introduction

Dyspnoea is a frequent symptom in advanced cancer patients with the highest prevalence in lung cancer (up to 74%) increasing in the terminal phase (up to 80%) with major impact on the quality of life of the patient, his or her family, as well as the caregivers [1-5]. Patients describe dyspnoea as suffocating, choking or tightness of breath. Qualitative data have shown that the symptom can be described along three dimensions:

- air hunger—the need to breathe while being unable to increase ventilation;
- effort of breathing—physical tiredness associated with breathing;
- chest tightness—the feeling of constriction and inability to breathe in and out.

In summary, it can be defined as subjective perceived breathlessness, difficult breathing or shortness of breath. The experience of dyspnoea encompasses physical, as well as psychological, social and spiritual domains [6-8]. Recently, the term ‘total dyspnoea’ has been proposed to capture the complexity of the symptom [9, 10]. Moreover, dyspnoea has been demonstrated to be one of the most distressing symptoms in cancer patients [11]. This suggests a multidisciplinary approach focusing on the patient’s psychological, social and spiritual needs, as well as on the physical symptoms [12-14].

assessment

Breathing discomfort varies in intensity that may not be associated with hypoxaemia, tachy- (increased respiratory rate), brady- (reduced respiratory rate) or orthopnoea (normal respiratory rate). Since dyspnoea is completely subjective in perception, the most valid assessment instrument is the patient-reported outcome addressing the multidimensional and multifactorial nature of the symptom [15-19]. If this is impossible due to impaired communicative capability of the patient, relative or caregiver, reported dyspnoea may be helpful (Table 1).

The differentiation between continuous, episodic, breakthrough or crisis breathlessness, as well as the evaluation of onset, exacerbating and relieving factors is important in order to adjust the therapy appropriately, taking into consideration disease-modifying, causative and symptomatic treatment options [20]. Dyspnoea often leads to severe anxiety but severe anxiety can cause dyspnoea as well [19, 21-23]. Therefore, the psychosocial dimension and environmental conditions should not be omitted and very often play a major role in the clinical condition.

management strategies

treating reversible causes

With regard to the patient’s general condition and the state of disease, causative therapeutic options should be considered and discussed with the patient before starting symptomatic treatment, except in the case of emergency (acute suffocation). The required physical and technical examinations (complete blood count, electrolytes, creatinine, oximetry and full blood gas assessment, electrocardiogram, brain natriuretic peptide or chest X-ray and computed tomography scan) must correspond to the patient’s performance status as well as to the putative resulting therapeutic options [24] (Table 2).

non-pharmacological interventions

Little evidence but sufficient clinical consensus is available concerning non-pharmacological interventions. They should be offered before starting pharmacological interventions and should accompany them afterwards [26, 27].

They include education of the patient, and his or her relatives, about simple measures for ameliorating the symptom, such as cooling the face, opening windows, using small ventilators, adequate positioning (e.g. coachman’s seat, elevation of the upper part of the body), respiratory training, the use of a walking frame or a walker [28-30].

It is very important that the patient and the caregivers are familiar with these treatment options and can use them whenever they want [31]. This contributes to the reduction of helplessness and anxiety. In addition to technical support, psychological training (relaxation) contributes to the prevention of developing a panic attack when breathlessness is experienced, by improving emotional control during breakthrough dyspnoea [32].
requiring tubing and tanks), its risk of nosebleeds from the nasal cannula, and the patient’s psychological addiction to this ‘umbilical cord’, it cannot be recommended for routine use.

Even in the home-care setting, it serves as a surrogate for caregivers who may feel helpless and distressed when watching a breathless family member at home. Oxygen could be used for a short period before physical efforts or eating.

Oxygen supplementation through venturi masks can offer significant alleviation of dyspnoea in patients with hypoxaemia, if the patient suffered from chronic obstructive pulmonary disease as a co-morbidity and has been on oxygen before.

