QoL and the domains of emotional and functional well-being. Current benzodiazepine use, history of heavy alcohol use, and current and past tobacco use were also associated with lower QoL in specific domains.

CONCLUSIONS AND RELEVANCE Cognitive impairment is common in patients with HNC and is associated with QoL and psychosocial variables. Together with previous research indicating that cognitive function and QoL can influence treatment adherence and outcomes, the results argue for the incorporation of cognitive screening and QoL assessment as part of pretreatment assessment for patients.

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Changes in cognition are common with normative aging. However, cognitive impairment represents a range in cognition from more substantial than normative changes and up to the manifestations of dementia.[1] The prevalence of cognitive impairment in excess of normative changes due to aging is estimated at 16% to 22% of the population.[1] As would be expected, the risks of cognitive impairment increase with age, with those older than 65 years having an incidence of 14 to 111 per 1000 patient-years.[2,3] Cognitive impairment is also associated with sex (ie, more common in men),[4] lower level of education attainment, tobacco use, and heavy alcohol use.[5] There also exists a bidirectional relationship between psychiatric factors and cognitive impairment, with premorbid recurrent depression being an identified contributing factor to cognitive impairment and those with cognitive impairment having a higher risk of developing depression.[6-8] Anxiety has also been associated with higher risk of cognitive impairment.[3,5]

Previous research has found that cognitive impairment was associated with substance abuse, psychiatric symptoms, and quality of life (QoL) in other medical disorders, including neurological disorders[9-11] and cancers.[12,13] Cognitive impairment has also been associated with important treatment variables such as treatment adherence for rehabilitation and outcomes in patients with cancer.[14] In particular, cognitive impairment at cancer treatment initiation was associated with a 6 times higher risk of death in patients with breast, prostate, or colorectal cancers.[15] Additionally, both cognitive impairment and poorer QoL have separately been associated with decreased overall survival in patients with cancer.[12-14] While there exists significant previous research examining QoL in patients with head and neck cancers (HNCs) and some examining cognitive function in patients with HNC, there is a dearth of research examining the associations between QoL and cognitive function in this population.

Head and neck cancer represents 3% of all malignant neoplasms in the United States.[1] Head and neck cancer typically presents in an older population and is more common in men and in those with tobacco and/or alcohol use[15-18]—all of which are also risk factors for cognitive impairment.[2-5]

Previous research has determined that patient-reported cognitive functioning prior to HNC treatment is independently associated with disease progression and survival.[19] Additionally, in research examining cognitive function prior to induction chemotherapy or chemoradiation treatment for HNC, up to 47% of patients demonstrated cognitive impairment on neuropsychological tests.[20] However, these studies often rely on long neuropsychological test batteries or patient self-report. Whereas previous cross-sectional and longitudinal research has examined patient self-reported cognitive impairment and QoL in patients with HNC, these 2 variables have not been examined in relation to one another.[20-23]

To address the dearth of research examining the associations between QoL and cognitive function in patients with HNC, the present study sought to better elucidate the associations between cognitive functioning and QoL in patients prior to treatment for head and neck cancer within a multidisciplinary care team. We also worked to identify patient and clinical correlates associated with both cognitive function and QoL.

Key Points

Question What are the associations between cognitive functioning and quality of life (QoL) in patients prior to treatment for head and neck cancer within a multidisciplinary care team?

Findings In this case series of 83 adults evaluated before head and neck cancer treatment, 46 (55%) had cognitive impairment. The number of depressive symptoms was associated with impairments in delayed recall and QoL; cognitive impairment and delayed recall were associated with lower QoL; and past substance use was associated with current QoL and cognitive function.

Meaning Cognitive impairment is common in patients with head and neck cancer and is associated with QoL and psychosocial variables.

