Screening for oropharyngeal dysphagia and malnutrition in patients with head and neck cancer – a review of available tools

Przesiewowa diagnostyka dysfagii ustno-gardłowej i niedożywienia u pacjentów z nowotworami głowy i szyi – przegląd dostępnych narzędzi

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ABSTRACT: The occurrence of dysphagia and malnutrition in patients with head and neck cancers is associated with sequelae that negatively affect the treatment process and its effectiveness. Therefore, it is important to perform screening of dysphagia and malnutrition in this group of patients. Screening tests should be quick to perform, easy to use, cost-effective and the methods used should be validated on the target group of patients. For patients with head and neck tumours, such validation is provided by four dysphagia screening questionnaires and nine malnutrition screening questionnaires.

KEYWORDS: dysphagia, head and neck cancer, nutritional assessment, screening assessment

INTRODUCTION

Head and neck cancer (HNC) is the sixth most common cancer in the world. Its development is largely due to lifestyle factors, including smoking, alcohol consumption, exposure to asbestos. Other risk

ABBREVIATIONS

AND – Academy of Nutrition and Dietetics
BMI – Body Mass Index
CONUT – Controlling Nutritional Status
EAT-10 – Eating Assessment Tool 10
ESPEN – European Society for Clinical Nutrition and Metabolism
FEES – fibre optic endoscopic evaluation of swallowing
GLIM – Global Leadership Initiative on Malnutrition
HNC – head and neck cancer
HNSC – Head and Neck Patient Symptom Checklist
LF – long form
MASA-C – Macc Assessment of Swallowing Ability – Cancer version
MNA – Mini Nutritional Assessment
MSTC – Malnutrition Screening Tool for Cancer
MUST – Malnutrition Universal Screening Tool
NRI – Nutritional Risk Index
NRS-2002 – Nutrition Risk Screen 2002
O-PNI – Onodera’s prognostic nutritional index
PG-SGA – Patient-Generated Subjective Global Assessment
RMNST – Royal Marsden Nutritional Screening Tool
SGA – Subjective Global Assessment
SNAQ – Short Nutritional Assessment Questionnaire
SOAL – Swallow Outcomes After Laryngectomy
SSQ – Sydney Swallowing Questionnaire
VFSS – videofluoroscopy
factors include: some viral infections (HPV viruses and Epstein-Barr virus), inadequate oral hygiene, gastroesophageal reflux disease or use of a poorly fitted prosthesis [1].

The location of HNC can involve more than twenty different anatomical sites. Many publications on the incidence of HNC analyze data on the specific location of the tumor [2]. This may lead to the erroneous conclusion that these cancers are not a problem in terms of morbidity and mortality. With the GLOBOCAN initiative, which in 2020 brought together 185 countries that report data on 36 different cancer types, there is an opportunity to collect data worldwide and make predictions about cancer incidence. The GLOBOCAN project has been in operation since 2012 and has since improved both data collection and data presentation and analysis capabilities [3, 4].

The CANCER TODAY reports prepared by the International Agency for Research on Cancer, which are based on data received from around the world as part of the GLOBOCAN project, do not include a group of head and neck cancers. This group is divided into cancers of the lips and mouth, larynx, oral part of the pharynx, laryngeal part of the pharynx, salivary glands, and nasopharynx. Divided into subgroups, these cancers range from 15th and 33rd in terms of incidence and between 17th and 33rd in terms of deaths [4].

When the available data are analysed, it becomes apparent that in practice head and neck cancer is a significant problem and is ranked as the 7th most common cancer in Europe and the 6th most common cancer worldwide. The estimated number of new cases and deaths from head and neck cancer in Europe and worldwide in 2020 are presented in Tab. I. and II. They also include the position that each type of cancer occupies in the ranking of all cancers in terms of incidence and number of deaths, as well as the position it occupies when taken together, i.e. as a group of head and neck cancers.

Swallowing disorders (oropharyngeal dysphagia) are a serious problem in patients with head and neck cancer. It affects about 40% of patients with these tumors [5]. Szcześniak et al. demonstrated that aspiration of food content was the cause of 8% of all causes of death in the studied group of HNC patients [6]. Proper swallowing requires coordinated action of muscles of the oral cavity, larynx, pharynx and esophagus. The efficiency of all these structures is extremely important to ensure the safety of the entire process [7].