**pharmacological treatment**

**opioids.** Opioids are the only pharmacological agents with sufficient evidence in the palliation of dyspnoea [38–41]. They can be used in opioid-naive as well as in opioid-tolerant patients without causing relevant breath depression or impaired oxygenation or increase in CO₂ concentration [42]. Nevertheless, patients receiving opioids for breathlessness experience the well-known opioid-related unwanted side effects, e.g. initial nausea and persistent constipation. The mechanism of the antidyssnoeic effect of opioids seems complex and is mediated via opioid receptors of the cardio-respiratory system as well as different areas in the central nervous system [43–49]. There is some evidence for a close relationship between dyspnoea and anxiety. Opioids reduce the unpleasantness of dyspnoea. Although evidence has been provided only for oral and parenteral morphine, diamorphine and dihydrocodeine, larger series, retrospective studies and case reports suggest that no opioid is superior to another and that hydromorphone, fentanyl and oxycodone may also be used [46, 50–52]. Morphine should be avoided in patients with severe renal insufficiency, while dosage and dosage intervals should be adapted to the renal function for all µ-opioids because of their renal elimination [53–55].

Normal-release preparations of oral/rectal opioids may be used for titration, switching to sustained preparation afterwards [56]. Subcutaneously and intravenously applied opioids are effective, with the intravenous form having the most rapid onset. There is no evidence for the efficacy of nebulised or inhaled opioids [18, 57, 58]. The importance of buccal, nasal or transdermal preparations still remains unclear.

In opioid-naïve patients, the starting dose for dyspnoea is smaller than that for pain palliation [59]. On the contrary, patients receiving opioids for analgesia require an increase of dosage up to 25% or 50% [60] (Table 3).

**benzodiazepines.** Benzodiazepines can be used in cases of non- or insufficient response to opioids, either alone or in addition to

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**Table 1. Dimensions of dyspnoea**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Criterion</th>
<th>Measurement</th>
</tr>
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<tbody>
<tr>
<td>Sensory-perceptual experience</td>
<td>Intensity</td>
<td>NRS, VAS</td>
</tr>
<tr>
<td>Affective distress</td>
<td>Emotional unpleasantness</td>
<td>NRS, VAS, HADS</td>
</tr>
<tr>
<td>Impact on daily life</td>
<td>Meaning for social contact, functioning, quality of life</td>
<td>CRQ, EORTC-QLQ-C15-PAL, MRC, SF12</td>
</tr>
</tbody>
</table>

NRS, Numerical Rating Scale; VAS, visual Analogue Scale; MRC, Medical Research Council; CRQ, Chronic Respiratory Disease Questionnaire; HADS, Hospital Depression and Anxiety scale; SF12 Health survey; EORTC-QLQ-C15-PAL questionnaire to assess the quality of life of palliative cancer care patients.

**Table 2. Pathophysiology and causative intervention (examples only) [25]**

<table>
<thead>
<tr>
<th>Pathophysiology</th>
<th>Targeted intervention</th>
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<tr>
<td>Cancer-induced airways obstruction</td>
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<td>Anaemia</td>
<td>Transfusions</td>
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<td>Erythropoietin administration for chemotherapy-induced anaemia</td>
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<tr>
<td>Airway obstruction and chronic obstructive pulmonary disease as comorbidity</td>
<td>Anti-fibrinolytics, endoscopic or surgical intervention (stent, laser, argon-beamer), irradiation</td>
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<td>Haemoptysis</td>
<td>Airway dilators, corticosteroids</td>
</tr>
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<td>Pulmonary congestion</td>
<td>Diuretics or other appropriate intervention</td>
</tr>
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<td>Pericardial effusion</td>
<td>Pericardial puncture, pericardiodes</td>
</tr>
<tr>
<td>Upper venous congestion</td>
<td>Corticosteroids, irradiation, stenting of the vena cava, anticoagulation</td>
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Pharmacological interventions include reduction of artificial hydration, adding antisecretory drugs such as atropine, hyoscine or glycopyrronium bromide and optimise positioning of the dying.

**methodology**

These clinical practice guidelines were developed in accordance with the ESMO standard operating procedures for clinical practice guidelines development. They are based on the international literature and the available scientific guidelines and the relevant literature has been selected by the expert authors. Because these recommendations are not based on a systematic review of the evidence, undertaken by guideline development group members, with support from the SIGN Executive, they are not graded. For this purpose, we refer to the scientific German S3 guidelines. However, this manuscript has been subjected to an anonymous peer review process.

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