Methods

Approval with waiver of consent was obtained from the Henry Ford Health System Institutional Review Board for a retrospective medical record review of patient variables and selected outcomes. All patients with a diagnosis of oral cavity, oropharynx, hypopharynx, or larynx HNC between August 2015 and December 2016, regardless of medical and/or neurological comorbidities, who had both a pretreatment semistructured psychosocial interview and cognitive assessment with a clinical health psychologist and completed the Functional Assessment of Cancer Therapy–Head & Neck version 4 (FACT-H&N) during pretreatment assessment with the speech and language pathologist were included in analyses. Further patient demographic information and treatment variables, including clinical staging at initial presentation, treatment recommendations, and adherence to these recommendations were obtained via medical record review. All psychosocial and psychiatric variables were gathered during the evaluation with the health psychologist using a semistructured clinical interview. Psychosocial variables included current and past alcohol use, tobacco use, illicit drug use, and social support. Social support was dichotomized as adequate or inadequate, with adequate support indicating that the patient had perceived emotional and instrumental (eg, transportation, help at home) support available. Psychiatric variables included current and previous psychiatric care and psychotropic medication use, as well as current and baseline psychiatric symptoms. Depression was assessed as a symptom count based on *Diagnostic and Statistical Manual of Mental Disorders* (Fifth Edition) criteria, and anxiety was assessed as a presence or absence of generalized anxiety symptoms prior to cancer diagnosis. Adherence to treatment recommendations was defined as completing treatment as recommended. Those patients who did not receive the full treatment as recommended by the multidisciplinary tumor board were considered nonadherent, regardless of reason for this nonadherence.

Montreal Cognitive Assessment

At pretreatment assessment, the clinical health psychologist administered a brief screening tool for cognitive function, the Montreal Cognitive Assessment (MoCA). The MoCA[24] is a cognitive screening instrument that takes 5 to 10 minutes to administer. The MoCA has been validated against longer neuropsychological test batteries typically used in other studies that examined cognitive function in cancer treatment.[25-27] The MoCA measures the cognitive domains of executive functioning, attention and concentration, language, delayed recall, abstraction, and orientation. Executive functioning encompasses working memory, attentional and inhibitory control, problem solving, and planning. It represents the cognitive control over one's behavior. Attention and concentration is the ability to selectively pay attention to one thing while being able to ignore other stimuli. Language is a proxy for crystalized memory, or memory for previously learned material (ie, long-term memory). Conversely, delayed recall is a measure of short-term memory, or memory of newly learned materials. Abstraction is a measure of one's ability to isolate common features among dissimilar objects or "think outside the box." Finally, orientation is composed of one's knowledge of time, place, and current context.[24] Patients with scores greater than 26 out of 30 are considered normal or cognitively unimpaired.[24,28] To aid in better understanding of MoCA scores, previous research has shown that those with Alzheimer disease have mean scores of 16 (range, 11-21) and those with mild cognitive impairment have mean scores of 22 (range, 19-25).[28,29] In normal controls, the MoCA has demonstrated similar sensitivity and specificity compared with the more commonly used Mini-Mental State Examination (MMSE). However, the MoCA demonstrated improved sensitivity and specificity in both mild cognitive impairment and Alzheimer disease populations compared with the MMSE.[30-32] The MoCA was chosen for the purposes of this study due to its sensitivity and specificity, as well as its brevity, ease of use, multiple equivalent test forms allowing for repeated testing, availability in vision- and hearing-impaired versions and other languages, paper testing forms, and common use in other medical populations within our institution.

Functional Assessment of Cancer Therapy–Head and Neck Cancer

The FACT-H&N[33] is a validated measure of QoL in patients with HNC. The FACT-H&N is composed of 38 Likert-scored items, with higher scores indicating better QoL. A total score on the FACT-H&N can be calculated by summing the 5 domain subscales: physical well-being, social well-being, emotional well-being, functional well-being, and head and neck–specific well-being.[29] The FACT-H&N is commonly used in research examining QoL in patients with HNC and was chosen in this study for the brevity of the measure, the domain subscales, and the utility in clinical practice.

Analytic Plan

Data were analyzed using SPSS statistical software (IBM Corp). Descriptive statistics were computed for all demographic and cancer variables, substance use, psychiatric symptoms, QoL, and MoCA scores. Student *t* tests were used for comparison between groups, and bivariate correlations were used for comparison between interval variables.

Results

Demographic Characteristics

Patients were a sample of 83 patients presenting for treatment of HNC to the Department of Otolaryngology–Head and Neck Surgery at an academic medical center in a Midwest urban center. The patients' mean age was 59.54 (95% CI, 57.23-61.73) years. Additional demographic information can be found in **Table 1**.