Typically, dysphagia is not considered as a separate disease entity but as a symptom. It can lead to a number of clinically significant complications, including dehydration, malnutrition, and the development of pharyngitis. The presence of dysphagia promotes the exacerbation or development of malnutrition. Therefore, early recognition of oropharyngeal dysphagia in this group of patients is a key element of an appropriate therapeutic approach [8]. Instruments for detecting swallowing disorders should have high sensitivity and specificity. Routine use of appropriate diagnostic tools, early detection of dysphagia, and implementation

<table>
<thead>
<tr>
<th>LOCATION OF THE TUMOR</th>
<th>NUMBER OF CASES</th>
<th>PLACE IN THE RANKING</th>
<th>PERCENTAGE</th>
<th>NUMBER OF DEATHS</th>
<th>PLACE IN THE RANKING</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lip and oral cavity</td>
<td>65279</td>
<td>18</td>
<td>1.50%</td>
<td>24575</td>
<td>20</td>
<td>1.30%</td>
</tr>
<tr>
<td>Larynx</td>
<td>39863</td>
<td>22</td>
<td>0.91%</td>
<td>19604</td>
<td>21</td>
<td>1.00%</td>
</tr>
<tr>
<td>Oropharynx</td>
<td>29239</td>
<td>23</td>
<td>0.66%</td>
<td>13145</td>
<td>22</td>
<td>0.67%</td>
</tr>
<tr>
<td>Laryngeal part of the pharynx</td>
<td>18996</td>
<td>26</td>
<td>0.43%</td>
<td>9418</td>
<td>24</td>
<td>0.48%</td>
</tr>
<tr>
<td>Salivary glands</td>
<td>9917</td>
<td>31</td>
<td>0.23%</td>
<td>4156</td>
<td>28</td>
<td>0.21%</td>
</tr>
<tr>
<td>Nasopharynx</td>
<td>5204</td>
<td>33</td>
<td>0.12%</td>
<td>2586</td>
<td>31</td>
<td>0.13%</td>
</tr>
<tr>
<td>Sum</td>
<td>168498</td>
<td></td>
<td></td>
<td>73484</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Place in the ranking after summing up</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LOCATION OF THE TUMOR</th>
<th>NUMBER OF CASES</th>
<th>PLACE IN THE RANKING</th>
<th>PERCENTAGE</th>
<th>NUMBER OF DEATHS</th>
<th>PLACE IN THE RANKING</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lip and oral cavity</td>
<td>377713</td>
<td>17</td>
<td>2.00%</td>
<td>177757</td>
<td>17</td>
<td>1.80%</td>
</tr>
<tr>
<td>Larynx</td>
<td>184615</td>
<td>21</td>
<td>0.96%</td>
<td>99840</td>
<td>19</td>
<td>1.00%</td>
</tr>
<tr>
<td>Oropharynx</td>
<td>98412</td>
<td>25</td>
<td>0.51%</td>
<td>48143</td>
<td>24</td>
<td>0.48%</td>
</tr>
<tr>
<td>Laryngeal part of the pharynx</td>
<td>84254</td>
<td>26</td>
<td>0.44%</td>
<td>38599</td>
<td>26</td>
<td>0.39%</td>
</tr>
<tr>
<td>Salivary glands</td>
<td>53583</td>
<td>29</td>
<td>0.28%</td>
<td>22778</td>
<td>29</td>
<td>0.23%</td>
</tr>
<tr>
<td>Nasopharynx</td>
<td>133354</td>
<td>23</td>
<td>0.69%</td>
<td>80008</td>
<td>22</td>
<td>0.80%</td>
</tr>
<tr>
<td>Sum</td>
<td>931931</td>
<td>4.88%</td>
<td>467125</td>
<td>4.70%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Place in the ranking after summing up</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>
of appropriate nutritional management may reduce the risk of developing aspiration pneumonia and improve the patient’s overall condition and response to treatment [9].

The nutritional status of cancer patients is one of the factors that significantly affect the course of treatment and its effectiveness. Patients with head and neck cancers are at high risk of malnutrition, which is also associated with the occurrence of swallowing disorders [10]. Malnutrition is associated with such consequences as an increase in the frequency of infections, weakened muscle strength, decreased serum protein levels, impairment of organ function, increased morbidity and mortality, and increased treatment costs [11]. Nutritional screening assessment allows early detection of malnutrition and initiation of treatment. For this assessment to be applicable, it must be effective, easy to use in practice, and inexpensive, but also have a high sensitivity and specificity of the test [12]. Currently, there is no “gold standard” for screening the nutritional status of patients, which is reflected in the validation of the tools. However, there are questionnaires that are preferred in daily practice and those that appear more frequently in scientific studies: Subjective Global Assessment (SGA), Nutrition Risk Score (NRS-2002), Malnutrition Universal Screening Tool (MUST) [13, 14]. It is also possible to find questionnaires that have been developed for oncology patients. However, as this group is very heterogeneous, their validation should refer to a more specific group of patients, e.g. with a specific type of cancer [15].

