

Supplementary files

A tool for rapid assessment of functional outcomes in patients with head and neck cancer

Supplemental data S1: Literature search of 120 included articles

Full-text analysis was performed in 68 of 120 included articles, highlighted as bold. Trigger words in the title are underlined.

1: Samuel SR, Maiya AG, Fernandes DJ, Guddattu V, Saxena PUP, Kurian JR, Lin PJ, Mustian KM. Effectiveness of exercise-based rehabilitation on functional capacity and quality of life in head and neck cancer patients receiving chemo-radiotherapy. Support Care Cancer. 2019 Oct;27(10):3913-3920. doi: 10.1007/s00520-019-04750-z. Epub 2019 Mar 27. PMID: 30919154; PMCID: PMC6728220.

2: Grote M, Maihöfer C, Weigl M, Davies-Knorr P, Belka C. Progressive resistance training in cachectic head and neck cancer patients undergoing radiotherapy: a randomized controlled pilot feasibility trial. Radiat Oncol. 2018 Nov 6;13(1):215. doi: 10.1186/s13014-018-1157-0. PMID: 30400971; PMCID: PMC6219249.

3: Mendez A, Seikaly H, Eurich D, Dzioba A, Aalto D, Osswald M, Harris JR, O'Connell DA, Lazarus C, Urken M, Likhterov I, Chai RL, Rauscher E, Buchbinder D, Okay D, Happonen RP, Kinnunen I, Irjala H, Soukka T, Laine J; Head and Neck Research Network. Development of a Patient-Centered Functional Outcomes Questionnaire in Head and Neck Cancer. JAMA Otolaryngol Head Neck Surg. 2020 May 1;146(5):437-443. doi: 10.1001/jamaoto.2019.4788. PMID: 32271362; PMCID: PMC7146527.

4: Capozzi LC, McNeely ML, Lau HY, Reimer RA, Giese-Davis J, Fung TS, Culos-Reed SN. Patient-reported outcomes, body composition, and nutrition status in patients with head and neck cancer: Results from an exploratory randomized controlled exercise trial. Cancer. 2016 Apr 15;122(8):1185-200. doi: 10.1002/cncr.29863. Epub 2016 Feb 1. PMID: 26828426.

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6: Boright L, Doherty DJ, Wilson CM, Arena SK, Ramirez C. Development and Feasibility of a Prehabilitation Protocol for Patients Diagnosed with Head and Neck Cancer. Cureus. 2020 Aug 20;12(8):e9898. doi: 10.7759/cureus.9898. PMID: 32968564; PMCID: PMC7505529.

7: Lin CR, Fan KH, Lin CY, Hung TM, Huang BS, Chen EY, Kang CJ, Huang SF, Chang JT, Chang CH. Development and evaluation of a computerized clinical outcome assessment tool for head and neck cancer patients. Medicine (Baltimore). 2020 Aug 21;99(34):e20304. doi: 10.1097/MD.00000000000020304. PMID: 32846748; PMCID: PMC7447395.