Patients were assessed in the pretreatment clinic prior to initiating treatment following presentation at a multidisciplinary tumor board. Appropriate staging is determined at the tumor board, and in this patient cohort, 60 (72%) patients had a late-stage cancer (American Joint Committee on Cancer stage III-IV). Sixty-three (76%) of patients followed the treatment recommendations made by the tumor board. Additional cancer-specific and treatment variables can be found in Table 1.

At pretreatment assessment, 25 (30%) patients were using tobacco products and 61 (73%) patients had a history of tobacco use. Heavy alcohol use was common, with 48 (58%) reporting past heavy alcohol use (ie, weekly binge drinking >5 standard drinks or more than recommended moderate alcohol use of 1 standard drink/d for women or 2 standard drinks/d for men) and 23 (28%) reporting current heavy alcohol use (**Table 2**). Additionally, 12 (14%) reported current illicit drug use and 38 (46%) past illicit drug use, with the most common illicit drug being marijuana, followed by cocaine and heroin.

Overall, 46% (n = 38) of patients reported a psychiatric history, with 36% (n = 30) of all patients reporting elevated baseline anxiety. At the time of assessment, patients reported a mean of 2.43 depressive symptoms (range, 0-8) (Table 2), with 6% (n = 5) of all patients reporting 5 or more depressive symptoms and 6% (n = 5) reporting passive suicidal ideation. Despite only 5% (n = 4) patients reporting current engagement in mental health treatment (ie, being under the care of a psychiatrist and/or engaged in psychotherapy), 21 (25%) patients had a history of taking psychotropic medications and 27 (33%) were currently taking a psychotropic medication, typically prescribed by a nonpsychiatric clinician (Table 2).

In the present study, reliability of the MoCA was good (Cronbach α = .77). **Table 3** presents the MoCA total and subscale descriptives. In the present sample, the mean MoCA score was less than the cut score of 26 out of 30, indicating that most patients would be considered cognitively impaired. In particular, 45% (n = 37) scored in the nonimpaired range (ie, overall MoCA score ≥26). Fifty-five percent (n = 46) of all patients scored in the impaired range, with 54% (n = 45) of all patients scoring between 18 and 25 (ie, level of mild cognitive impairment), and 1% (n = 1) between 10 and 17 (ie, level of Alzheimer disease).

The FACT-H&N reliability was acceptable to good, depending on the scale (overall QoL Cronbach α = .91, physical well-being α = .66, social well-being α = .75, emotional well-being

Table 1. Demographic and Cancer-Specific Variables

Variable	Value (N = 83)
Age, y	
Mean (95% CI)	59.54 (57.23-61.73)
Range	34-86
Sex, No. (%)	
Female	19 (23)
Male	64 (77)
Race, No. (%)	
White	63 (76)
African American	17 (20)
Other	3 (4)
Education, y	
Mean (95% CI)	13.78 (13.31-14.48)
Range	9-21
Employment at diagnosis, No. (%)	
Full or part time	34 (41)
Retired	30 (36)
Disability	13 (16)
Marital status, No. (%)	
Married or partnered	54 (65)
Single or divorced	25 (30)
Widowed	4 (5)
Sufficient social support, No. (%)	75 (90)
American Joint Committee on Cancer stage, No. (%)	
Early (stage I-II)	23 (28)
Late (stage III-IV)	60 (72)
Histopathologic subtype, No. (%)	
Squamous cell carcinoma	76 (92)
Site, No. (%)	
Oral cavity	27 (33)
Oropharynx	37 (45)
Laryngopharynx	16 (19)
Other head and neck cancer	3 (4)
Human papillomavirus type P16 positive, No. (%)	29 (35)
Followed tumor board instructions, No. (%)	63 (76)
Primary treatment, No. (%)	
Radiotherapy	4 (5)
Chemoradiotherapy	26 (31)
Chemotherapy	2 (2)
Surgery	51 (61)
Adjuvant treatment, No. (%)	
Any	33 (40)
Radiotherapy	16 (19)
Chemoradiotherapy	16 (19)
Chemotherapy	1 (1)