Due to the prevalence of malnutrition and dysphagia and their associated complications, screening tests for malnutrition and swallowing disorders should be performed in the group of patients with head and neck cancers. Such a procedure enables an early decision-making for a thorough diagnosis and initiation of interventions, including nutritional interventions.

**QUESTIONNAIRE-BASED SCREENING FOR OROPHARYNGEAL DYSPHAGIA IN HEAD AND NECK CANCER – ANALYSIS OF AVAILABLE TOOLS**

There are numerous tools for screening for dysphagia, but not all have been validated in patients with cancer, including head and neck cancer. We reviewed the literature and evaluated 13 questionnaires for validation in HNC patients: Eating Assessment Tool (EAT-10), Questionnaire used to elicit symptoms related to swallowing, Swallowing Disturbance Questionnaire, Dysphagia Screening Questionnaire, Swallow Outcomes After Laryngectomy (SOAL), Sydney Swallow Questionnaire (SSQ), Self-reported Symptom Inventory, Mann Assessment of Swallowing Ability – Cancer version, Digit-Symbol Substitution Test, Mayo Dysphagia Questionnaire – 2 week, Mayo Dysphagia Questionnaire-30, Esophageal Symptoms Questionnaire, Dysphagia Short Questionnaire. Only 4 questionnaires were found to have validation in HNC patients:

- EAT-10 (Eating Assessment Tool),
- MASA-C (Macc Assessment of Swallowing Ability – Cancer version),
- SSQ (Sydney Swallow Questionnaire),
- SOAL (Swallow Outcomes After Laryngectomy).

For those patients for whom screening has revealed dysphagia, a clinical evaluation of swallowing should be performed and, if indicated, followed by instrumental testing for dysphagia. The gold standard diagnostic procedure for oropharyngeal dysphagia is to perform the FEES (fiber optic endoscopic evaluation of swallowing) or videofluoroscopy (VFSS) test. One of the studies comparing the sensitivity and specificity of FEES and VFSS, a scintigraphic examination of esophageal motility was also described. A study by Fattori et al. showed that the sensitivity and specificity of scintigraphic examination for oropharyngeal dysphagia was comparable to the other two tests. However, the authors point out that FEES and VFSS can provide more useful information for ENT and speech therapists [21]. In addition, diagnosing swallowing disorders itself, these tests can be used to determine, among others, what consistency of food the patient should eat in order to minimize the risk of complications of dysphagia [22].

**SCREENING QUESTIONNAIRES FOR MALNUTRITION RISK AND MALNUTRITION IN HEAD AND NECK CANCER PATIENTS – ANALYSIS OF AVAILABLE TOOLS**

Only three scientific societies recommend the use of questionnaires to assess nutritional status, the others merely emphasize the need for such an assessment. Even fewer guidelines exist for screening the nutritional status of patients with head and neck cancer. Questionnaires should be quick and easy to use, not costly, and validated for specific patient populations [23]. The content of fourteen questionnaires/tools was analyzed for feasibility of use in head and neck cancer patients:

- PG-SGA (Patient-Generated Subjective Global Assessment) – in full and abridged version,
- SGA (Subjective Global Assessment),
- MNA (Mini Nutritional Assessment) – in full and abridged version,
- NRS-2002 (Nutritional Risk Score),
- MUST (Malnutrition Universal Screening Tool),
- MSTC (Malnutrition Screening Tool for Cancer),
- O-PNI (Onodera’s prognostic nutritional index),
- CONUT (Controlling Nutritional Status),
- NRI (Nutritional Risk Index),
- malnutrition criteria ESPEN,
- SNAQ (Short Nutritional Assessment Questionnaire),
- NUTRISCORE,
- RMNST (Royal Marsden Nutritional Screening Tool),
- HNSC (Head and Neck Patient Symptom Checklist).

Among the tools listed, those that were feasible without additional equipment were selected (with the exception of scales, anthropometric measurements, and altimeters). Those questionnaires that required additional testing, such as drawing blood to obtain information (e.g. serum albumin levels) or additional measurements or tests (e.g. to determine lean body mass), were excluded from the analysis. Therefore, the following were excluded from the analysis: the O-PNI index, the calculation of which requires information on albumin levels and total lymphocyte counts; the ESPEN criteria...
for malnutrition, which by definition include information on lean body mass; and the CONUT index, which requires knowledge of cholesterol, albumin, and total lymphocyte count.