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- 10: Davudov MM, Rahimov C, Harirchi I, Mirzajani Z, Amiraliyev N, Amiraliyev K, Rustamova N, Zebardast J, Montazeri A. Psychometric evaluation of Azeri version of the head and neck cancer specific quality of life questionnaire (EORTC QLQ-H&N43). *Health Qual Life Outcomes.* 2020 Jul 23;18(1):248. doi: 10.1186/s12955-020-01500-2. PMID: 32703297; PMCID: PMC7379343.
- 11: Gelbard A, Anderson C, Berry LD, Amin MR, Benninger MS, Blumin JH, Bock JM, Bryson PC, Castellanos PF, Chen SC, Clary MS, Cohen SM, Crawley BK, Dailey SH, Daniero JJ, de Alarcon A, Donovan DT, Edell ES, Ekbom DC, Fernandes-Taylor S, Fink DS, Franco RA, Garrett CG, Guardiani EA, Hillel AT, Hoffman HT, Hogikyan ND, Howell RJ, Huang LC, Hussain LK, Johns MM 3rd, Kasperbauer JL, Khosla SM, Kinnard C, Kupfer RA, Langerman AJ, Lentz RJ, Lorenz RR, Lott DG, Lowery AS, Makani SS, Maldonado F, Mannion K, Matrk L, McWhorter AJ, Merati AL, Mori MC, Netterville JL, O'Dell K, Ongkasuwan J, Postma GN, Reder LS, Rohde SL, Richardson BE, Rickman OB, Rosen CA, Rutter MJ, Sandhu GS, Schindler JS, Schneider GT, Shah RN, Sikora AG, Sinard RJ, Smith ME, Smith LJ, Soliman AMS, Sveinsdóttir S, Van Daele DJ, Veivers D, Verma SP, Weinberger PM, Weissbrod PA, Wootten CT, Shyr Y, Francis DO. Comparative Treatment Outcomes for Patients With Idiopathic Subglottic Stenosis. *JAMA Otolaryngol Head Neck Surg.* 2020 Jan 1;146(1):20-29. doi: 10.1001/jamaoto.2019.3022. PMID: 31670805; PMCID: PMC6824232.
- 12: Rogers SN, Barber B. Using PROMs to guide patients and practitioners through the head and neck cancer journey. *Patient Relat Outcome Meas.* 2017 Nov 8;8:133-142. doi: 10.2147/PROM.S129012. PMID: 29184455; PMCID: PMC5687779.
- 13: Alberga JM, Korfage A, Bonnema I, Witjes MJH, Vissink A, Raghoobar GM. Mandibular dental implant placement immediately after teeth removal in head and neck cancer patients. *Support Care Cancer.* 2020 Dec;28(12):5911-5918. doi: 10.1007/s00520-020-05431-y. Epub 2020 Apr 11. PMID: 32279135; PMCID: PMC7686200.
- 14: Cmelak A, Dietrich MS, Li S, Ridner S, Forastiere A, Burtneess BA, Cella D, Murphy BA. ECOG-ACRIN 2399: analysis of patient related outcomes after Chemoradiation for locally advanced head and neck Cancer. *Cancers Head Neck.* 2020 Dec 22;5(1):12. doi: 10.1186/s41199-020-00059-1. PMID: 33353553; PMCID: PMC7756946.
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carcinoma of the head and neck: A trial of the ECOG-ACRIN Cancer Research Group (E1302). *Cancer Med.* 2020 Dec;9(23):8884-8894. doi: 10.1002/cam4.3506. Epub 2020 Oct 10. PMID: 33040481; PMCID: PMC7724483.

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3783. doi: 10.1007/s00520-017-3808-3. Epub 2017 Jul 12. PMID: 28702685; PMCID: PMC5658458.

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Supplemental data S2: Mapping of functions or symptoms repetitively mentioned in publications on functional outcome in HNC-patients to functional domains

	Functional or symptom	Functional domain
Eating, drinking		
Swallowing		
Dysphagia		
Feeding, Feeding tube, percutaneous endoscopic gastrostomy, PEG		Food intake
Trism, mouth opening, chewing, dental status ¹		
Xerostomia, sticky saliva, dry mouth, (hypo-)salivation ¹		
Aspiration		
Taste alteration (dysgeusia)		
Normality of diet		
Laryngectomy		
Respiration, respiratory		
Dyspnea		
Breath, breathing		Breathing
Tracheo(s)tomy		
Pharyngeal, laryngeal, tracheal stenosis		
Pharyngeal, laryngeal, tracheal edema		
Vocal chord paresis		
Speaking		
Dysarthria		
Neuropathy, paresis		
Tongue mobility		
Voice, Voice rehabilitation		Speech
Communication (verbal)		
Hoarseness		
Nasality, nasalization, velopharyngeal insufficiency, rhinolalia, rhinophonia		
Pain		Pain
Pain medication		
Depression		
Emotion, emotional		
Antidepressants		Mood
Well-being		
Distress		
Enjoy life		
Neck		Shoulder-neck mobility

Shoulder

Neck lymphedema

Induration, fibrosis

Range of motion

¹Despite considerable effort, we have not been able to code the functional domain saliva using external criteria with verbal rating scales in a meaningful sequence. This functional domain was assigned to the functional domain food intake.