Table 2. Psychosocial Variables

Variable	Value (N = 83)
Substance use, No. (%)	
Heavy alcohol	
Current	23 (28)
Past	48 (58)
Tobacco	
Current	25 (30)
Past	61 (73)
Illicit drug	
Current	12 (14)
Past	38 (46)
Type of illicit drug(s) reported, No. (%)	
Marijuana	36 (43)
Cocaine	10 (12)
Heroin	4 (5)
Psychiatric symptoms	
Depressive symptoms	
Mean (95% CI)	2.43 (2.06-2.89)
Range	0-8
Anxiety, No. (%)	30 (36)
Trauma, No. (%)	10 (12)
Passive suicidal ideation, No. (%)	5 (6)
Psychotropic medication use, No. (%)	
Past	21 (25)
Current	
Any	27 (33)
Benzodiazepine	16 (19)
Antidepressant	18 (22)
Antipsychotic	2 (2)
Mental health treatment, No. (%)	
Current	4 (5)
Past	25 (30)

α = .67, functional well-being α = .89, head and neck-specific well-being α = .82). Table 3 presents the FACT-H&N total and subscale descriptives.

Cognitive Function and QoL

Patient scores on the language subscale were positively associated with social QoL/well-being. Patient scores on delayed recall were positively associated with overall QoL, emotional QoL/well-being, and functional QoL/well-being. There were no other significant associations between MoCA total or subscales and QoL scales (**Table 4**).

Cognitive Function, QoL, and Demographic and Psychosocial Variables

Table 5 highlights the associations between cognitive function, QoL, and demographic variables. In particular, age was negatively associated with executive function, delayed recall, and total MoCA score, indicating that older patients have increasing difficulty with these processes. Age was also negatively associated with head and neck–specific well-being. Patient level of education was positively associated with attention/concentration (r = 0.22; 95% CI, 0.02-0.40) and abstraction (r = 0.23; 95% CI, 0.03-0.42), indicating that those with higher educational attainment demonstrated higher scores in these processes.

Table 5 also highlights the associations between cognitive function, QoL, and psychosocial variables. The number of depression symptoms reported by patients was negatively

associated with delayed recall scores. Additionally, number of depression symptoms was also negatively associated with the overall QoL and each QoL/well-being subscale. Higher baseline anxiety was associated with lower emotional well-being and impairment in the language subscale. Furthermore, current benzodiazepine use was associated with lower overall, physical, emotional, and functional QoL/well-being. As would be expected, lack of social support for treatment was associated with lower social well-being ($t(81) = -3.36$; $P = .001$; adequate support mean, 22.94; 95% CI, 21.92 to 23.96; inadequate support mean, 17.73; 95% CI, 12.31 to 23.15), as well as greater impairment in delayed recall ($t(80) = 2.17$; $P = .03$; adequate support mean, 2.68; 95% CI, 2.36 to 2.99; inadequate support mean, 3.86; 95% CI, 2.50 to 5.21). Sex, current and past antidepressant use, and past benzodiazepine use were not associated with MoCA overall or subscales or with overall QoL or the well-being scales.

Table 3. Descriptives for Montreal Cognitive Assessment (MoCA) and Functional Assessment of Cancer Therapy–Head & Neck, Version 4 (FACT-H&N)

Scale or Subscale (Maximum Score)	Mean (Range)	(95% CI)
MoCA		
Total (30)	24.63 (17-30)	(23.97-25.72)
Executive function (5)	4.17 (1-5)	(3.95-4.37)
Attention/concentration (6)	5.41 (2-6)	(5.20-5.59)
Language (6)	4.84 (2-6)	(4.60-5.07)
Abstraction (2)	1.21 (0-2)	(1.04-1.37)
Free recall (5)	2.75 (0-5)	(2.46-3.06)
Orientation (6)	5.89 (4-6)	(5.80-5.96)
FACT-H&N		
Total (148)	110.20 (60-143)	(105.97-114.54)
Physical well-being (28)	22.97 (11-28)	(22.15-23.79)
Social well-being (28)	22.54 (8-28)	(21.47-23.46)
Emotional well-being (24)	17.67 (10-24)	(16.90-18.44)
Functional well-being (28)	17.99 (4-28)	(16.58-19.47)
Head and neck-specific well-being (40)	29.04 (4-40)	(27.44-30.76)