The information regarding the MNA questionnaire refers only to the full version of the questionnaire, as for the shortened version, no work was found during the literature review that validated it in head and neck cancer patients. Similarly, the table includes information only for the full version of the PG-SGA questionnaire, and not for the abbreviated version, as no data on specificity and sensitivity are available. For both the PG-SGA and the MNA questionnaire, the abbreviated versions are tools to help assess which patients should be administered the full version of the survey, which requires more time [24]. However, the shortened version of the questionnaire has been used by many authors in head and neck cancer studies [25–27]. A meta-analysis of the MNA questionnaire found that, although intended use for patients over 65 years of age, this questionnaire is used in the screening assessment of the severity of symptoms, which by definition include information on lean body mass; and the CONUT index, which requires knowledge of cholesterol, albumin, and total lymphocyte count.

Since the PG-SGA questionnaire can be used to obtain patient data that overlap with the ESPEN (European Society for Clinical Nutrition and Metabolism) definition of malnutrition [38], many authors recommend its use for screening nutritional status in oncology patients [39]. The sensitivity and specificity of the NRS-2002, MST, and MSTC tests were evaluated by referring to the PG-SGA questionnaire, both in its full and abbreviated versions, has been translated into many languages and validated for different patient groups. This is of particular importance in the context of data analysis, preparation of meta-analyses and conducting further studies [39]. In addition, an abbreviated version of the PG-SGA has been tested in the form of a mobile application, and the results suggest that this method of data collection (even remotely) is effective and understandable to patients and may be useful in clinical practice [13]. In the context of using the NRS-200 questionnaire in a group of oncology patients, it is worth bearing in mind the results of the study by Orell et al [32]. The authors suggest that in this group of patients a score \( \geq 2 \) should be used as a cut-off point.

It is worth noting that recommendations from scientific societies on the use of screening tools vary. ESPEN recommends the use of the NRS-2002, MST or MUST [41]. On the other hand, AND (Academy of Nutrition and Dietetics) recommends in its guidelines PG-SGA, MST, MSTC or MUST, whereas Clinical Oncology Society of Australia recommends MST, MSTC or PG-SGA [42]. In Poland, the law obliges physicians to perform screening of nutritional status in all patients undergoing hospitalization, excluding, among others, hospital emergency wards, as well as ophthalmology, otolaryngology, allergy and orthopedics and traumatology of musculoskeletal organs departments, if the patient’s hospitalization lasts less than 3 days.

Assessment of nutritional status should be performed at the beginning of treatment using the NRS-2002 or the Subjective Global Assessment of Nutritional Status (SGA) questionnaire [43]. The SGA requires more experience of the screener, as it is at least partially subjective. Considering that oncology patients are often hospitalized in ENT departments, routine implementation of nutritional status screening should be considered, regardless of

<table>
<thead>
<tr>
<th>Full name of the tool</th>
<th>EAT-10 (16)</th>
<th>MASA-C (17)</th>
<th>SSQ (18)</th>
<th>SOAL (19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The year of origin</td>
<td>2008</td>
<td>2013</td>
<td>2010</td>
<td>2012</td>
</tr>
<tr>
<td>No. of questions</td>
<td>10</td>
<td>15</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Scale</td>
<td>0–4</td>
<td>0–200</td>
<td>0–1700</td>
<td>0–30–4</td>
</tr>
<tr>
<td>Scoring range</td>
<td>0–40</td>
<td>0–200</td>
<td>0–1700</td>
<td>0–3–4</td>
</tr>
<tr>
<td>Cut-off points</td>
<td>0–2 correct result</td>
<td>No data</td>
<td>0–192 correct result 193–1700 indicates the presence of dysphagia</td>
<td>0–4 correct result 5–34– indicates the presence of dysphagia</td>
</tr>
<tr>
<td>Questionnaire completion time</td>
<td>3–5 minutes</td>
<td>10–15 minutes</td>
<td>10 minutes</td>
<td>5–15 minutes</td>
</tr>
<tr>
<td>What the questionnaire evaluates [20]</td>
<td>Assessment of the severity of symptoms, quality of life and treatment effectiveness</td>
<td>Evaluation of swallowing ability</td>
<td>Assessment of dysphagia severity</td>
<td>Assessment of the severity of dysphagia symptoms 3 months after laryngectomy</td>
</tr>
<tr>
<td>Cohen's Kappa coefficient relative to VFS studies</td>
<td>0.87</td>
<td>No data</td>
<td>0.69</td>
<td>No data</td>
</tr>
<tr>
<td>ICC coefficient</td>
<td>0.90</td>
<td>0.96</td>
<td>0.78</td>
<td>No data</td>
</tr>
</tbody>
</table>
Tab. IV. List of validated screening questionnaires for the nutritional status assessment for the group of patients with head and neck cancer (own study according to [9, 29–37]).