Supplemental data S3: Adapted Head and Neck Cancer Functional Integrity Scale (HNC-FIT Scale)

Functional Domain	Integrity Grad					Due to tumor / treatment		
	0	1	2	3	4			
Food intake	No oral feeding; only via gastrostomy tube	Gastrostomy tube needed; some oral feeding possible	No gastrostomy tube, oral diet, but only liquid/soft food	No gastrostomy tube, diet/ swallowing near normal	normal			
Respiration	Tracheostoma, needs blocked cannula	Tracheostoma, speech cannula/no cannula	No tracheostoma, breathing difficulties at rest	No tracheostoma, breathing difficulties only on exertion	normal			
Speech	Not possible, without phonation	Difficult to understand, no phone calls	Telephoning possible	Easy to understand, but pronunciation/ voice changed	normal			
Pain	Pain despite opiate therapy	Controlled with opiates	Regularly needs non-opioid analgesics	Needs analgesics from time to time	normal			
Mood	Suicidal thoughts	Very depressed despite antidepressants	with antidepressants overall normal mood, very depressed without	Occasionally depressed, no antidepressants	normal			
Neck & shoulder mobility ¹	Stiff neck and/or shoulder, hardly any movement possible	Can hair hardly comb, looking backwards in car not possible	Combing with problems, looking backwards in car difficult	Combing and looking backwards in car slightly restricted	normal			

¹The worse result of neck mobility and shoulder mobility is counted.

The Head and Neck Cancer Functional Integrity Scale (HNC-FIT-scale) is completed by the clinician during the patient interview at oncology follow-up visits. It takes 1-2

minutes to complete the questionnaire. The HNC-FIT scale includes the functional domains of food intake, breathing, speech, pain, mood, and neck and shoulder mobility. Functional integrity is graded on a scale of 0 to 4, with 0 indicating complete loss of normal function (worst outcome) and 4 indicating functional integrity (best outcome).

Supplemental data S4: Assessment of face and content validity of the Head and Neck Cancer Functional Integrity Scale (HNC-FIT scales) via semi-structured expert interviews

Head and neck cancer (HNC) and its treatment can lead to various functional impairments. The "head and neck functional integrity scales" (HNC-FIT scale) is a clinical instrument for rapid physician-rated assessment of basic functional outcomes in HNC-patients during the initial diagnosis and oncological follow-up investigation. As part of the development and empirical validation of this clinical tool, we would appreciate your opinion as physician or therapist involved in the treatment of HNC-patients within the framework of a semi-structured interview. Please read the HNC-FIT scales and the instructions on how to complete it carefully. Then imagine you are completing this clinical instrument with a HNC-patient in the context of initial diagnosis or oncological follow-up investigation.

As part A of the semi-structured interview, we would like you to rate the entire HNC-FIT scales for its face-validity on a 5-point Likert scale from 1 ("very good") to 5 ("not sufficient") and to rate each functional domain on the same 5-point Likert scale via 8 questions for their content validity.

As part B of this semi-structured interview, we would like you to express concerns, additions, advantages and disadvantages of the entire HNC-FIT scales and for each functional domain. In addition, we would like you to express whether you considered any functional domains not important or irritating and whether you would like to include any previously missed functional domains.

Part A

1.) Please, rate the **entire HNC-FIT scales**. The individual functional items...

		1	2	3	4	5
a)	...record the most important functions impaired in HNC patients	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2.) Please, rate the functional domain "**food intake**". This functional domain...