Cognitive Function, QoL, and Substance Use

Table 5 demonstrates the associations between heavy alcohol, tobacco, and heavy drug use and the total and subscales of both the MoCA and FACT-H&N. Patients with histories of heavy alcohol use reported lower emotional, functional, and head and neck–specific well-being, as well as overall QoL/well-being. Current tobacco use was associated with lower social, functional, and overall QoL/well-being, as well as lower performance on the language subscale. Past tobacco use was associated with lower QoL/well-being overall and across all subscales. Past heavy drug use was associated with lower delayed recall, abstraction performance, and overall MoCA, as well as lower functional well-being. Current heavy alcohol and heavy drug use were not associated with overall MoCA or subscales or with overall QoL or the well-being scales.

Cognitive Function, QoL, and HNC Variables

Patients with human papillomavirus type p16–positive disease reported higher social well-being ($t(81) = 2.20$; $P = .03$; p16-positive mean, 23.95; 95% CI, 22.41 to 25.49; p16-negative mean, 21.56; 95% CI, 20.18 to 22.93). Stage at presentation and whether the patient followed tumor board recommendations were not associated with overall MoCA or subscales or with overall QoL or the well-being scales.

Discussion

The present study sought to better elucidate the associations between cognitive functioning and QoL in patients prior to treatment for HNC within a multidisciplinary care team. We also worked to identify patient and clinical correlates associated with both cognitive function and QoL. Slightly more than 50% of patients presented with at least mild cognitive impairment at pretreatment assessment. This is in proportion to previous findings of 47% of patients presenting with cognitive impairment prior to treatment.[20] As would be expected, cognitive impairment was related to age and educational attainment.[25]

As with previous research in patients with non-HNC disorders, cognitive impairment was associated with QoL in

Table 4. Correlations Between Montreal Cognitive Assessment (MoCA) Total and Subscale Scores and Functional Assessment of Cancer Therapy–Head & Neck, Version 4 (FACT-H&N), Scales

FACT-H&N Scale or Subscale	MoCA Scale or Subscale, Correlation (95% CI)						
	Total	Executive Function	Attention and Concentration	Language	Abstraction	Delayed Recall	Orientation
Total	0.20 (−0.03 to 0.42)	−0.002 (−0.19 to 0.21)	−0.03 (−0.28 to 0.26)	0.15 (−0.07 to 0.37)	0.13 (−0.10 to 0.33)	0.32 (0.13 to 0.51)	−0.13 (−0.28 to 0.02)
Physical well-being	0.06 (−0.13 to 0.27)	−0.02 (−0.21 to 0.17)	−0.06 (−0.25 to 0.16)	0.08 (−0.10 to 0.27)	0.08 (−0.13 to 0.30)	0.12 (−0.09 to 0.34)	−0.02 (−0.14 to 0.12)
Social well-being	0.20 (−0.03 to 0.44)	0.02 (−0.18 to 0.23)	0.02 (−0.20 to 0.29)	0.24 (0.06 to 0.44)	0.11 (−0.12 to 0.34)	0.23 (−0.004 to 0.45)	−0.20 (−0.30 to −0.08)
Emotional well-being	0.11 (−0.08 to 0.31)	−0.005 (−0.17 to 0.18)	−0.05 (−0.29 to 0.21)	−0.06 (−0.27 to 0.16)	0.11 (−0.13 to 0.30)	0.26 (0.07 to 0.45)	0.03 (−0.24 to 0.27)
Functional well-being	0.18 (−0.03 to 0.38)	0.01 (−0.18 to 0.19)	−0.11 (−0.33 to 0.15)	0.10 (−0.13 to 0.34)	0.14 (−0.09 to 0.33)	0.36 (0.16 to 0.53)	−0.11 (−0.28 to 0.03)
Head and neck–specific well-being	0.16 (−0.06 to 0.37)	−0.01 (−0.23 to 0.21)	0.05 (−0.19 to 0.33)	0.13 (−0.08 to 0.34)	0.06 (−0.16 to 0.26)	0.19 (0.02 to 0.36)	−0.11 (−0.28 to 0.10)