<table>
<thead>
<tr>
<th>ABBREVIATED TOOL NAME</th>
<th>MNA-LF</th>
<th>PC-SGA</th>
<th>NRS-2002</th>
<th>MST</th>
<th>MSTC</th>
<th>HNSC</th>
<th>SNAQ</th>
<th>NUTRISCORE</th>
<th>MUST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full name of the tool</td>
<td>Mini Nutritional Assessment Long Form</td>
<td>Patient Generated – Subjective Global Assessment</td>
<td>Nutritional Risk Screening – 2002</td>
<td>Malnutrition Screening Tool</td>
<td>Malnutrition Screening Tool for Cancer</td>
<td>Head and Neck Patient Symptom Checklist</td>
<td>Short Nutritional Assessment Questionnaire</td>
<td>NUTRISCORE</td>
<td>Malnutrition Universal Screening Tool</td>
</tr>
<tr>
<td>No. of questions</td>
<td>18</td>
<td>17</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Target group</td>
<td>Persons 65 years and older</td>
<td>Cancer patients</td>
<td>Hospitalized patients</td>
<td>Patients treated in the intensive care unit</td>
<td>Cancer patients</td>
<td>Patients with head and neck cancer</td>
<td>Hospitalized patients</td>
<td>Cancer patients</td>
<td>Hospitalized patients</td>
</tr>
<tr>
<td>Data analyzed</td>
<td>Anthropometric data, food intake, medication intake, physical performance, mental and physical health</td>
<td>History of weight changes, symptoms affecting food intake, food intake, physical performance</td>
<td>Health professional's assessment of impact of illness on nutritional status</td>
<td>BMI, unintentional weight loss (%), disease severity</td>
<td>Prevalence and impact on diet of symptoms that may affect the quality of nutrition</td>
<td>Weight loss, decreased appetite, nutritional treatment (including use of ONS)</td>
<td>BMI, weight loss, acute illnesses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Who fills out the form</td>
<td>Patient</td>
<td>Patient and medical personnel</td>
<td>Medical personnel</td>
<td>Medical personnel</td>
<td>Medical personnel</td>
<td>Patient</td>
<td>Medical personnel</td>
<td>Medical personnel</td>
<td></td>
</tr>
<tr>
<td>Sensitivity (in patients with HNC)</td>
<td>82% vs NRS-2002 (30)</td>
<td>73% vs NRS-2002 (31)</td>
<td>98% vs PC-SGA (32)</td>
<td>100% vs PC-SGA (33)</td>
<td>94% vs PC-SGA (34)</td>
<td>79% vs PC-SGA (35)</td>
<td>40% vs PC-SGA (36)</td>
<td>97% vs PC-SGA (37)</td>
<td>80% vs PC-SGA (38)</td>
</tr>
<tr>
<td>Specificity (in patients with HNC)</td>
<td>100% vs NRS-2002 (30)</td>
<td>100% vs NRS-2002 (31)</td>
<td>77% vs PC-SGA (32)</td>
<td>92% vs PC-SGA (33)</td>
<td>84% vs PC-SGA (34)</td>
<td>99% vs PC-SGA (35)</td>
<td>92% vs PC-SGA (36)</td>
<td>96% vs PC-SGA (37)</td>
<td>89% vs PC-SGA (38)</td>
</tr>
</tbody>
</table>

** - pacjenci z HNC stanowili 7,5% badanej grupy pacjentów onkologicznych.
current legislation. In addition, it should be remembered that screening assessment of nutritional status aims to detect malnutrition, including hospital-acquired malnutrition and, if necessary, to initiate nutritional intervention as early as possible, which should be carried out by a qualified clinical dietician.

**SUMMARY**

The incidence of head and neck cancer is still relatively common worldwide. Screening for malnutrition, malnutrition risk, and dysphagia should be a routine procedure performed using tools that are tailored to this patient population. Screening for malnutrition and oropharyngeal dysphagia is helpful in planning nutritional interventions to prevent deterioration of nutritional status and loss of muscle mass, which may lead to poorer tolerance of cancer treatment, prolonged hospital stay, and even increased risk of treatment failure. After analyzing data on the validation of questionnaires for dysphagia screening and nutritional status assessment, it seems that the most optimal questionnaires to use are the EAT-10 questionnaire for dysphagia and the PG-SGA, MST and NUTRISCORE for nutritional status assessment.

**REFERENCES**