		1	2	3	4	5
a)	...is formulated comprehensibly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b)	...is based on objective external criteria	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c)	...distinguishes impaired from non-impaired HNC-patients	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d)	...probably responds well to a change in functional integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e)	...probably achieves similar results if completed by different physicians	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f)	...probably achieves similar results if functional integrity remains unchanged	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g)	...represent a comprehensible increase from worst to best functional integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h)	...represent an equidistant increase from worst to best functional integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3.) Please, rate the functional domain "**breathing**". This functional domain...

		1	2	3	4	5
a)	...is formulated comprehensibly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

b)	...is based on objective external criteria	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c)	...distinguishes impaired from non-impaired HNC-patients	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d)	...probably responds well to a change in functional integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e)	...probably achieves similar results if completed by different physicians	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f)	...probably achieves similar results if functional integrity remains unchanged	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g)	...represent a comprehensible increase from worst to best functional integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h)	...represent an equidistant increase from worst to best functional integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4.) Please, rate the functional domain "**speech**". This functional domain...

		1	2	3	4	5
a)	...is formulated comprehensibly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b)	...is based on objective external criteria	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c)	...distinguishes impaired from non-impaired HNC-patients	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d)	...probably responds well to a change in functional integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e)	...probably achieves similar results if completed by different physicians	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f)	...probably achieves similar results if functional integrity remains unchanged	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g)	...represent a comprehensible increase from worst to best functional integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h)	...represent an equidistant increase from worst to best functional integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5.) Please, rate the functional domain "**pain**". This functional domain...

		1	2	3	4	5
a)	...is formulated comprehensibly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b)	...is based on objective external criteria	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c)	...distinguishes impaired from non-impaired HNC-patients	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d)	...probably responds well to a change in functional integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e)	...probably achieves similar results if completed by different physicians	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f)	...probably achieves similar results if functional integrity remains unchanged	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g)	...represent a comprehensible increase from worst to best functional integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h)	...represent an equidistant increase from worst to best functional integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6.) Please, rate the functional domain "**mood**". This functional domain...

	1	2	3	4	5
a) ...is formulated comprehensibly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) ...is based on objective external criteria	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) ...distinguishes impaired from non-impaired HNC-patients	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) ...probably responds well to a change in functional integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) ...probably achieves similar results if completed by different physicians	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) ...probably achieves similar results if functional integrity remains unchanged	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) ...represent a comprehensible increase from worst to best functional integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h) ...represent an equidistant increase from worst to best functional integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7.) Please, rate the functional domain "**shoulder-neck mobility**". This functional domain...

	1	2	3	4	5
a) ...is formulated comprehensibly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) ...is based on objective external criteria	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) ...distinguishes impaired from non-impaired HNC-patients	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) ...probably responds well to a change in functional integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) ...probably achieves similar results if completed by different physicians	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) ...probably achieves similar results if functional integrity remains unchanged	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) ...represent a comprehensible increase from worst to best functional integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h) ...represent an equidistant increase from worst to best functional integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Part B

1.) Please, express concerns, additions, advantages and disadvantages for the **entire HNC-FIT scale**:

2.) Please, express concerns, additions, advantages and disadvantages for the functional domain "**food intake**":

a)

b)

c)

d)

e)

- f) _____
- g) _____
- h) _____

3.) Please, express concerns, additions, advantages and disadvantages for the functional domain **"breathing"**:

- a) _____
- b) _____
- c) _____
- d) _____
- e) _____
- f) _____
- g) _____
- h) _____

4.) Please, express concerns, additions, advantages and disadvantages for the functional domain **"speech"**:

- a) _____
- b) _____
- c) _____
- d) _____
- e) _____
- f) _____
- g) _____
- h) _____

5.) Please, express concerns, additions, advantages and disadvantages for the functional domain **"pain"**:

- a) _____
- b) _____
- c) _____
- d) _____
- e) _____
- f) _____
- g) _____
- h) _____

6.) Please, express concerns, additions, advantages and disadvantages for the functional domain **"mood"**:

- a) _____
- b) _____
- c) _____
- d) _____
- e) _____
- f) _____
- g) _____
- h) _____

7.) Please, express concerns, additions, advantages and disadvantages for the functional domain **"shoulder-neck mobility"**:

- a) _____
- b) _____
- c) _____
- d) _____
- e) _____

f) _____
g) _____
h) _____

8.) Related to the HNC-FIT scales, were there any functional domains that you considered **not** important?