Table 5. Associations Between Demographic, Psychosocial, Montreal Cognitive Assessment (MoCA), and Functional Assessment of Cancer Therapy–Head & Neck, Version 4 (FACT-H&N), Scales

Scale or Subscale	r (95% CI)		Mean (95% CI)											
			Current Generalized Anxiety		Current Benzodiazepine Use		Past Heavy Alcohol Use		Tobacco Use				Past Illicit Drug Use	
	Age	Depressive Symptoms	No (n = 52)	Yes (n = 30)	No (n = 59)	Yes (n = 16)	No (n = 35)	Yes (n = 48)	Current		Past		No (n = 63)	Yes (n = 20)
									No (n = 58)	Yes (n = 25)	No (n = 22)	Yes (n = 61)		
FACT-H&N														
Total	−0.19 (−0.39 to 0.03)	−0.56 (−0.69 to −0.39)	111.68 (106.47 to 116.89)	107.47 (99.59 to 115.34)	112.29 (107.44 to 117.13)	99.97 (89.14 to 110.80)	117.89 (112.59 to 123.19)	104.65 (98.66 to 110.64)	113.77 (108.81 to 118.72)	101.87 (93.83 to 109.92)	121.69 (113.23 to 130.14)	105.91 (101.21 to 110.60)	111.22 (106.49 to 115.94)	106.80 (96.23 to 117.37)
Physical WB	−0.03 (−0.24 to 0.19)	−0.38 (−0.55 to −0.18)	22.98 (21.87 to 24.09)	22.87 (21.64 to 24.09)	23.37 (22.40 to 24.33)	20.75 (18.82 to 22.68)	23.86 (22.81 to 24.90)	22.27 (21.08 to 23.46)	23.34 (22.37 to 24.32)	22.00 (20.44 to 23.56)	24.45 (22.77 to 26.14)	22.39 (21.47 to 23.32)	23.11 (22.28 to 23.95)	22.40 (20.08 to 24.72)
Social WB	−0.06 (−0.27 to 0.16)	−0.31 (−0.49 to −0.10)	22.76 (21.48 to 24.04)	21.73 (19.82 to 23.65)	22.32 (21.02 to 23.61)	22.03 (19.39 to 24.67)	23.52 (22.08 to 24.96)	21.57 (20.08 to 23.05)	23.61 (22.62 to 24.61)	19.55 (17.18 to 21.93)	24.83 (23.39 to 26.26)	21.51 (20.23 to 22.80)	22.61 (21.45 to 23.77)	21.70 (19.12 to 24.28)
Emotional WB	−0.11 (−0.32 to 0.11)	−0.41 (−0.58 to −0.21)	18.44 (17.59 to 19.30)	16.33 (14.99 to 17.68)	18.14 (17.33 to 18.94)	16.00 (14.09 to 17.91)	19.00 (17.90 to 20.10)	16.73 (15.77 to 17.69)	18.11 (17.22 to 18.99)	16.68 (15.27 to 18.09)	19.36 (17.74 to 20.99)	17.05 (16.25 to 17.85)	17.79 (16.92 to 18.66)	17.30 (15.70 to 18.90)
Functional WB	−0.15 (−0.35 to 0.07)	−0.58 (−0.71 to −0.42)	18.62 (16.96 to 20.29)	17.13 (14.35 to 19.91)	18.75 (17.15 to 20.35)	14.19 (10.65 to 17.73)	19.83 (18.03 to 21.63)	16.81 (14.73 to 18.90)	19.07 (17.45 to 20.68)	15.80 (12.86 to 18.74)	20.73 (17.99 to 23.47)	17.13 (15.47 to 18.80)	19.02 (17.51 to 20.52)	15.15 (11.56 to 18.74)
H&N-specific WB	−0.24 (−0.44 to −0.03)	−0.36 (−0.54 to −0.16)	28.55 (26.37 to 30.73)	29.40 (26.64 to 32.16)	29.42 (27.49 to 31.34)	27.00 (22.40 to 31.60)	31.03 (28.95 to 33.10)	27.27 (24.83 to 29.71)	29.29 (27.26 to 31.33)	27.84 (24.69 to 30.99)	32.32 (29.45 to 35.19)	27.61 (25.62 to 29.59)	28.41 (26.53 to 30.30)	30.25 (26.33 to 34.17)
MoCA														