Functional domain "food intake", because:

Functional domain "breathing", because:

Functional domain "speech", because:

Functional domain "pain", because:

Functional domain "mood" because:

Functional domain "shoulder-neck mobility", because:

9.) Related to the HNC-FIT scale, were there any functional domains that you found irritating?

Functional domain "food intake", because:

Functional domain "breathing", because:

Functional domain "speech", because:

Functional domain "pain", because:

Functional domain "mood" because:

Functional domain "shoulder-neck mobility", because:

10.) Related to the HNC-FIT scales, where there any additional functional domains that should be included?

Thank you for your participation!

Supplemental data S5: Instructions for clinicians on how to complete the Head and Neck Functional Integrity Scale.

The functional domain food intake includes eating and drinking. 'Unable to swallow; only via gastrostomy tube' means that the patient is unable to swallow, and his intake of food is exclusively via gastrostomy (or nasogastral) tube. This applies also for nasogastric tubes. 'Gastrostomy tube needed, some oral feeding possible' means that the patient relies on PEG for adequate food and fluid intake, but occasional sips are possible. 'No gastrostomy tube, oral diet, but only liquid/soft food' means that the patient does not have a gastrostomy tube but cannot eat solid food. 'No gastrostomy tube, diet near normal' means that the patient can essentially eat normally, but with certain (e.g. dry foods) problems, but these can be overcome (for example, by simultaneously taking liquid). 'Normal', like in all functional domains, means that the function is as it was before the illness.

In the functional domain respiration 'Tracheostoma, needs blocked cannula' means that the patient has a tracheostoma and must use a cannula with blocked cuff, e.g. because of aspiration. 'Tracheostoma, speech cannula/no cannula' means a simple condition with tracheostomy. 'No tracheostoma, breathing difficult at rest' is ticked at dyspnea at rest. With 'No tracheostoma, breathing difficulties only on exertion', a typical loading situation would be e.g. climb stairs.

In the functional domain speech 'Not possible, without phonation' means that the patient is incapable of speech and essentially must rely on written communication. At 'Difficult to understand, no phone calls', the patient can indeed make sounds and you can understand the meaning with high concentration, but the patient is not able to make calls. At 'Telephoning possible' the language is very limited and difficult to understand, but it is a communication over the phone with strangers possible. 'Easy to understand, but pronunciation/voice changed' also detects slight functional limitations of speech, but the communication is possible without any problems.

In the pain dimension 'pain despite of opiate therapy' means that the patient suffers from pain despite pain therapy with opiates by experienced pain specialists. 'Controlled with opiates' means that with adequate pain therapy including opiates the patient is essentially painless. 'Regularly needs non-opioid analgesics' means that the patient has a long-term pain therapy without opioids and is thus essentially painless. 'Needs analgesics from time to time' means occasional pain and occasionally use of painkillers.

In the dimension mood, 'suicidal thoughts' means that the patient is so depressed that he has suicidal thoughts. As a rule, psychiatric intervention is urgently needed. 'Very depressed despite antidepressants' means that the patient has sustained depressive mood despite adequate antidepressant therapy received by a suitable medical facility. 'With antidepressants overall normal mood' means that the patient regularly needs antidepressants because of depressive mood. With this antidepressant therapy, however, the mood is essentially normal. 'Occasionally depressed, no antidepressants needed' is ticked in case of occasional depressive mood.

In the shoulder-neck-mobility dimension two functions are queried simultaneously, namely shoulder mobility and neck mobility. In each case the worse functional status is ticked. 'Stiff neck and/or shoulder, hardly any movement possible' is a complete fixation in the neck and/or shoulder area. 'Can hair hardly comb, looking backwards in car not possible' means that the shoulder mobility is so severely limited that with a straight head not all areas of the head are reachable with the comb and/or that without a rear view camera the car cannot be reversed under visual control because the head cannot be turned far enough. 'Combing with problems, looking backwards in car difficult' means that combing the hair when the head is straight and that reversing under sight is possible, but means a considerable effort. 'Combing and looking backwards in car near normal' means

a slight restriction of the neck and shoulder mobility without significant functional impairment.

Supplemental data S6: Selection of HNC-related symptoms and functions not covered by HNC-FIT scales.

- Sight
- Hearing, Tinnitus
- Hyposmia, smell disturbances
- Balance, vertigo
- Neuropathies, sensation, proprioception
- Sleep, Sleep disturbances
- Fatigue
- Thyroid dysfunction
- Body image
- Sexuality
- Disfigurement
- Cognitive function
- Anxiety and concerns
- Appetite
- Nausea
- Weight loss
- Mucositis/stomatitis
- Dermatitis
- Hair loss/alopecia
- Hyperpigmentation or hypopigmentation
- Soft-tissue- osteonecrosis
- Chronic wounds, ulcers
- Social function, doing s.th. in public
- Work status
- Performance status (ECOG/Karnofsky)
- Cough

Supplemental data S7: Mean scores and standard deviations of the adapted HNC-FIT-scales.

Functional domain	Controls	Pretreatment group	Posttreatment group
Food intake	3.9+/-0.8	3.6+/-1.3	2.8+/-0.7
Breathing	3.9+/-0.6	3.7+/-1.2	3.1+/-0.7
Speech	3.9+/-0.6	3.7+/-1.2	3.1+/-0.7
Pain	3.9+/-0.8	3.6+/-1.2	3.4+/-0.9
Mood	3.7+/-0.8	3.4+/-0.8	3.4+/-0.9
Mobility	3.9+/-0.5	3.9+/-0.9	3.5+/-0.3

Supplemental data S8: German Version of the adapted Head and Neck Cancer Functional Integrity Scale (HNC-FIT Scale)

Funktions Domäne	Grad der Integrität					Durch Tumorerkrankung / -behandlung	
	0	1	2	3	4		
Ernährung	Keine orale Nahrungsaufnahme; nur über	Magensonde nötig; orale Ernährung teilweise möglich	Keine Magensonde, orale Ernährung nur flüssig/breilig/passiert	Keine Magensonde, Ernährung/Schlucken annähernd normal	Normal		
Atmung	Tracheostoma, brachth geblockte Kanüle	Tracheostoma, Sprechkanüle/keine Kanüle	Kein Tracheostoma, Atmung in Ruhe erswert	Kein Tracheostoma, Atmung bei Belastung erswert	Normal		
Sprechen	Nicht möglich, ohne Phonation	Schwer verständlich, telefonieren nicht möglich	Telefonieren möglich	Gut verständlich, aber Aussprache oder Stimme verändert	Normal		
Schmerzen	Schmerzen trotz Opiattherapie	Kontrolliert mit Opiaten	Braucht regelmäßig Nicht-Opioid-Analgetika	Bracut ab und zu Analgetika	Normal		
Stimmung	Suizidgedanken	Auch mit Antidepressiva sehr niedergedrückt	Mit Antidepressiva insgesamt normale Stimmung, ohne	Gelegentlich gedrückte Stimmung, keine Antidepressiva nötig	Normal		
Schulter-Hals-Beweglichkeit ¹	Hals steif, kaum Bewegung möglich	Haare kämmen kaum, umsehen im Auto nicht möglich	Haare kämmen mit Problemen, Umsehen im Auto gerade eben	Etwas eingeschränkt, haare kämmen problemlos möglich, Umsehen im Auto kein Problem	Normal		

¹The worse result of neck mobility and shoulder mobility is counted.