Total	−0.30 (−0.48 to −0.09)	−0.11 (−0.32 to 0.11)	24.94 (24.16 to 25.73)	24.17 (22.95 to 25.39)	24.90 (24.12 to 25.68)	24.00 (22.40 to 25.60)	25.03 (24.17 to 25.89)	24.38 (23.41 to 25.36)	24.83 (24.08 to 25.57)	24.25 (22.83 to 25.67)	25.27 (24.15 to 26.39)	24.43 (23.62 to 25.24)	25.05 (24.30 to 25.80)	23.45 (22.11 to 24.79)
Exec func	−0.25 (−0.44 to −0.04)	−0.03 (−0.24 to 0.19)	4.13 (3.82 to 4.44)	4.07 (3.71 to 4.42)	4.13 (3.84 to 4.43)	4.13 (3.74 to 4.51)	4.23 (3.95 to 4.51)	4.02 (3.67 to 4.37)	4.14 (3.89 to 4.39)	4.04 (3.50 to 4.58)	4.41 (4.06 to 4.76)	4.00 (3.71 to 4.29)	4.14 (3.86 to 4.42)	4.00 (3.57 to 4.43)
Attn/conc	−0.11 (−0.32 to 0.11)	0.20 (−0.02 to 0.40)	5.28 (4.95 to 5.61)	5.47 (5.15 to 5.79)	5.33 (5.03 to 5.63)	5.38 (4.95 to 5.80)	5.31 (4.97 to 5.66)	5.38 (5.04 to 5.71)	5.41 (5.17 to 5.66)	5.20 (4.62 to 5.78)	5.36 (4.88 to 5.85)	5.34 (5.06 to 5.62)	5.40 (5.11 to 5.68)	5.20 (4.75 to 5.65)
Language	−0.01 (−0.23 to 0.21)	−0.05 (−0.26 to 0.17)	5.06 (4.81 to 5.31)	4.50 (4.03 to 4.97)	4.88 (4.61 to 5.16)	4.88 (4.33 to 5.42)	4.97 (4.63 to 5.31)	4.77 (4.44 to 5.10)	5.03 (4.76 to 5.30)	4.42 (3.97 to 4.86)	4.73 (4.23 to 5.22)	4.90 (4.63 to 5.17)	4.82 (4.54 to 5.10)	4.95 (4.48 to 5.42)
Abstraction	0.08 (−0.21 to 0.22)	−0.004 (−0.22 to 0.21)	1.23 (1.01 to 1.45)	1.13 (0.84 to 1.42)	1.24 (1.04 to 1.44)	0.94 (0.48 to 1.39)	1.37 (1.13 to 1.61)	1.06 (0.82 to 1.30)	1.22 (1.03 to 1.42)	1.13 (0.75 to 1.50)	1.41 (1.11 to 1.70)	1.12 (0.91 to 1.32)	1.35 (1.16 to 1.54)	0.70 (0.39 to 1.01)
Free recall	−0.37 (−0.55 to −0.17)	−0.28 (−0.47 to −0.07)	2.81 (2.42 to 3.20)	2.73 (2.20 to 3.27)	2.88 (2.51 to 3.25)	2.44 (1.64 to 3.24)	3.00 (2.52 to 3.48)	2.62 (2.20 to 3.03)	2.79 (2.42 to 3.17)	2.75 (2.16 to 3.34)	3.18 (2.53 to 3.83)	2.63 (2.28 to 2.99)	3.00 (2.64 to 3.36)	2.10 (1.53 to 2.67)
Orientation	0.03 (−0.19 to 0.24)	0.23 (0.02 to 0.43)	5.90 (5.80 to 6.00)	5.87 (5.74 to 6.00)	5.90 (5.81 to 5.99)	5.88 (5.69 to 6.06)	5.89 (5.75 to 6.02)	5.89 (5.80 to 5.99)	5.90 (5.80 to 5.99)	5.88 (5.73 to 6.02)	5.91 (5.78 to 6.04)	5.88 (5.79 to 5.98)	5.87 (5.77 to 5.97)	5.95 (5.85 to 6.05)

Abbreviations: attn/conc, attention/concentration; exec func, executive fuction; H&N, head and neck; WB, well-being.

patients with HNC.[9-13] In particular, language and delayed recall (ie, memory) were associated with poorer QoL in multiple domains. Interestingly, there were no significant relationships between cognitive impairment and QoL in the physical or head and neck–specific domains. This may indicate that impairments in cognitive function have a larger effect in the domains of a patient's life that are important to psychosocial functioning, such as emotional functioning, daily independence, and social support and engagement. It is also likely that these areas may influence the patient's ability to appropriately engage in HNC care. Hence, this is an area for future research.

Similar to previous research demonstrating a relationship between psychiatric symptoms, cognitive impairment, and QoL,[3,6-11] the present study found these associations, particularly with depressive symptoms and anxiety. The consistency in these associations within the research highlight the importance of clinicians not just identifying pretreatment psychiatric symptoms and monitoring for these symptoms throughout cancer treatment, but also treating these appropriately with referral to behavioral health clinicians and/or psychotropic medications.

In contrast to previous research,[23,34] cognitive impairment in the present study was not related to heavy alcohol use. Previous research has shown heavy alcohol use to be a predictor of cognitive impairment.[34] However, past heavy alcohol use was associated with poorer QoL across most domains. Perhaps most notably, past heavy alcohol use was associated with poorer emotional well-being. This finding may indicate that patients with heavy alcohol use are less likely to have the coping strategies necessary to cope with their cancer diagnosis. This limitation in coping has been found to interfere with engagement in treatment, adherence, and survival in cancer.[12,23,35,36] Adding to the literature in this area, the present study also demonstrated that past tobacco use was associated with QoL.

Limitations

The present study is a case series of patients presenting for treatment of HNC at a tertiary care center that practices multidisciplinary care. Whereas the field of HNC care is moving toward specialty care at tertiary centers, this does not represent a majority of HNC care settings. Hence, there are some limitations to the generalizability of the results that warrant future research. Whereas the MoCA is a brief cognitive assessment, making it clinically useful in determining cognitive function and the need for further neuropsychological workup, it is limited by patient engagement in testing, fatigue, and other psychosocial variables. These limitations are true for most forms of psychological assessment, and these limitations should not deter further investigation of cognitive function in this population, particularly in light of research demonstrating the role of cognitive impairment in treatment adherence. Additionally, medical comorbidities known to affect cognitive function were not assessed in the present study and future research should include comorbidities. Because the present study was cross-sectional, it can only demonstrate associations between variables, not directionality. Future research should focus on prospective, longitudinal studies in patients with HNC to examine QoL, as well as cognitive and mood symptom changes, across treatment and how these may affect disease-free and overall survival.

Conclusions

The dearth of research examining the associations between QoL and cognitive function in HNC highlights the need for research to better elucidate the relationships among cognitive impairment, QoL, and other psychosocial variables within the context of treatment adherence and outcomes. Increased understanding of these factors and their interaction with the ability to rehabilitate, morbidity, and mortality would aid in the development of both medical and psychosocial interventions that influence morbidity and mortality in this population. Such intervention should likely start with identification of risk factors, such as alcohol and tobacco use, in addition to the cognitive impairment itself prior to treatment initiation, thus allowing the treatment team to intervene and possibly improve both patient and treatment outcomes (eg, QoL and survival). Further research is needed in this area, particularly with patients with HNC due to the high prevalence of comorbid substance use and psychiatric symptoms.

The present study sought to better elucidate the associations between cognitive functioning and QoL in patients prior to treatment for HNC within a multidisciplinary care team. The findings demonstrated the feasibility of assessing cognitive function within a multidisciplinary team, as well as the associations between domains of cognitive impairment and areas of QoL in patients with HNC. It further demonstrated important associations between cognitive impairment, QoL, and psychosocial variables. The results argue for the incorporation of cognitive screening and assessment of QoL as part of pretreatment assessment for patients, as well as further research into more direct, causal relationships via longitudinal, prospective studies.

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Acquisition, analysis, or interpretation of data: Williams, Lindholm, Cook, Chang.
Drafting of the manuscript: Williams, Siddiqui.
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Administrative, technical, or material support: Williams, Lindholm, Cook, Chang.
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